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Infants' emotional states influence maternal behaviors during holding



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ABSTRACT

Previous studies have mainly examined how maternal behaviors influence infants during holding. However it is unclear how infants influence maternal holding. This current study investigated how infants' emotional states influence maternal holding behaviors, and whether maternal holding behaviors are also influenced by the mothers' parenting stress. We manipulated infants' emotional states and videotaped mothers' holding behaviors. The mothers also completed a questionnaire about their parental stress. Results showed that mothers varied their holding behaviors depending on their infants' emotional states. When infants were comfortable, mothers rocked them horizontally and quietly. When infants were uncomfortable, mothers rocked them vertically at a high frequency. Furthermore, some types of parenting stress were related to several types of maternal behaviors in the context of holding. These findings suggest that maternal holding behaviors are influenced by both the infants' emotional states and the mothers' parenting stress.

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1. Introduction

Mothers and infants show a great variety of interactions, such as holding, touching, playing, and vocalizing. Mother–infant interactions are important because they provide the foundation for attachment and the cognitive development of infants (Cogill, Caplan, Alexandra, Robson, & Kumar, 1986; Lewis & Feiring, 1989; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). One basic mother–infant interaction involves touching. Touching regulates the emotions of infants or attracts the attention of infants (Gray, Watt, & Blass, 2000; Stack & Muir, 1992). Ferber, Feldman, and Makhoul (2008) showed that affective touching promoted dyadic reciprocity, such as give-and-take interactions, sharing activities, or adapting to mutual needs. Moreover, touching is associated with secure attachment, mental and psychomotor development, and maternal sensitivity (Feldman, Eidelman, Sirota, & Weller, 2002; Weiss, Wilson, Hertenstein, & Campos, 2000). Through affective touching, especially during holding, mothers and infants influence each other as part of the process of maintaining stable contact. Negayama et al. (2010) point out that caregivers could transport, nurse, protect and love their infants through holding, so holding is an essential component in mother–infant interactions.

Regarding the influence of mothers, Saijo and Negayama (2001) reported that mothers' body postures during holding make infants change their behaviors. When mothers were standing or walking, infants clung to their mothers or their mothers' clothing using their arms or legs. Esposito et al. (2013) showed that maternal holding accompanying walking made infants calm down. Infants held by walking mothers decreased their voluntary movements, crying, and heart rates. The

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authors considered that these behaviors made it easier for the mothers to carry their infants. Reddy, Markova, and Wallot (2013) observed infants' responses while being picked up by mothers. Three-month-old infants adjusted the position of their body parts, such as widening arms, raising arms, or extending legs, in response to the approach of their mother. Mothers' body postures and movements during holding may influence infants' movements or emotional states.

Conversely, do infants' movements and emotional states influence mothers during holding? Jean and Stack (2009) found that mothers changed the amount of nurturing touch according to their infant's distress level. Aso and Iwatate (2006) pointed out that mothers showed different types of touching related to different parenting situations (e.g., playing, infant crying, putting infant to sleep, bathing etc.). For example, in a playing context, mothers used strong physical stimulation (e.g., shaking hands, poking, tickling, and rough rocking). When the infant was crying, mothers used rhythmic touching (e.g., moderate rocking, tapping, and stroking). This finding indicates that maternal behaviors may vary depending on infants' emotional states related to parenting situations. However, it is still unclear how infants' emotional states influence maternal holding. In the present study, we investigated how maternal holding behaviors are influenced by infants' emotional states.

In addition, we focused on the relationship between parenting stress and mothers' holding behaviors. Previous studies have suggested that mothers with depression or maternity blues show specific parenting behaviors (e.g., Ferber, 2004; Malphurs, Raag, Field, Pickens, & Pelaez-Nogueras, 1996; Paulson, Dauber, & Leiferman, 2006; Væver, Krogh, Smith-Nielsen, Harder, & Køppe, 2013). For example, mothers with depression had fewer interactions with their infants, or touched their infants roughly, such as stimulating touching and shaking. These findings raise the possibility that, even in healthy mothers, parenting stress can influence their parenting behaviors. Thus, we examined the relationship between parenting stress and holding behaviors in healthy mothers with no depression.

In the current study, we hypothesized that (a) infants' emotional states would influence maternal holding behaviors, and (b) parenting stress would relate to the types of mothers' holding behaviors.

2. Method

2.1. Participant

The participants were 25 six-month-old infants (13 females, $M=27.93$ weeks, $SD=1.42$) and their mothers ($M=33.32$ years, $SD=4.00$). An additional 10 pairs of mothers and infants were excluded from analysis because of the fussiness of the infants. This study was approved by the Ethic Committee of Kyoto University (26-P-3). The study was conducted in accordance with the standards specified in the 1964 Declaration of Helsinki. Before the experiment, each mother provided written informed consent.

2.2. Measures

2.2.1. Parenting stress

The Japanese version of the Parenting Stress Index (PSI) was used to assess parenting stress (Abidin, 1995; Hanada, Honda, Tokumaru, & Ozawa, 2006; Narama et al., 1999). This questionnaire consists of 78 self-report items (rated on a 4 or 5-point scale), comprising two subscales: *stress regarding the child* and *stress regarding the parents*. The subscale of stress regarding the child included C-1 (The child provides few responses that make the parents happy), C-2 (The child is in a bad mood), C-3 (The child is not the way I expected), C-4 (The child cannot concentrate/is hyperactive), C-5 (The child follows the parent/has a hard time getting used to others), C-6 (I think that the child is problematic), and C-7 (The child is sensitive to stimulation/has a hard time getting used to things). The subscale of stress regarding the parents included P-1 (Restrictions due to parental roles), P-2 (Social isolation), P-3 (The relationship with the spouse), P-4 (Parental capability), P-5 (Depression/sense of guilt), P-6 (Feelings after being discharged from the hospital), P-7 (I can hardly feel affection for my child), and P-8 (Health status).

2.2.2. Infant heart rate measure

During the experiment, the heart rate (HR) of the infants was measured. A wireless NeXus-10 device (MindMedia B.V., Netherlands) was used to obtain electrocardiogram data. The sampling rate was 1024 Hz. Three electrodes were placed on the body surface around both collar bones and the left rib. When mothers held their infants, a wireless NeXus-10 device was in the mother's waist pack. Mean HR was calculated by detecting peaks of the R-wave using the software, Biotrace+ (MindMedia B.V., Netherlands) and BIMUTAS II(KISSEI COMTEC, Japan).

2.3. Procedure

The mother and infant participants were brought into the study room, which was softly illuminated. The mother gave her written informed consent for participating in the study. Experimenters developed a rapport with the infant by playing using toys for about 10 min and the experiment was started after the experimenters judged that the infant had become habituated to the experimenters and the room. The heart rate monitoring equipment was attached to the infant, who sat in an infant seat. The mother sat next to her infant. The mother was instructed to sit still and watch a scenery video with her infant (the baseline period). One infant sat on the mother's lap because this infant was unwilling to sit in the infant seat. Following the baseline period, there were two experimental conditions (the comfortable and the uncomfortable conditions). First, in

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