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Infant face interest is associated with voice information and maternal psychological health☆

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ABSTRACT

Early infant interest in their mother's face is driven by an experience based face processing system, and is associated with maternal psychological health, even within a non clinical community sample. The present study examined the role of the voice in eliciting infants' interest in mother and stranger faces and in the association between infant face interest and maternal psychological health.

Infants aged 3.5-months were shown photographs of their mother's and a stranger's face paired with an audio recording of their mother's and a stranger's voice that was either matched (e.g., mother's face and voice) or mismatched (e.g., mother's face and stranger's voice). Infants spent more time attending to the stranger's matched face and voice than the mother's matched face and voice and the mismatched faces and voices. Thus, infants demonstrated an earlier preference for a stranger's face when given voice information than when the face is presented alone. In the present sample, maternal psychological health varied with 56.7% of mothers reporting mild mood symptoms (depression, anxiety or stress response to childbirth). Infants of mothers with significant mild maternal mood symptoms looked longer at the faces and voices compared to infants of mothers who did not report mild maternal mood symptoms. In sum, infants' experience based face processing system is sensitive to their mothers' maternal psychological health and the multimodal nature of faces.

1. Introduction

Faces represent a special stimulus for preverbal infants, providing them with an early source of communication (see Nelson, 2001). Indeed, infants possess an innate face interest mechanism which facilitates early attention to faces (Morton & Johnson, 1991) and drives an early preference for looking at their mother's face over a stranger's face (e.g., Bushnell, 2001; Field, Cohen, Garcia, & Greenberg, 1984; Pascalis, de Schonen, Morton, Deruelle, & Fabre-Grenet, 1995). This preference, which is present within the first days of life, enables the formation of the mother–infant relationship which is important for infant's social and emotional development (Bowlby, 1969; Blass & Camp, 2003). At around 2-months of age, Morton and

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Johnson (1991) propose that infant face interest is driven by an experience based system that is dependent upon infants' exposure to faces. Although early mother face interest has been widely researched, less is known about the experiences that may influence interest in mother and stranger faces as the infant develops.

In accordance with an experience based face processing system, infants prefer to look at faces that are the same gender (Quinn, Yahr, Kuhn, Slater & Pascalis, 2002) and ethnicity (Kelly et al., 2005) as their primary caregiver. Moreover, infants typically exhibit a developmental trend from a preference for looking towards their mother's face, when it is presented simultaneously with a stranger's face, to a preference for looking towards a stranger's face at around 4–5-months of age (Bartrip, Morton, & De Schonen, 2001). However, 3-month-old infants begin exhibiting a stranger face preference following repeated exposure to the photograph of their mother's face (Barerra & Maurer, 1981). Thus, the trend from a mother face preference to a stranger face preference around 4–5-months of age is assumed to reflect infants' increasing exposure and familiarity with their mother's face as well as an increasing drive towards attending to novel faces. Thus, individual differences in infant face interest may potentially reflect infants' prior experiences with their mother.

Infants' prior experiences with their mother may be shaped by their mother's maternal psychological health. Differences in infants' face interest have been documented in relation to maternal symptoms of postnatal depression (PND; for review, see Field, Diego, & Hernandez-Reif, 2009). Neonates of mothers with symptoms of depression take longer to habituate to their mother's face and voice (Hernandez-Reif, Field, Diego, & Largie, 2002) and, in general, orient less to faces and voices than neonates of mothers who do not report symptoms of depression (Hernandez-Reif, Field, Diego & Ruddock 2006). These findings persevere across early infancy; infants of mothers with symptoms of depression take longer to habituate to video clips of a stranger's happy/sad facial and vocal expressions (Hernandez-Reif, Field, Diego, Vera, & Pickens, 2006), spend less time attending to a stranger's live facial expressions (Diego et al., 2004) and fail to discriminate between a stranger's happy and neutral facial expressions (Bornstein, Atterberry, Mash, & Manian, 2011). Thus, there is an important influence of maternal symptoms of PND on infant face interest which persists across early infancy. The overarching aim of the present experiment was to determine the role of maternal psychological health as a prior social experience on infant's interest in their mother's and a stranger's face.

