Effects of Maternal Behavior on Infants' Regulatory Behaviors during The Still Face Paradigm

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Abstract

This study investigated whether maternal reflective functioning was related to maternal sensitivity during the Still Face Paradigm (SFP). It was investigated whether the SFP elicited the still face effect. Additionally, the effect of maternal sensitivity on infants' regulatory behaviors during the SFP was examined. Infants' stress reactivity during the SFP was explored using skin conductance levels. Maternal risk status and infants' temperament has been taken into account. The sample consisted of 52 mother-infant dyads (mean age infants 5.96 months). Reflective functioning was measured with an interview around 27 weeks of pregnancy. During a home-visit the SFP was administered and mothers reported about the infants' temperament using the Infant Behavior Questionnaire. Infant and maternal behaviors were coded based on the SFP. Results indicated that the still face effect was found for arching and squirming, while it was not found for self-soothing behavior. Preliminary results showed an increased skin conductance level, and thus stress reactivity, over the whole SFP. Furthermore, maternal reflective functioning was found as predictor of maternal sensitivity during the SFP. Higher levels of maternal sensitivity predicted more self-soothing behaviors during the first minute of the reunion and less arching and squirming behaviors during the second minute of the reunion. It was not related to any other regulatory behaviors measured. Infants' temperament was not associated with infants' regulatory behaviors. The findings of this study can be used in developing interventions to improve maternal reflective functioning and sensitivity, which, in turn, can influence infants' regulatory behaviors and emotional development.

Keywords: maternal reflective functioning, maternal sensitivity, arching and squirming behaviors, self-soothing behaviors, skin conductance level, Still Face Paradigm

Parental reflective functioning capacities play a crucial role in the psychosocial development of children (Slade, 2007). Reflective functioning is the capacity of an individual to understand behavior in terms of underlying mental states and intentions where mental states refer to all mental experiences of an individual, such as thoughts, feelings, beliefs, and desires (Slade, 2007). Reflective functioning is not only an essential ability in affect regulation but also in the maintaining of social relationships since reflective functioning is also about the understanding of the behaviors of others. Understanding the behavior of others makes it possible to anticipate on actions and behaviors of others (Fonagy & Target, 1998). Individuals who are more able to understand mental states in the self or others, are more likely to participate in close relationships (Slade, 2005).

Development of reflective functioning.

In the first years of life a child learns to mentalize and create mental states through the caregiver (Fonagy, Gergely, Jurist, & Target, 2002). Caregivers, for example mothers, have the capacity to hold a representation in their mind of the child as an individual with their own desires, feelings and intentions (Slade, 2005). The child is able to learn about his or her own internal experiences by using the mental representations of the mother. Three-month-old infants learn by observing their caregivers and learn through them about mental states and the mental world.

So, the way in which a parent thinks and evaluates his or her own mental state can help the child to create meaningful and stable relationships and regulate the child's own mental state through the parent-child relationship. Important in this parent-child relationship is that the parent has the capacity to mentalize about the child's mental state and is able to monitor changes in the mental state of the child (Slade, 2005).

For many parents in general it is difficult to think about the internal experiences of a child, but especially for very young mothers who live in poverty (Slade, 2007). These mothers face a number of challenges and often have under-developed reflective capacities as a consequence of their own (traumatic) life experiences. It can be difficult for these young mothers to understand their infants. The mother-infant relationship can be improved by improving the reflective capacities of the mother (Slade, 2007). A stable relationship between mother and infant is necessary for child development (Polan & Hofer, 2008) since infants learn to protect themselves from distress through emotional regulation (Propper & Moore, 2006). Effective regulation of behavioral and physiological reactivity during the first years of life results in successful regulation in later years (Sroufe, Egeland, & Carlson, 1999) and protects children from psychopathological outcomes (Izard, 2002).

Reflective functioning and maternal sensitivity.

Maternal reflective functioning is closely related to maternal behavior (Grienenberger, Kelly, & Slade, 2005). One aspect of maternal behavior is maternal sensitivity. Maternal sensitivity is the ability of a mother to notice the needs of a child and respond to these cues in a responsive and accurate manner (Ainsworth, Blehar, Waters, & Wall, 1978). For children, maternal sensitivity is essential in forming mental states and learning from the mothers' representations of the mental world (Slade, 2005). Effective maternal sensitivity should enable mothers to regulate the infant's distress to give the infant a general feeling of security (Lyons – Ruth & Spielman, 2004).

