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Infant attention to same- and other-race faces [☆]

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ABSTRACT

We recorded visual attention to same- and other-race faces in Hispanic and White 11-month-old infants, an age at which face processing is presumably biased by an own-race recognition advantage. Infants viewed pairs of faces differing in race or ethnicity as their eye movements were recorded. We discovered consistently greater attention to Black over Hispanic faces, to Black faces over White faces, and to Hispanic over White faces. Inversion of face stimuli, and infant ethnicity, had little effect on performance. Infants' social environments, however, differed sharply according to ethnicity: Hispanic infants are almost exclusively exposed to Hispanic family members, and White infants to White family members. Moreover, Hispanic infants inhabit communities that are more racially and ethnically diverse. These results imply that race-based visual attention in infancy is closely aligned with the larger society's racial and ethnic composition, as opposed to race-based recognition, which is more closely aligned with infants' immediate social environments.

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1. Introduction

Studies of infant face perception represent an important opportunity to inform theories of social cognitive development, in particular the means by which we develop the ability to identify critical features of social categories such as race (Hugenberg, Young, Bernstein, & Sacco, 2010) sex (Ramsey, Langlois, & Marti, 2005), and age (Macchi Cassia, Pisacane, & Gava, 2012), and the means by which social context influences categorization of individuals from specific groups (Scott, Pascalis, & Nelson, 2007). In the present paper we examine 11-month-olds' oculomotor scanning patterns to faces to determine whether same-race faces recruit greater visual attention.

Infants provide no evidence of differentiating race at birth (Kelly et al., 2005), but the ability to discriminate perceptually based on race develops early. At 3 months, Black, Asian, and White infants distinguished between own-race and other-race faces in a simple preferential-looking paradigm, looking longer at own-race faces when these races were the majority in their culture, the familiar in-group (e.g., Bar-Haim, Ziv, Lamy, & Hodes, 2006; Kelly

et al., 2005, 2007). Longer looking at own-race faces was not observed, however, in infants whose race was not the majority (Bar-Haim et al., 2006) or in biracial infants (Gaither, Pauker, & Johnson, 2012), implying an important role for the social environment in tuning infants' face attention. Infant face recognition, likewise, is shaped by the social environment. At 3 months, White and Asian infants from majority-race cultures recognized different faces of their race as well as different faces of other races (Kelly et al., 2007, 2009), but the ability to discriminate between faces from racial out-groups appears to decline after this time such that by 9 months, infants recognize same-race faces but have difficulty recognizing other-race faces (Kelly, Quinn, et al., 2007; Kelly et al., 2009), as do adults (Hugenberg et al., 2010). Added experience with a novel stimulus category (e.g., Asian faces) can reverse effects of perceptual narrowing, perhaps via improved stimulus recognition and encoding (Anzures et al., 2012).

Perceptual tuning for face characteristics may also guide development of infants' ability to categorize faces by race. After exposure to a series of Black or Asian faces (i.e., individual faces belonging to a single racial category), White 6-month-olds with limited experience with other-race faces distinguished between a new face from the familiar racial category compared to a new face from the novel race (i.e., Asian or Black, respectively), but 9-month-olds tested under identical conditions did not categorize either race (Quinn, Lee, Pascalis, & Tanaka, 2016). Additional experiments, however, revealed that White 9-month-olds formed a category for White faces that excluded Asian faces (Anzures, Quinn,

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Pascalis, Slater, & Lee, 2010) and formed a category of White faces that excluded Black or Asian faces, or a category of Black or Asian faces that excluded White faces (Quinn et al., 2016). Thus infants who lack experience with other-race faces appear to have difficulty constructing other-race categories, and instead may establish a broader distinction between same-race (e.g., White in-group) and other-race faces grouped together (e.g., Asian and Black out-groups). In sum, infants at birth do not exhibit attentional differences to faces based on race, but come to look longer own-race faces in racially homogeneous social environments by 3 months. Over the next 6 months infants' visual discrimination by race becomes tuned toward own-race faces, facilitating own-race recognition, and categorizing faces according to own- vs. other-race features.

Here, we investigate attention to same- and other-race faces in 11-month-old infants, addressing the possibility that greater attention to own-race faces persists following the presumed developmental period of perceptual tuning toward own-race face characteristics just described, or whether (and how) they might become altered. Current evidence for differences in visual attention as a function of face race in infants older than 3 months is mixed: A study comparing Asian infants' responses to sequential presentations of own- (Asian) and other-race (Black or White) faces yielded no evidence for race preferences in 9-month-olds (Liu et al., 2011); similar effects were reported in studies of White infants viewing White vs. Black faces (Wheeler et al., 2011) and White vs. Asian faces (Xiao, Quinn, Pascalis, & Lee, 2014). However, a recent report testing Asian infants with little exposure to other races found greater attention to own-race faces in 3-month-olds, no differences in attention at 6 months, and greater attention to other-race faces in 9-month-olds (Liu et al., 2015). (Notably, stimuli were presented side-by-side, which may be a more sensitive means of testing differences in race-based attention than sequential presentation due to reduced memory demands.)

