



Infant distress to novelty is associated with maternal anxiety disorder and especially with maternal avoidance behavior[☆]



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ABSTRACT

Research suggested that maternal anxiety disorders might be related to infants' behavioral inhibition. This study investigated whether maternal postpartum anxiety disorder is associated with infant temperament, more precisely, infant distress to novelty, an early predictor of behavioral inhibition. Differences in the latter were analyzed in a German sample by comparing $n = 38$ healthy mother–infant dyads to $n = 44$ dyads comprised of mothers diagnosed with a DSM-IV anxiety disorders. Infant age ranged from 2.83 to 7.97 months. Infant temperament was measured by means of the Infant Behavior Questionnaire. Mothers were screened for postpartum anxiety disorder using the Structured Clinical Interview for DSM-IV Disorders. Severity of anxiety was measured by self-reported questionnaires (Anxiety Cognition Questionnaire, Body Sensations Questionnaire and Mobility Inventory). Infant salivary cortisol reaction when being confronted with a socio-emotional stressor (Face-to-Face-Still-Face paradigm) was assessed to validate infant distress. A Mann–Whitney– U analysis suggested that infants of mothers with an anxiety disorder show more distress to novelty than infants of healthy mothers. Furthermore, data reveal a positive Spearman's ρ -correlation between infant distress to novelty and maternal avoidance behavior (Mobility Inventory). A strong correlation between infant cortisol reactivity and reported distress to novelty validated the maternal evaluation of infant temperament in our sample. Results suggest a possible approach to promote infant development by encouraging mothers with anxiety symptoms to encounter feared stimuli.

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1. Introduction and theory

According to previous research, maternal anxiety disorders might have a negative impact on child development. Prepartum and postpartum anxiety has been linked to higher rates of behavioral and emotional problems such as hyperactivity, externalizing problems and anxiety (Hettema, Neale, & Kendler, 2001; Connor, Heron, Golding, & Glover, 2003; Turner, Beidel, Roberson-Nay, & Tervo, 2003; Van den Bergh & Marcoen, 2004; Weissman, 1988). Likewise, an increased risk for the development of a behaviorally inhibited interaction style, defined as an increased avoidance behavior toward unfamiliar stimuli, has been demonstrated (Rosenbaum, Biederman, Bolduc-Murphy, & Faraone, 1993). More precisely, Rosenbaum and colleagues found incidence rates for behavioral

inhibition of 70% for children of parents with Panic Disorder or Agoraphobia compared to only 50% for children of healthy parents. Warren and colleagues also drew a connection between a behaviorally inhibited interaction style at the age of four to fourteen months and maternal Panic Disorder (Warren et al., 2003).

Studies demonstrated that toddlers and pre-school aged children with an increased avoidance behavior toward unfamiliar stimuli also have higher incidence rates of Social Phobia and depressive disorder in middle childhood, adolescence and early adulthood (Biederman, Rosenbaum, Bolduc-Murphy, & Faraone, 1993; Hirshfeld, Rosenbaum, Biederman, & Bolduc, 1992). This has been confirmed by several longitudinal studies (Biederman et al., 2001; Hirshfeld-Becker et al., 2007; Kagan & Snidman, 1999; Rubin, Hastings, Stewart, & Henderson, 1997; Schwartz, Snidman, & Kagan, 1999).

If severe maternal anxiety is indeed associated with a behaviorally inhibited interaction style in childhood, which, in turn, increases the vulnerability for mental health problems in childhood or adulthood, it is of great importance to identify behavioral precursors on the infant's and mother's side at an early stage. Great effort has been made to find such predictors of behavioral inhibition. For instance, Kagan and Snidman (1999) found that high

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motor reactivity and frequent crying when being faced with unfamiliar stimuli in early infancy represents the earliest predictor of behavioral inhibition to the unfamiliar. Furthermore, Calkins, Fox, and Marshall (1996) assigned 15% of infants to one of two discrete categories of anxious reactivity, namely high and low reactivity: Infants with high motor activity and high negative affect at four months of age were at great risk to develop a behaviorally inhibited interaction style at fourteen months of age. Previously, Möhler and colleagues were able to demonstrate that maternal assessment of infant distress to novelty at four months of age predicts behavioral inhibition in preschool children (Möhler et al., submitted for publication). More precisely, the subscale named “distress to novelty” of the Infant Behavior Questionnaire converged highly with laboratory assessments of infant temperament. A strong reactivity to diverse stimuli at the age of sixteen weeks also turned out to be a predictor of behavioral inhibition while facing unfamiliar stimuli at five years of age. Therefore, high levels of infant distress to novelty might be an early precursor of childhood psychopathology. The goal of this study was to find out if maternal anxiety disorders indeed influence this infant temperament parameter.

