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Brief report

Infants' scanning of dynamic faces during the first year

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ABSTRACT

This research investigated infants' scanning of a talking, socially engaging face. Three- to four-month-olds looked equally at the mouth and eyes whereas 9-month-olds attended more to the eyes than mouth. These findings shed light on information infants' seek from dynamic face stimuli.

From the first moments of life we have extensive and repeated exposure to faces. Recognition and identification of faces forms the basis for human interaction and facial features convey a host of socially relevant information. There are some aspects of face processing about which a great deal is known. For example, we know that newborn infants orient to and prefer face-like over other patterned stimuli (Fantz, 1963; Farroni, Johnson, Menon, Zulian, & Faraguna, 2005; Goren, Sarty, & Wu, 1975). Young infants prefer pictures of upright to inverted or scrambled faces (Chien, 2011; Mondloch et al., 1999; Turati, Valenza, Leo, & Simion, 2005) and fixate more on the human face than other visual stimuli (Gliga, Elsabbagh, Andravizou, & Johnson, 2009). Newborns are sensitive to differences between individual human faces, quickly learn to identify their own mother from non-familiar females (Barrera & Maurer, 1981; Bartrip, Morton, & de Schonen, 2001; Bushnell, Sai, & Mullin, 1989), and with time and experience better discriminate between individuals within their own than a different race (Kelly et al., 2007; Sangrigoli & de Schonen, 2004).

In contrast, there are other aspects of face processing that are underspecified. For example, we have more limited information about how infants scan individual components of a face. There is evidence that 1-month-olds fixate primarily on the outer contour of the face but by 2 months focus on internal elements, mostly the eyes and mouth (Hainline, 1978; Maurer & Salapatek, 1976). When scanning of the internal features relative to each other is assessed, young infants spend more time attending to the eyes than the mouth (Haith, Bergman, & Moore, 1977; Hunnius, de Wit, Vrins, von Hofsten, 2011). Most faces infants see, however, are not static but dynamic and viewed within a social context. Studies investigating infants' visual scanning of dynamic face displays are few and the results mixed. One group of researchers (Lewkowicz & Hansen-Tift, 2012; see also Haith et al., 1977) showed infants a video in which a female produced a monolog while looking at the infant. Infants aged 4 months attended more to the eyes than the mouth, whereas 8- and 10-month-olds attended more to the mouth than the eyes. In contrast, other researchers (Hunnius & Geuze, 2004; see also Merin, Young, Ozonoff, & Rogers, 2007) presented infants with a video of a female smiling and attempting to engage their attention. Infants aged 1.5–6.5 months looked about equally at the eyes and mouth. Although infants older than 6.5 months were not tested in this study, there

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is some evidence to suggest that between 6 and 10 months infants shift attention away from the mouth and to the eyes of dynamic face displays (Wheeler et al., 2011).

On the basis of current findings it is difficult to draw firm conclusions about the nature and development of dynamic face scanning during the first year. The dynamic displays used in the studies reported above differed in two important ways. First, the dynamic displays used by Lewkowicz and Hansen-Tift (2012) contained an auditory component, whereas the dynamic displays used by Hunnius and Geuze (2004) were silent. Second, in Hunnius and Geuze the speaker's primarily intent was to engage the infants' attention, a social act, and in Lewkowicz and Hansen-Tift the speaker produced a scripted monolog. The current research explored 3- to 4-month-olds' and 9-month-olds' scanning of dynamic faces in which the speaker attempted to engage the infants' attention by smiling and uttering simple vocalizations. Hence, the displays were socially engaging and included an auditory component.

1. Method

Participants were twenty 3- to 4-month-olds (10 F; *M* age = 4 months, 2 days; range = 3 months, 1 day to 4 months, 26 days) and eighteen 9-month-olds (7 F; *M* age = 9 months, 14 days; range = 9 months, 1 day to 9 months, 31 days). Six additional infants were tested but failed to contribute eye-tracking data. Parents reported their infant's race/ethnicity as Caucasian (*N* = 27), Hispanic (*N* = 3), Asian (*N* = 2), Black (*N* = 2), or mixed race (*N* = 4). Parents were recruited from commercially produced lists and were offered $5 or a lab T-shirt for participation. The experimental procedure was explained to the parents and informed consent was obtained prior to testing.

