



## The impact of breastfeeding on mothers' attentional sensitivity towards infant distress

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### ABSTRACT

**Background:** Maternal response towards infant distress has an important impact on infant development. In animals it is established that lactation and pup suckling plays an important role in maintaining maternal responses. Previous research suggests that breastfeeding is associated with sensitive maternal responses in human mothers. However, this may be because women who are more sensitive to their infant choose to breastfeed. The current study investigated the attentional sensitivity towards infant distress in women who went on to breast or formula feed during pregnancy as well as after birth. We hypothesised that differences in breast and formula feeding mothers would only emerge after birth once feeding had commenced.

**Method:** Women were recruited during pregnancy through community midwives as part of a longitudinal study. 51 women were seen during late pregnancy and between 3 and 6 months after birth (27 were breast and 24 were formula feeding). Sensitivity to infant distress was measured as the extent of women's attentional bias towards infant distress stimuli.

**Results:** After birth, we found that our index of attentional bias towards infant distress was 37 ms (0.5 S.D.s) (CI; 6–69,  $p = 0.021$ ) higher in breastfeeding compared to formula feeding mothers. However, mothers who went on to breastfeed did not show greater attentional bias towards infant distress already during late pregnancy.

**Conclusions:** Our results suggest that the act of breastfeeding may influence mothers' attentional sensitivity towards infant distress. Previous research suggests breastfeeding is indicative of sensitive parenting. The current findings may suggest a mechanism by which breastfeeding and/or associated infant interaction could contribute to this sensitivity.

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### 1. Introduction

A mother's sensitivity towards her infant's signals, particularly those of distress, is important for the mother–infant relationship and the infant's future emotional, cognitive and physical health (Ainsworth, 1979; Bigelow et al., 2010; Mantymaa et al., 2003; McElwain & Booth-Laforce, 2006; Murray, Hipwell, Hooper, Stein, & Cooper, 1996). Preferential processing of infant signals may be an important adaptation to enable such maternal sensitivity. For example, it is well established that basic sensory preference for infant related stimuli, such as preference for bedding soiled by pups, develops in rodents during pregnancy secondary to the large changes in sex steroids (Bauer, 1983; Buntin, Jaffe, & Lisk, 1984). Animal evidence

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also suggests this infant preference is maintained in mothers following birth through lactation and pup interaction and the associated releases in oxytocin (Francis, Champagne, & Meaney, 2000; Liu, Diorio, Day, Francis, & Meaney, 2000; Neumann, 2008; Pedersen, 2004). We have previously found that human mothers develop an attentional bias towards infant distress stimuli by the end of their first pregnancy (Pearson, Lightman, & Evans, in sub). For example, by late pregnancy, women's reaction times to locate peripheral targets are slowed by the presentation of distressed compared to non-distressed infant faces. However, this bias is not found in non-mothers (Pearson, Lightman, & Evans, in sub). This basic attentional prioritisation may facilitate infant sensitive maternal behaviour. For example, maintaining attention towards infant distress will be important for a mother to engage with and sensitively respond to her infant's emotion. Furthermore, we have found that this attentional bias towards infant distress is positively associated with self reports of more successful mother-infant relationships (Pearson, Lightman, & Evans, 2010).

The influence of breastfeeding on this attentional bias towards infant distress following birth has not yet been established in human mothers. Previous research has, however, demonstrated that breastfeeding is associated with more infant sensitive maternal responses (Britton, Britton, & Gronwaldt, 2006; Gutman, Brown, & Akerman, 2009). However, it is difficult to disentangle whether associations between breastfeeding and sensitive maternal responses are influenced by the act of breastfeeding or merely indicative of the existing differences in the women who choose to breastfeed. Indeed, breastfeeding and intent to breastfeed are associated with higher maternal education and income (Jacobson & Jacobson, 2002) and these factors are also associated with sensitive parenting (Gutman et al., 2009). This may suggest that women who are already more likely to be sensitive to their infant choose to breastfeed (Britton et al., 2006). To investigate whether the act of breastfeeding influences sensitivity towards infant distress rather than women's existing sensitivity to infant distress influencing their choice to breastfeed, it was important to control for women's response to infant distress before their infant was born. We, therefore, conducted a longitudinal study to investigate women's attentional bias towards infant distress during pregnancy and after birth. We hypothesised that if breastfeeding leads to attentional bias towards infant distress no differences between women who went on to breast or formula feed will exist during pregnancy and such differences will emerge after birth once breastfeeding has commenced.

## 2. Method

### 2.1. Procedure

Healthy pregnant women were recruited by community midwives at routine booking appointments. The study was approved by The South East Research NHS Research Ethics Committee and North Bristol Trust. All participants gave informed signed consent. Women with a history of severe mental illness (taken as ever having seen a psychiatrist which in the UK provides an indication of a significant impairment to functioning), substance abuse or epilepsy were excluded from the study. Women were seen at their homes during late pregnancy (after 34 weeks) and after birth (3–6 months after birth). At these sessions women completed the attention task and further emotion processing tasks. Emotion processing tasks other than the attention task are reported elsewhere (Pearson, Lightman, & Evans, 2009). These emotion processing tasks were completed after the attention task and will not have influenced this task. At the postnatal session, feeding method as well as maternal age, social class, education level and parity were ascertained by questionnaire. Bottle feeding was defined as formula bottle feeding. Women were asked to feed their infants by their usual method within an hour before testing. Women's mood was investigated using a 10 item self report specifically designed for the perinatal period: the Edinburgh Postnatal Depression Scale (Cox, Holden, & Sagovsky, 1987).

### 2.2. Measures

#### 2.2.1. Attention task

Identical versions of this task were completed during late pregnancy and after birth. We measured attentional bias towards infant distress using a modified version of an established paradigm designed to measure the extent that attention is retained by stimuli (Bindemann, Burton, Hooge, Jenkins, & de Haan, 2005). Further details of the attention task as used here are reported in (Pearson, Cooper, Penton-Voak, Lightman, & Evans, 2010).

In this attention task, subjects' attention was initially directed towards a red or green cross in the centre of a computer screen. One horizontal and one vertical line were also presented at the screen's periphery. Only if the cross was green participants were instructed to indicate which side of the screen the vertical line appeared by making a keyboard response. Green trials, therefore, required disengaging attention from the central cross to a peripheral line target. Reaction time to identify the location of the vertical line presented peripherally was recorded. Stimuli that retain attention for longer will result in longer reaction times on green trials. In the present task distressed or non-distressed infant faces appeared behind the cross (see Pearson, Cooper, et al., 2010; Pearson, Lightman, et al., 2010). Distressed infant faces displayed an infant actively crying. Non-distressed infant faces consisted of an equal number of happy and neutral infant faces. Participants were instructed to ignore pictures appearing in the task.

A practice block of 36 trials with no images and a further 21 trials with adult and infant faces were included. There were then blocks of 20 green and 10 red trials for each face type, each block was followed by a rest. Each trial began with central black fixation cross (750 ms). The stimuli display (face stimuli behind the central green or red cross and line targets presented

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