Aiming also at a validation of infant “distress to novelty” by means of maternal evaluation, we decided to measure infant stress reactivity by means of salivary cortisol when carrying out a socio-emotional stressful procedure. Infant cortisol reactivity is a valid marker of infant stress reactivity in the early months of infancy. For instance, Tollenaar, Beijers, Jansen, Riksen-Walraven, and de Weerth (2012) successfully examined infant cortisol responses to an everyday potentially stressful situation for neonates (i.e. bathing session) at the age of five weeks postpartum. To quantify stress reactivity, many studies have focused on the reactivity of the *hypothalamic-pituitary-adrenocortical axis* (HPA-axis) using pre- to post-stressor change analyses in salivary cortisol concentrations (see review, Jansen, Beijers, Riksen-Walraven, & de Weerth, 2010). However, Gunnar, Mangelsdorf, Larson, and Hertsgaard (1989) have noted strong individual differences in reaction to stress inducing stimuli. For example, some infants only respond to blood samples being taken, whereas others already respond to undressing, weighing and length measurement prior to the blood sample. Similarly, Lewis and Ramsay (1995) found that 25% of the infants between the ages of two and six months neither reacted with an increase nor a decrease in cortisol levels when having an invasive immunization.

Findings also indicate that, on an average, psychological stimuli (such as separation) do not provoke cortisol reactions in young infants. However, Jansen et al. (2010) stated that the lack of reactivity does not necessarily imply the measurement of cortisol reaction in response to psychological stressors to be redundant. Rather, Jansen argues that a closer look at the causes of individual differences may bring light to potential risk factors that may adversely affect infant development. Obviously, there are many factors, but we suggest that infant distress to novelty as assessed by maternal judgment is associated to infant cortisol reactivity, irrespectively of the maternal health status.

We chose the Face-to-Face-Still-Face-paradigm (FFSF) as a socio-emotional stressor. It is an experimental paradigm to investigate the face-to-face interaction between mothers and their infants and has been conducted with infants between one and twelve months of age (for an overview, see Adamson & Frick, 2003). It usually consists of three different phases, starting with a free play episode, followed by a phase in which the mother is instructed to remain unresponsive to the infant (so-called still-face), thus, evoking a prolonged state of mismatch. The procedure concludes with a reunion phase in which the mother resumes the initial face-to-face play with her infant. By means of the still-face paradigm, it is possible to assess how mother–infant dyads manage emotionally stressful situations, in particular, the reunion phase.

This socio-emotional stressor might represent a novel situation to infants that leads to a highly activated sympathetic system followed by a higher expression of cortisol in the pituitary glands (Lewis & Ramsay, 1995). Consequently, infant cortisol reactivity in response to the FFSF might be an appropriate mean to validate maternal judgment of infant distress to novelty.

The presented study involved a sample of mothers with a DSM-IV postpartum anxiety disorder and healthy mothers, each with their infant. The following disorders were considered: Generalized Anxiety Syndrome, Panic Disorder with and without Agoraphobia, Agoraphobia without history of Panic Disorder, Specific Phobia, Social Phobia, Obsessive Compulsive Disorder, Post-Traumatic Stress Disorder and Anxiety Disorder not Otherwise Specified. It is important to mention that Specific Phobias were diagnosed; yet, a mere diagnosis of Specific Phobia was not sufficient to be classified as a clinical subject due to its relatively low clinical relevance.

The clinical and control group were compared with respect to infant distress to novelty. Furthermore, this parameter of infant temperament was related to infant cortisol reactivity. We expected higher rates of “distress to novelty” for infants of mothers with an anxiety disorder compared to those of healthy mothers. Moreover, we hypothesized distress to novelty to be positively associated with infant cortisol reactivity. In addition, we tested for any differences on the remaining infant temperament scales and checked for relations between specific anxiety variables and infant distress to novelty in an exploratory manner.

2. Method

2.1. Sample

Recruitment was conducted by means of flyers, newspaper advertisements, public birth announcements and pregnancy screenings at the Gynecological Clinic of the Heidelberg University Hospital between July 2006 and October 2010. $n = 11$ mothers of the clinical sample were recruited from the mother–infant unit of the Psychiatric Clinic of the Heidelberg University Hospital. Six weeks postpartum, participants were interviewed by phone to assess participants' suitability for the study, a good mastery of the German language provided. Women were asked about pregnancy, birth, former and current psychopathology including the anxiety screening questions from the German version of the SCID-I (Wittchen, Wunderlich, Gruschwitz, & Zaudig, 1997).

One dyad was excluded since the infant had APGAR values lower than seven. None of the other exclusion criterion (i.e. a gestational age of less than 36 weeks) was met by any other dyad. Clinical subjects had to experience at least one clinically significant anxiety disorder. Acute psychosis, Bipolar Disorder and suicidal tendency were the exclusion criteria for subjects of the experimental group. Moreover, clinical subjects needed to have no history of psychosis and Bipolar Disorder. In case of current comorbid depression or other Axis-I diagnoses, the anxiety disorder had to be more prominent. In healthy controls, any current and antecedent mental health problem needed to be ruled out. Finally, the participants were informed about the objectives and procedures of the study.

The sample ($n = 87$) is comprised of $n = 38$ women with a postpartum anxiety disorder and $n = 49$ healthy women without a history of mental disorders, each with their infant. $n = 17$ women (44.7%) suffered from one single DSM-IV anxiety disorder. As $n = 21$ women had two or more anxiety diagnoses, the comorbidity rate for anxiety disorders in our sample is 55.3%. Of these, $n = 20$ women (52.6%) had a *Generalized Anxiety Syndrome*. Further $n = 15$ women (39.5%) had a diagnosis of *Obsessive Compulsive Disorder*, while $n = 15$ women (39.5%) had either a *Panic Disorder*, a *Panic Disorder with Agoraphobia* or an *Agoraphobia without History of Panic*

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