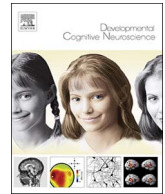




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## The mindedness of maternal touch: An investigation of maternal mind-mindedness and mother-infant touch interactions

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### ABSTRACT

Increasing evidence shows that maternal touch may promote emotion regulation in infants, however less is known about how parental higher-order social cognition abilities are translated into tactile, affect-regulatory behaviours towards their infants. During 10 min book-reading, mother-infant sessions when infants were 12 months old ( $N = 45$ ), we investigated maternal mind-mindedness (MM), the social cognitive ability to understand an infant's mental state, by coding the contingency of maternal verbal statements towards the infants' needs and desires. We also rated spontaneous tactile interactions in terms of their emotional contingency. We found that frequent non-attuned mind-related comments were associated with touch behaviours that were not contingent with the infant's emotions; ultimately discouraging affective tactile responses from the infant. However, comments that were more appropriate to infant's mental states did not necessarily predict more emotionally-contingent tactile behaviours. These findings suggest that when parental high-order social cognitive abilities are compromised, they are also likely to translate into inappropriate, tactile attempts to regulate infant's emotions.

### 1. Introduction

Social touch is thought to play a vital role in early physiological, cognitive and social development (Field, 2010). The potential benefits of touch have been studied in many fields, ranging from animal studies to developmental psychology studies (e.g. Harlow and Zimmermann, 1958; Panksepp and Bishop, 1981; Sharp et al., 2012; Maitre et al., 2017). In particular, increasing clinical and experimental evidence points to the importance of maternal tactile interactions for the promotion of mental and physical health (e.g. Peláez-Nogueras et al., 1997; Field, 2010; Sharp et al., 2012). Human infants receive constant and sustained tactile stimulation whilst being cuddled and breastfed. Skin-to-skin contact at birth in premature infants ("kangaroo care"; Feldman and Eidelman, 2003) is standard practice in many countries, and it has been shown to promote successful breastfeeding and to help keep babies calm and warm (Bystrova et al., 2003; Moore et al., 2016). Caregiver touch is essential for growth and development; it actively reduces infant stress by increasing positive affect (Stack and Muir, 1992;

Feldman et al., 2009) and calms infants in pain and discomfort (Bellieni et al., 2007; Maitre et al., 2017). In the context of attachment theory (Bowlby, 1969), studies support the facilitating role of touch in establishing the social bond between infant and caregivers (Ainsworth, 1979; Weiss et al., 2000; Beebe et al., 2010).

These studies on attachment, as well as other studies on parent-infant interactions, suggest that it is not merely the presence or absence of maternal touch that affects infant behaviour, but also the quality of the touch itself. For example, Stack et al. (1996) found that mothers employed different types of touch in order to elicit a specific behavioural response in the infant (e.g. high levels of tickling and lifting, and low levels of holding in order to elicit infants' smiling). These findings suggest that infants may become sensitive to precise characteristics of their mother's touch, particularly as regards the experience of certain emotions (Stack and Muir, 1992). Increasing evidence supports the idea that mothers might use touch in order to emotionally regulate the infant (e.g. Hertenstein and Campos, 2001). Hertenstein and Campos (2001) showed that specific qualities of tactile stimulation

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provided by the mother (in the sense of negative/tense and positive/relaxed fingers grip) in a given context were able to elicit an appropriate emotion or affect in the 12-month-old infants.

However, to our knowledge, little is known about whether the quantity and quality of maternal tactile behaviours towards their children depend on their higher-order social cognition abilities. Two factors that are deemed particularly important in terms of parental social cognition abilities are the parental capacity to infer the mental states of their infant and their capacity to recognise the infant as an individual with independent mental states. The former ability has been termed ‘mentalization’, or ‘the capacity to envision mental states in self and others’ (Fonagy et al., 2004, p. 23). The latter ability has been termed “mind-mindedness (MM) and is considered a related, but more specific concept employed particularly in parent-infant relationships to refer to the parent’s tendency to represent and respond to their infants as “individuals with a mind rather than merely as a creature with needs that must be satisfied” (Meins et al., 2001, p. 638). Importantly, according to some developmental theories (e.g. Fonagy et al., 2004; Meins et al., 2001) infants can progressively learn to independently recognise and regulate their own emotions because their caregivers have the ability to recognise their infants as having independent minds and feelings of their own (mind-mindedness), and respond to them with contingent affective displays (e.g. mirroring joy in response to a display of enthusiasm in the infant, Gergely and Watson, 1999). According to such theories, this parental ability to recognise and respond to an infant’s mental needs accordingly, creates a situation of parent-infant synchrony (Feldman et al., 1999) and the contingent mirroring of the infant’s emotions enables the infant to modulate her or his own affective states. Theories on caregiver-infant affective ‘contingency’ (Gergely and Watson, 1999), mirroring and mentalisation (Fonagy et al., 2004), mind-mindedness (Meins et al., 2001) or ‘synchrony’ (Feldman et al., 1999) are not identical but they share the idea of the importance of ‘mind reading’ and a co-ordination between infant and caregiver during interactions for the development of affect regulation. For example, Meins et al. (2002) suggest that when infants are exposed to caregiver comments that appropriately describe their mental states, they are offered a ‘representational reference’ for their current experience. A contingency between what the infant is experiencing and what the caregiver is verbally describing (i.e. mind-related comments) would allow the infant to see more clearly the connection between experience, behaviour and mental states and hence ultimately understand and regulate her and other people’s mental states and actions.