Infants were positioned in an infant seat 56 cm from a 20 in computer monitor. An infrared eye-tracker with remote optics (Model R6, Applied Science Laboratories) measured eye movements during test trials. The camera was placed directly below the computer monitor (and 56 cm from infants' eyes) and was not visible to infants. A magnetic head tracker (Flock of Birds®, Ascension Technology Corporation) was worn by infants to limit disruption in eye tracking as a function of head movement. Eye movement data were calibrated prior to testing using three gaze positions covering over 80% of the viewing area.

The test stimuli (Fig. 1) were two videos of a smiling Caucasian female adult who waved with one hand and said "Hi Baby" or clapped her hands together below her mouth and said, "Hey Baby". The videos filled the computer screen. The hands served as a control for motion-directed attention. Each video was approximately 4 s and shown twice for a total of

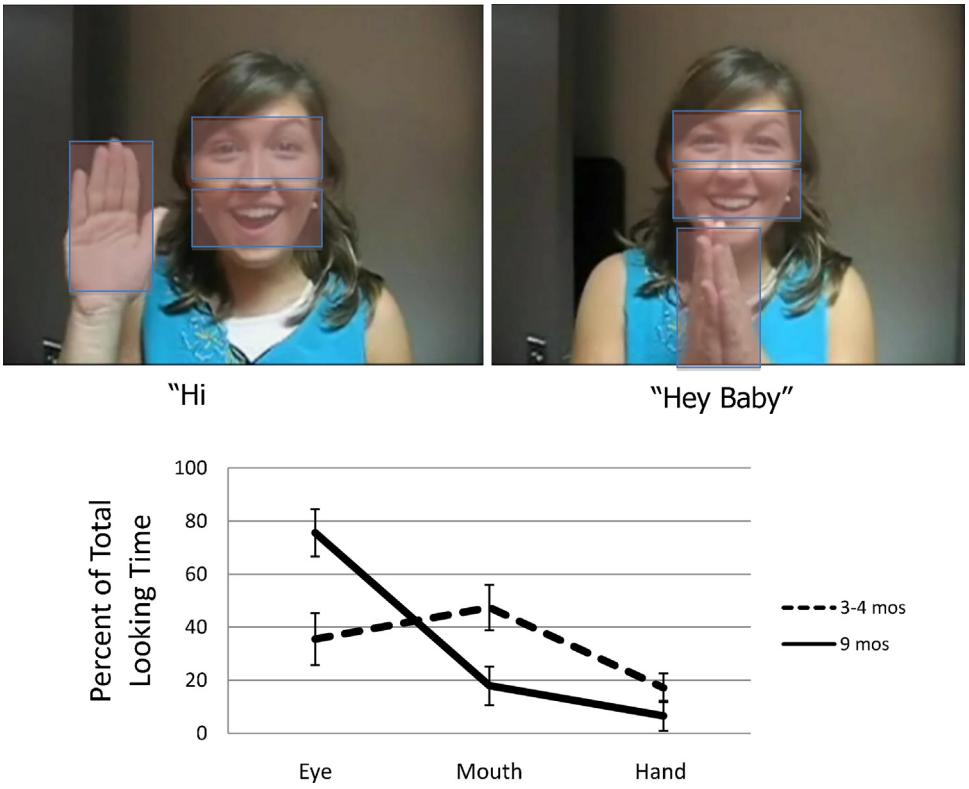

Fig. 1. (Top) Screen shot from each of the two dynamic face videos used in the present experiment with the three AOIs (eyes, mouth, hands) drawn to scale. The eyes, mouth, and hands AOIs covered approximately the same percentage of the face area in both videos, respectively. (Bottom) Mean (SE) proportion of looking to each of the three AOIs for the younger and older infants.