Maternal psychological health varies considerably within general community samples of postnatal women. Clinically significant levels of symptoms of PND are prevalent in around 17% of women (e.g., Morrell et al., 2009) and symptoms of anxiety and post-traumatic stress disorder (PTSD) can also occur postnatally (Czarnocka & Slade, 2000; Wenzel, Haugen, Jackson, & Brendle, 2005; White, Matthey, Boyd, & Barnett, 2006). For 3–5.6% of mothers, childbirth is experienced as a traumatic event which results in clinical symptoms of PTSD (Creedy, Shochet, & Horsfall, 2000; Czarnocka & Slade, 2000). Moreover, the mother–infant relationship is affected by maternal symptoms of PTSD (Davies, Slade, Wright, & Stewart, 2008; McDonald, Slade, Spiby, & Iles, 2011) and PND (Edhborg, Lundh, Seimyr, & Widstorm, 2001; Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Murray, 1992; Taylor, Atkins, Kumar, Adams, & Glover, 2005). Thus, it is important to consider the role of a variety of maternal emotional responses, in relation to infant face interest, within general community samples.

Within such a community sample, Jones, Slade, Pascalis, and Herbert (2013) have recently shown that differences in maternal psychological health affect infant face interest at 3.5-months of age. Maternal psychological health was determined in that study by mothers' responses to questionnaires regarding anxiety, depression, and stress responses to childbirth. An additional questionnaire also examined mother–infant bonding, which was determined by maternal perceptions of their infant's warmth and invasiveness. Infants were sequentially shown photographs of their mother's and a stranger's face, while the duration of visual attention to each face was measured. In this community sample, 57% of mothers reported mild symptoms on at least one measure of anxiety, depression, or stress responses to childbirth. Overall, infants of mothers who did not report maternal mood symptoms looked longer during the presentation of their mother's face. In contrast, there was no difference in looking times to the mother's and a stranger's face by infants of mothers who report maternal mood symptoms. Moreover, maternal anxiety predicted infant interest in their mother's face such that increases in maternal symptoms of anxiety were associated with shorter infant looking times at their mother's face. Maternal perceptions of their infant's warmth and invasiveness, however, were not related to infant face interest. Taken together, the findings from Jones et al. (2013) emphasise how even small differences in maternal psychological health found within community samples can produce sufficiently different experiences to impact on infant face interest at 3.5 months of age.

Although Jones et al. (2013) have started to investigate how a variety of maternal factors in a community sample may interact with infant face interest, their research is not representative of infants' typical encounters with faces as it does not reflect the visual and auditory multidimensionality involved in face presentation in the normal environment (e.g., Brookes et al., 2001; Coulon, Guella, & Streri, 2011; Sai, 2005). Consistent with the face interest literature, newborn infants exhibit a preference for listening to their mother's voice, rather than a female stranger's voice (DeCasper & Fifer, 1980), and for listening to speech in their mother's language (Moon, Cooper, & Fifer, 1993). Moreover, early experience with the mother's voice from birth is necessary for facilitating neonatal mother face preference (Sai, 2005). Infants also orient to their mother's face when listening to a recording of her voice (Spelke & Owsley, 1979). Thus, for young infants, experience with their mother's voice appears to be important for early mother face interest.

For younger infants, stranger face interest is determined by experience with voices. Infants' increased attention to dynamic talking faces over static silent faces may be explained by infants preference for dynamic stimuli over static stimuli (e.g., Shaddy & Colombo, 2004; Ting & Bergeson, 2007). Newborn infants recognise and show a preference for looking at a stranger's face that was previously seen talking over an unfamiliar talking face (Coulon et al., 2011). Given that all of the stimuli seen during familiarisation and test in Coulon et al.'s study were dynamic talking faces, a familiarity preference for a