Substantial evidence (i.e. Verhage et al., 2016 for a recent meta-analysis) links adults’ mental representations of attachment and related concepts (e.g. mentalization, mind-mindedness) to the development of infant’s attachment and mentalisation abilities (e.g. Meins et al., 2002, Meins et al., 2003; Verhage et al., 2016). Furthermore, parental attachment representations have also been associated with the sensitivity of parent-infant interaction, particularly in terms of parental responsiveness (e.g. Van IJzendoorn, 1995) and parental mind-mindedness (Arnott and Meins, 2007). However, the precise mechanisms by which higher-order social cognition abilities such as parental mind-mindedness are translated into specific affect regulation behaviours during infant-parent interactions remains unclear. In this study we are interested in the role of touch in parent-infant dyads and in particular we aim to investigate how concepts such as parental mind-mindedness that are measured typically based on verbal maternal comments are also expressed ‘physically’ in emotion-laden, tactile interactions.

What is special about tactile interactions, in comparison to other modalities of interaction such as gaze, is that they are necessarily mutual, proximal and frequently multisensory; we can look without been looked back, or, we can be looked at while we are not looking. However, in the absence of tools, we cannot touch someone without feeling the touch on our own body too, nor can anyone touch us without also feeling the touch on their body. Thus, social touch and the necessary physical contact it entails is a modality that is in this

embodied sense, intrinsically shared and synchronous (Ciaunica and Fotopoulou, 2017). Also, touch requires physical proximity, which typically means touch is accompanied by a cascade of other sensations from other bodies, such as smell and vision, thus providing strong multisensory feedback from other bodies. In addition, social proximity itself has well known implications for cognition, for example influencing how space around the body is processed for both action and protection (Teneggi et al., 2013). Lastly, a recent proposal regarding the development of affect regulation suggests that touch is a fundamental component of the homeostatic regulation parents provide to their infants, which in turn is the basis of how infants progressively learn to regulate their own interoceptive states (the perception of the physiological state of the body) in relation to exteroceptive states (Fotopoulou and Tsakiris, 2017; see also Atzil and Barrett, 2017; Fonagy and Campbell, 2017; Bolis and Schilbach, 2017). Hence, examining the role of parental social cognitive abilities on parent-infant tactile interactions can shed light into some of the factors that may influence embodied, affect regulation in parent-infant interactions and its importance for emotional and physical development (Atzil and Barrett, 2017; Kleckner et al., 2017).

Specifically, this study focused on the relation between maternal mind-mindedness and the quantity and affect-regulatory quality of touch during mother-infant interactions. Mind-mindedness (MM) is typically operationalized in terms of mothers’ tendency to comment appropriately on their infants’ putative internal states during infant–mother interactions, as defined and validated in previous studies (Meins and Fernyhough, 2015). However, not all such “mind-related comments” are indicative of MM; each of these comments is further coded dichotomously as *appropriate* (e.g. “do you want this teddy?” when the infant leans over towards the teddy) or *non-attuned* to the infant’s current mental state (e.g. “do you want to turn the page?” when the infant has no interest in a book). MM has therefore been conceptualized as having two distinct dimensions: one indexing traditional notions of responsiveness, and sensitivity (appropriate mind-related comments) and one that captures the caregiver’s lack of attunement to the infant’s point of view and imposition of the caregiver’s own agenda (non-attuned mind-related comments). These two dimensions of MM are unrelated (Arnott and Meins, 2007; Meins et al., 2002) and have been found to independently contribute to different aspects of infant development (Meins et al., 2012). Here, our main aim was to examine whether there is a one-to-one, or a more complex relation between the maternal ability or inability to perceive the infants’ mental states (as measured by means of appropriate and non-attuned mind-related comments, respectively), and her ability or inability to translate this perception into contingent touch reactions that ‘mirrored’ and hence regulated the infants emotional state (classified as contingent and non-contingent touch). Thus we developed a tactile coding scheme that distinguished between maternal touch that was appropriate (i.e. *contingent/excitatory*, in the sense of synchrony with what the infant was experiencing in that moment) or non-attuned (i.e. *non-contingent/down-regulatory* in the sense of lack of synchrony with the infant’s emotional experience) to the infant’s emotional needs or displays in order to explore to what extent the two independent dimensions of maternal MM were translated into contingent and non-contingent, tactile responses, respectively.

More specifically, we wanted to examine whether appropriate mind-related comments, and therefore understanding of the infant’s mental state would result in a more affect-appropriate use of touch, i.e. tactile behaviours contingent to the infant’s needs and desires. In contrast, we aimed to explore whether non-attuned mind-related comments would be associated with non-contingent tactile behaviours, e.g. restrictive or intrusive behaviours in response to enthusiasm or curiosity in the infant. To our knowledge the only relevant studied aspect of maternal mental characteristics in this context is post-partum depression (Tronick and Gianino, 1986; Herrera et al., 2004; Malphurs et al., 1996). Mothers with postnatal depressive symptoms have been shown

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