



## Subclinical levels of maternal depression and infant sensitivity to social contingency



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### ABSTRACT

The aim of the study was to investigate how young infants respond to contingent and non-contingent interaction in relation to maternal level of depressive symptoms in a non-clinical sample of mothers and infants. Two groups of three-month-olds interacted with their mother who was assessed as either non-depressed or sub-clinically depressed, based on self-reported scores on the Edinburgh Postnatal Depression Scale (EPDS). The infants were presented with a continuous image and voice of their mother in a closed circuit computer system, using the double video procedure. The experiment comprised five sequences, alternating between contingent (Live) and non-contingent (Replay) maternal behaviour in a fixed Live1–Replay1–Live2–Replay2–Live3 sequence. The infants of the sub-clinically depressed mothers showed a high gaze focus at their mother independently of the quality of interaction, while the infants of the non-depressed mothers showed a preference for looking at the mother only when the interaction with their mother was contingent. Further, the infants of the sub-clinically depressed mothers showed no differentiation in affective expression between contingent and non-contingent interactions, while the infants of the non-depressed mothers expressed more positive affect than negative affect only when the interaction with their mother was contingent. Finally, there was a significant relation between the infant's preference for looking at the mother and the infant's amount of positive affect, but this was only found for the infants of the non-depressed. These results indicate that young infants' sensitivity to social contingency is related to maternal level of depression, even in a non-clinical sample. This expands the implications of earlier findings on the impact of maternal depression on infant sensitivity to social contingency, demonstrating that even sub-clinical levels of maternal depression may effect early interaction and child development.

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## 1. Introduction

Young infants' capacity for intersubjective awareness is fundamental for early human interaction (Trevvarthen, 2001; Trevvarthen & Aitken, 2001). This capacity is shaped by the infants early experiences of sensitive, contingent responses from

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their caregivers, which comprises the core in the attachment between infants and caregivers (Ainsworth, 1991). It is well established that maternal depression is associated with impairment in the mother's ability or motivation to synchronize with the infant's emotional state (Field, Healy, Goldstein, & Guthertz, 1990). Microanalytic studies of depressed mothers have shown that they respond more slowly and less consequentially to their infants than non-depressed mothers and that they have less positive and more negative facial expressions during interaction with their infants (Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field, 1995). Interestingly, studies using continuous scales to measure depression have shown that even sub-clinical levels of maternal depression is associated with impaired parenting (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Postnatal depression is prevalent, estimated to affect around 10% of all mothers (Berle, Aarre, Mykletun, Dahl, & Holsten, 2003; O'Hara & Swain, 1996) and coincides with the period where the infant establish a pattern of joint interaction, often termed the period of primary intersubjectivity (Trevarthen, 1979). It is demonstrated that infants respond to the mother's depression with less attention of gaze and less emotional expressions when interacting with their mother (Cohn et al., 1986; Field, 1995), close to the concept of social withdrawal (Guedeney, 2007). For these reasons, it is important to understand the mechanisms through which maternal depression contributes to increased psychosocial risk in infants and children.

One explanation is that postnatal depression affects infants' capacity to detect and expect social contingency (Field et al., 2005; Nadel, Soussignan, Canet, Libert, & Gerardin, 2005). Two experimental perturbation procedures have been used to examine infant sensitivity to social contingency. In the still-face procedure (Tronick, Als, Adamson, Wise, & Brazelton, 1978) the mother interrupts an on-going face-to-face interaction with the infant by holding a still face while she continues to gaze at the infant. Infants react to the mothers' still face with gaze aversion and less positive affect. The still-face effect is thought to indicate infant sensitivity to changes in adults' behavior and the tendency to react with distress because they expect adults to produce contingent responses and positive affect during the interaction. When presented with a blank face in the still face procedure, infants of depressed mothers show less negative reactions compared to infants of non-depressed mothers. A limitation with the still face procedure is that the infants' responses to their mother's still face could be due to the distress witnessing their mother become unresponsive and expressionless rather than the shift in contingency.

The double video procedure represents a more subtle and less stressful manipulation, where the infant interact face-to-face with their mother via a closed-circuit computer system (Murray & Trevarthen, 1985). Following an initial live sequence, where the mother and infant interact in real time, the infant is presented with a replay of the mother from the first live sequence. In the replay sequence, the mother's facial expressions and vocalizations are exactly the same as in the initial live sequence, except for the fact that the mother's behavior is unrelated to the infant's current behavior. Thus, in the double video procedure all parameters of communication are unchanged during the replay sequence, except for the interruption of the contingency in the interaction between the mother and infant.

In their classical report, Murray and Trevarthen (1985) found that 6–12 weeks olds showed a decline in gaze and positive affect in the replay sequence compared to the initial live sequence. Subsequent studies failed to replicate this and attributed the original finding to various other mechanisms, such as increased fussiness over the course of the experiment (Rochat, Neisser, & Marian, 1998), familiarity or boredom with the adult (Bigelow & Birch, 1999; Hains & Muir, 1996) memory of the mother's previous behavior (Hains & Muir, 1996) or differences in the degree to which the mothers mirror the infants' affect (Legerstee & Varghese, 2001). However, when contingent interaction between mother and infant was established during the first live sequence, both Nadel, Carchon, Kervella, Marcelli, and Reserbat-Plantey (1999), Stormark and Braarud (2004) and Braarud and Stormark (2006) found that 2-to-3 month olds discriminated between contingent and non-contingent interaction with their mother, thus replicating Murray and Trevarthen's (1985) original finding. Furthermore, the infants were also able to re-engage with their mother in a subsequent contingent live sequence, after the interaction was set out of phase in the replay sequence.

Using the double video procedure, both Field et al. (2005) and Nadel et al. (2005) found that infants of depressed mothers, like infants of non-depressed mothers were sensitive to the shift from contingent to non-contingent interaction, by showing reduced gaze at their mother during the non-contingent interaction. However, only the infants in Field et al. (2005) study reacted to the non-contingent interaction with a change in affect. In addition, while the infants of depressed mothers in Field et al. (2005) reengaged with their mothers and returned back to low levels of negative affect in the subsequent, contingent interaction, the infants of depressed mothers in Nadel et al. (2005) continued with gaze aversion and actually showed an increase in negative affect in the second contingent live interaction. Thus, the finding that infants of depressed mothers also detect shifts from contingent to contingent interaction could both reflect the same sensitivity to social contingency observed in infants of non-depressed mothers (Field et al., 2005) or be part of a persistent reaction to non-contingency (Nadel et al., 2005), related to the reaction of social withdrawal.

The purpose of this study was to examine the extent to which young infants' sensitivity to social contingency in the double video paradigm is related to their mothers' level of depression, as an indicator of the infants' past experience with contingent and responsive parenting. Building on the work by Field et al. (2005) and Nadel et al. (2005), we made several important modifications in the design and the recruitment of the subjects. First, in order to control for a possible memory bias where the infant recognize the maternal behaviour that is being replayed for them, we introduced a second replay sequence where the infants witnessed their mothers' responses to a replay of non-contingent infant behavior, in accordance with the design developed by Stormark and Braarud (2004; see also Braarud & Stormark, 2006). If infants of mothers with higher depressive symptoms are sensitive to shifts in social contingency, we would expect that the infants would respond equally to both replay sequences. Second, the mothers were naive with respect to the experimental manipulation, unlike the mothers in both Field et al. (2005) and Nadel et al. (2005), who were informed in advance that the infants would be presented with a replay of their

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