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Discrimination of facial expression by 5-month-old infants of nondepressed and clinically depressed mothers

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ABSTRACT

Five-month-old infants of nondepressed and clinically depressed mothers were habituated to either a face with a neutral expression or the same face with a smile. Infants of nondepressed mothers subsequently discriminated between neutral and smiling facial expressions, whereas infants of clinically depressed mothers failed to make the same discrimination.

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1. Introduction

Facial expressions convey essential social signs that call for immediate and exact recognition. Sensitivity to variations in facial expression is a precursor to decoding and assigning meaning to others' emotions, and so accurate perception, discrimination, and recognition of facial expressions is vital to healthy emotional functioning and appropriate interpersonal interactions (Jaffe, Beebe, Feldstein, Crown, & Jasnow, 2001; Reissland & Shepherd, 2006). Human beings are skilled at discriminating facial expressions. Indeed, research indicates that as early as 2–3 months of age infants (of nondepressed mothers) reliably discriminate a range of facial expressions, such as happiness, sadness, anger, fear, and surprise (e.g., Barrera & Maurer, 1981; Bornstein & Arterberry, 2003; Caron, Caron, & Myers, 1985; LaBarbera, Izard, Vietze, & Parisi, 1976; Ludemann, 1991; Serrano, Iglesias, & Loeches, 1995; Young-Browne, Rosenfield, & Horowitz, 1977).

As the neurodevelopment of face processing during infancy and childhood shows, these abilities follow a natural history (see Johnson, 2005, for review). Newborn infants preferentially respond to faces generally (Johnson & Morton, 1991; Sugita, 2008), a behavior thought to be mediated by the subcortical visuo-motor pathway that processes low spatial frequency "coarse" information about faces (Mancini et al., 1998; Simion, Valenza, Umiltà, & Dalla Barba, 1998). Abilities to recognize individual faces and make finer discriminations based on internal features of faces develop later and are mediated by the ventral stream of visual cortical processing (de Schonen & Mathivet, 1989) that matures around the second month of life. Thus, the face-sensitive N170 is present from at least 3 months of age (although it has a slightly longer latency in infants than in adults; de Haan, Pascalis, & Johnson, 2002; Halit, de Haan, & Johnson, 2003) but continues to develop into middle childhood as it becomes more specifically tuned (Johnson, 2011).

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As babies improve in their acuity (Held, Birch, & Gwiazda, 1980), the internal features of faces become more prominent (Turati, Cassia, Simion, & Leo, 2006). However, experience too has rapid as well as lasting influences on human visual development (Maurer, Lewis, Brent, & Levin, 1999; Maurer, Mondloch, & Lewis, 2007). Experience in processing faces plays a critical role in establishing a mature face-processing system. Infant monkeys exposed first to either human or monkey faces following deprivation of face exposure entirely, selectively discriminate the exposed species of face and show marked difficulty in regaining the ability to discriminate the other nonexposed species of face (Sugita, 2008). Likewise, human infants are better at recognizing a face if the face is from their own ethnic group than from another ethnic group, an effect that obtains for Africans, Japanese, Koreans, Chinese, East Indians as well as European Americans and African Americans. This effect appears to be the product of experience with faces from various ethnic groups, and its strength depends on amount of exposure to people of different ethnicities (Hancock & Rhodes, 2008; Kelly et al., 2007; Meissner & Brigham, 2001). More germane to the present study, Kuchuk, Vibbert, and Bornstein (1986) examined sensitivity to varying intensities of smiling faces and their experiential correlates in 3-month-olds (of nondepressed mothers). Infants discriminated different levels of smiles, and infants whose mothers more often encouraged their attention to the mothers' own face while she was smiling showed stronger preferences for higher intensities of smiles, suggesting that infants' sensitivity to facial expressions relates to their experiences. de Haan, Belsky, Reid, Volein, and Johnson (2004) investigated the relation between the emotional environment provided by mothers (as indexed by affective measures of their personality) and 7-month-olds' processing of emotional experiences (as indexed by visual attention and event-related potentials). They too found that the emotional environment experienced by infants contributed to the development of infants' sensitivity to facial expressions.