Liu et al. (2015) suggested that the patterns of longer looking to other-race faces they reported reflected a transition from an early familiarity preference to a later novelty preference stemming from increasing exposure to own-race faces. Other-race faces might be conspicuous also by virtue of infant identification of in- and out-groups if race has achieved *psychological salience* as a marker of groups (Bigler & Liben, 2006, 2007). Out-groups may naturally come to recruit attention as the capacity for social categorization develops between 6 and 9 months (Anzures et al., 2010; Quinn et al., 2016).

Other developments in infancy, in contrast, might be predicted to yield greater attention to own-race faces. At 11–12 months, for example, infants preferred others similar to themselves in a choice task (Mahajan & Wynn, 2012), implying a general in-group or similarity bias also seen in children (Hailey & Olson, 2013). Some theories of social category formation propose that in-group bias stems not from emerging attitudinal preferences, but rather from perceptual expertise in social information processing from exposure to individuals in specific groups, fostering extraction of relevant visual cues and processing strategies such as configural visual scanning (Hugenberg et al., 2010; Sporer, 2001). Thus *processing fluency* may favor attention to in-group (viz., own-race) category members. Consistent with this possibility, studies of infant eye movement patterns revealed developments between 6 and 9 months in attention to specific facial features when viewing own-race faces—attention to the nose, for example, in Chinese infants (Liu et al., 2011) and attention to the eyes in White infants (Wheeler et al., 2011)—features that help adults identify in-group individuals (e.g., Hu, Wang, Fu, Quinn, & Lee, 2014). In addition, 8-month-olds processed own- but not other-race faces holistically, evinced by the disruptive effect of inversion on face recognition (cf. Maurer, LeGrand, & Mondloch, 2002); inversion had little effect on

4-month-olds' performance (Ferguson, Kulkofsky, Cashon, & Casasola, 2009).

Other studies suggest a third possibility: a loss of race-based attention differences after 3 months. As noted previously, infants who have increased exposure to and familiarization with other-race faces do not demonstrate greater looking at own-race faces (Bar-Haim et al., 2006; Gaither et al., 2012). Importantly, older infants do not appear to use race to guide their behavior in a toy-choice task. When offered a toy by a Black or White actor, White 10-month-olds were equally likely to select toys offered by the own- and the other-race individual (Kinzler & Spelke, 2011).

Infant attention to own- and other-race faces in infancy, therefore, remains poorly understood, yet it is central to understanding development of biases toward in- and out-group members, and, therefore to theories of social cognition and social development. Taken together the studies just reviewed suggest that, at least among infants with limited cross-race exposure, race may become psychologically salient and utilized as a basis for social categorization by 9 months, but these processes seem to be fluid and context-dependent in infancy. To clarify these issues, we observed 11-month-old infants from two ethnic groups—Hispanic and White, whom we later demonstrate to have substantial differences in daily experience to racial and ethnic minorities—and presented them with Black, Hispanic, and White faces. As noted previously, our study addresses the possibility that greater attention to own-race faces, observed in young infants, persists following the presumed developmental period of perceptual tuning toward own-race face characteristics, or if not, how they can best be explained. Results will tell us the extent to which the own-race recognition advantage (discussed previously) and/or the immediate social environment influence infants' attention to same- and other-race faces. Testing Hispanic and White infants will tell us the extent to which infants exhibit ethnicity-based as well as race-based attention differences, because each pair of faces contrasted either race (Black vs. Hispanic and Black vs. White) or ethnicity (Hispanic vs. White).

2. Method

2.1. Design

We recruited Hispanic and White infants and presented them with pairs of Black, Hispanic, and White women's faces (Fig. 1). Each pair contrasted either race (Black vs. Hispanic, Black vs. White) or ethnicity (Hispanic vs. White). Stimulus pairings were structured such that each face was presented twice across the experiment, paired once with each of the two other types (e.g., a Black face was paired once with a Hispanic face and again with a White face). Pairings were randomized with the constraint that no face type could appear more than three times in a row on either side. Infants viewed the face pairs as their eye movements were recorded with an eye tracker. The dependent variables were dwell times (accumulated visual fixations) in an area of interest (AOI) surrounding each face (Fig. 2) to gauge overall differences in attention to faces of different races, as well as dwell times for AOIs encompassing eyes, nose, and mouth of each face, to probe for any race- or ethnicity-specific patterns of visual attention to facial features. Because inversion of faces impairs recognition (Farah, Tanaka, & Drain, 1995), and configural face processing (Maurer et al., 2002), separate groups of Hispanic and White infants were recruited to view inverted faces so we could analyze for effects of inversion on overall attention to faces and to facial features. We also collected data about each infant's social environment (exposure to different racial/ethnic groups in the family and

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