Slade, Grienenberger, Bernbach, Levy, and Locker (2005) found that reflective functioning possibly plays a role in the intergenerational transmission of attachment. Results indicated that higher levels of maternal reflective functioning

were associated with secure attachment in children. On the other hand, insecure attachment was associated with lower levels of maternal reflective functioning while resistant and disorganized children have mothers with the lowest levels of reflective functioning. In the study of Grienenberger, Kelly, and Slade (2005) the relation between maternal reflective functioning and infant attachment was further explored. Maternal reflective functioning predicted the infant's attachment status and this relation was mediated by maternal behavior. Aspects of maternal behavior that were investigated in the study of Grienenberger, Kelly, and Slade (2005) were the mother's ability to regulate her infant's distress and fear without frightening or disturbing her infant. These aspects of maternal behavior are aspects of sensitive caregiving. It is important to notice that the sample size of these studies was small and that the levels of maternal reflective functioning were measured with the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984, 1985, 1996 as described in Hesse (2008)). The AAI is not predominantly developed to measure parental reflective functioning but it is developed to investigate the attachment-childhood related experiences. Adults were asked to evaluate the influence of their own childhood experiences on their development and current functioning (Hesse, 2008).

Another study investigated the associations between the insightfulness of mothers regarding their infants' internal experience, maternal sensitivity, and infant attachment (Koren-Karie, Oppenheim, Dolev, Sher, & Etzion–Carasso, 2002). Maternal insightfulness refers to the ability of the mother to comprehend and reflect on the motives underlying their child's behavior and emotional experience. It was measured using an interview with the mother. Maternal sensitivity was assessed during two different sessions of play and the infants' attachment was investigated using the Strange Situation procedure. An association was found between maternal

insightfulness and both maternal sensitivity and the infant attachment status. Mothers with higher levels of insightfulness received higher scores on sensitivity, implicating that mothers who can understand and reflect on their infants' motives underlying their behavior and emotional experience, were more sensitive caregivers.

Maternal sensitivity and regulatory behaviors in infants.

As explained earlier, maternal reflective functioning plays an important role in the emotional development of children. Maternal sensitivity in turn also has an essential contribution to the emotional development of children, especially for regulatory behaviors of young infants (Conradt & Albow, 2010; Haley & Stansbury, 2003). In their early years of life, infants will develop self-regulatory behaviors as a result of supportive caregiving (Calkins & Fox, 2002). Haley and Stansbury (2003) showed that 5- and 6- month-old infants of more responsive parents showed greater regulation of behavioral and physiological reactions in a stressful situation. The regulatory behaviors investigated in their study were social attending and negative affect. Social attend refers to the direction of infant gaze toward the parent and negative affect refers to facial expressions or vocalizations of negative affect as crying. Infants of more responsive parents showed more regulation of negative affect.

Furthermore, another study with 5-month-old infants showed that maternal sensitivity uniquely predicted the infants' physiological and behavioral reactions and regulation during and following a stress situation independent of maternal sensitivity during a period of play (Conradt & Albow, 2010). The regulatory behaviors investigated in their study were gaze aversion, negative affect, arching and squirming behaviors, and attention-seeking behaviors. Negative affect and arching and squirming behaviors were predicted by maternal sensitivity.

Mesman, Van IJzendoorn, and Bakersmans-Kranenburg (2009) established that infants can respond to distress by increasing their self-soothing behavior as a form of emotion regulation. Several studies in their review showed that infants of sensitive mothers showed more regulatory behaviors during and following a stressful situation called the Still Face Paradigm (SFP). Regulatory behaviors were defined as showing positive affect, regulating negative affect, and showing gaze aversion.

Infant's behavioral responses in the Still Face Paradigm.

The SFP is a procedure than can be used to assess specific behavior of parents and infants in a social interaction. It consists of three episodes: the play, the still-face, and the reunion episode. During the play episode, parents have to engage their infant in a normal face-to-face interaction. The still-face episode is an episode in which the parent is asked to be unresponsive to the infant while holding a still and neutral face. After a certain time the parent can resume the normal interaction and this is called the reunion episode (Tronick, Als, Adamson, Wise, & Brazelton, 1978). The SFP is a mildly stressful situation for the infant which can consolidate individual differences such as distress (Moore & Calkins, 2004).

Mesman, Van IJzendoorn, and Bakermans-Kranenburg (2009) described in their review the classic still face effect. This effect is about the increase in distress from baseline to still-face and a decrease of distress during the reunion episode. The still face effect is not limited to infant behavioral responses but it is also apparent in infant physiological responses. The physiological responses of an infant are indicative of the reaction of the autonomic nervous system.

Infant's stress reactivity in the Still Face Paradigm.

The autonomic nervous system (ANS) consists of the sympathetic (SNS) and parasympathetic (PNS) systems (Beauchaine, 2001). The SNS is activated in

situations of stress to prepare the body for a fight-or-flight response (Jansen, Van Nguyen, Karpitskiy, Mettenleiter, & Loewy, 1995). The PNS controls the vegetative functions of the body. The system is responsible for the body's ability to recover from stress (Ohman, Hamm, & Hugdahl, 2000). The SNS and PNS can have an antagonistic working on the activation of organs but they can also be co-active (Bradley, 2000). Heart rate activity is a consequence of the interaction between an increased activation of the SNS and a decreased activation of the PNS.