Mothers' facial expressions are typically the first facial expressions that infants experience and the ones they experience in the greatest numbers (Montague & Walker-Andrews, 2002; Nelson, Morse, & Leavitt, 1979). In this respect, infants of depressed mothers have systematically different social experiences than do infants of nondepressed mothers (Field, 1995). Although they show similar levels of gazing at and vocalizing to their infants as nondepressed mothers (Field et al., 2005), depressed mothers tend to smile less and interact with their infants in a withdrawn and muted style (Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field et al., 1985; Field, Diego, & Hernandez-Reif, 2009; Field, 1992). Thus, infants and children of clinically depressed mothers experience an atypical emotional environment characterized by disproportionately high levels of exposure to sad, angry, or neutral facial expressions compared to other infants (Dawson et al., 2003).

Depressed mothers also provide their infants with less optimal levels of general stimulation (Field, 1998; Murray, Hipwell, Hooper, Stein, & Cooper, 1996). Mothers with greater depressive symptomatology show lower levels of sensitive-responsiveness in interacting with their infants (NICHD Early Child Care Research Network, 1999). Lovejoy, Graczyk, O'Hare, and Neuman (2000) meta-analyzed 46 studies linking maternal depression with observed mothering and learned that the strongest relations obtain in children under 1 year of age. Infants of depressed mothers are therefore less likely to be exposed to smiling and have their discrimination capacities supported.

For their part, infants typically react negatively and avert their gaze when their mothers are expressionless (still-face) during a face-to-face interaction (Gusella, Muir, & Tronick, 1988; Stack, 2004) and when mothers are instructed to behave as if depressed (Cohn & Tronick, 1983; Manian & Bornstein, 2009). However, infants of depressed mothers exhibit less negative behavior during such still-face interactions (Field, 1984; Pelaez-Nogueras, Field, Hossain, & Pickens, 1996), suggesting that they may be more accustomed to "still-face" expressions in their mothers and so experience less violation of expectancy during such situations. Taken together, these findings suggest the hypothesis that, by 5 months of age, infants of nondepressed mothers will have little difficulty discriminating facial expressions (especially happy), whereas infants of depressed mothers will not make such discriminations. We tested this hypothesis here.

Maternal depression has been implicated in multiple adverse effects on infant perception and behavior. Germane to this study, infants of depressed mothers reportedly experience difficulty processing and discriminating faces and facial expressions (Hernandez-Reif, Field, Diego, Vera, & Pickens, 2006). Hernandez-Reif, Field, Diego, and Largie (2002) observed that infants of depressed mothers require more trials, and take almost twice as long, to habituate to their mother's face and voice as infants of nondepressed mothers and, afterward, in a posthabituation test with the face and voice of their mother and a female stranger, infants of depressed mothers fail to discriminate a novel stranger relative to their mother, whereas infants of nondepressed mothers do so successfully. At 3 months, infants of depressed mothers are reputedly less responsive to facial expressions than infants of nondepressed mothers (Pickens & Field, 1995). Three- to 6-month infants of depressed mothers are less likely to look at facial expressions displayed by either their mother or stranger (Diego et al., 2004). In a facial affect discrimination task, 3-month-olds of nondepressed mothers looked longer at sad facial expressions than infants of depressed mothers (Field, Pickens, Fox, Gonzalez, & Nawrocki, 1998).

The present study attempts to advance the extant literature on face perception in infants of depressed versus nondepressed mothers with the following features. Whereas most studies enlist infants of mothers with self-reported depressive symptoms (typically using a scale of symptoms experienced over the previous week and administered on the maternity ward shortly after delivery), here we first identified mothers with depressive symptomatology but subsequently selected into the study only those who received a diagnosis of depression as defined by extensive clinical interview. Both a history of maternal depression and greater current maternal depression impact infant development adversely (Kurstjens & Wolke, 2001; NICHD Early Child Care Research Network, 1999; Striano, Brennan, & Vanman, 2002). In most studies of infants of depressed mothers, depression and low SES, both of which independently undermine infant performance, are confounded; here we assessed infants of nondepressed and clinically depressed mothers from middle-SES families. Whereas most studies of face perception use images of infants' own mothers (thereby ceding control over the independent variable), here we used