Sympathetic arousal can be measured through the levels of skin conductance (Ham & Tronick, 2006). The level of skin conductance (SCL) can be used as an indicator of stress, in which high levels are indicative for high levels of sympathetic arousal. Only few studies investigated skin conductance activity in young infants. Ham & Tronick (2006) investigated the SCL of 5-month-old infants during the SFP in a pilot study with only 12 infants. Their report on the measurements of the skin conductance is only minimally. It is only reported that gelled sensors were placed on the infants to measure the SCL. The infants showed a general pattern of increasing skin conductance during the episodes throughout the reunion episode. Baker, Shelton, Baibazarova, Hay, and Van Goozen (2013) investigated skin conductance levels in infants (7 through 14 months-old) during an emotionally challenging task. Skin conductance levels were measured using two electrodes on the infant's feet. It was used to predict aggression in these infants two years later and the role of the infant's temperament in this relation was investigated. Their results indicated that low skin conductance levels in infancy were able to predict aggressive behavior when these infants were toddlers. No association was found between skin conductance levels and nonaggressive behavior problems in toddlers. The infant's temperament reported by mother was not associated with skin conductance levels.

The role of infant temperament in regulatory behaviors and stress reaction.

As discussed earlier, a relation between maternal sensitivity and the infants' regulatory behaviors is likely. Maternal sensitivity is likely to be an independent contributor to infant's regulation behaviors (Conradt & Albow, 2010), but regulatory behaviors develop, or are influenced or shaped by infant temperament as well. Moreover, the infant's temperament has a crucial role in behavioral and physiological regulation. It was found that infants who were more temperamentally difficult had more regulatory problems (Dale, O'Hara, Keen, & Porges, 2011).As far as known only a few studies investigated temperament in relation to the infant's regulatory behavior in the SFP (Braungart-Rieker et al., 1998; Tarabulsy et al., 2003; Haley & Stansbury, 2003; Conradt & Albow, 2010). These studies show contradictory results about the role of infant's temperament in infant's behavioral reactions. In the study of Tarabulsy et al. (2003) the infant's temperament, reported by mother, was not a predictor of the infant's affect or self-soothing behavior during the still-face episode. The studies of Haley & Stansbury (2003) and Conradt & Albow (2010) also reported on the lack of an association between temperament, reported by mother, and regulatory behaviors observed during the SFP. In contrast, Braungart-Rieker et al. (1998) found that infants with a negative temperament, as reported by mother, showed lower levels of self-comforting during the still-face episode. A similar result was found in a study assessing the effect of temperament, as reported by mother, in 5 month-old infants on their behavior during the SFP (Yoo & Reeb-Sutherland, 2013).

Relevance of the current study

It is important to investigate whether maternal reflective functioning is related to maternal sensitivity and what the influence of both factors is on the early development of regulatory behaviors. Since self-regulation is related to antisocial

behavior (Henry, Caspi, Moffitt, Harrington, & Silva, 1999; Raine, 2002; Van Goozen, Fairchild, Snoek, & Harold, 2007), it is important to intervene in the development of self-regulation as early as possible to prevent infants from developing antisocial behavior. Low autonomic activity has also been related to antisocial and criminal behavior in older children and adults (Raine, 2002). There is some evidence that heightened autonomic arousal can protect against antisocial outcome, although the associations with infant outcomes are not consistent. Several explanations were given for the relationship between low autonomic activity and aggression: the stimulation seeking theory (Zuckerman, 1979 as described in Van Goozen, Snoek, Matthys, Van Rossum, & Van Engeland, 2004), fearlessness theory (Raine, 2002), and a combination of those two theories (Wilson & Gottman, 1996 as described in Baker, Shelton, Baibazarova, Hay, & Van Goozen, 2013).

Aim of the study

The aim of the current study is to investigate the relation between reflective functioning and maternal sensitivity in first-time mothers. The influence of reflective functioning and maternal sensitivity on 6-month-old infants' regulatory behavior and stress reactivity will be investigated through administering of an emotional challenging task (the SFP). Maternal sensitivity will be coded during the sessions of play and reunion. The infant's regulatory behaviors and stress reactivity (SCL) will be measured during the whole SFP. Mothers will be asked to report about their infant's temperament using a short form of the Revised -Infant Behavior Questionnaire (IBQ-R; Gartstein & Rothbart, 2003). A distinction will be made between infants of mothers with a low risk status and infants of mothers with a high risk status.

Research question and hypotheses

The main question of the current study is: Is reflective functioning a predictor of maternal sensitivity and is maternal sensitivity associated with infants' regulatory behaviors? This study will investigate whether infants in the present study show the classical still-face effect for regulatory behaviors and stress reactivity as described by other studies. If the still-face effect is present, it will be investigated whether there is an association between maternal sensitivity and regulatory behaviors of the infant during the SFP and what the role is of temperament in this relation. Since only few studies have investigated stress reactivity with SCL in 6-month-old infants, the analysis regarding SCL will be explorative of nature.

A number of hypotheses were formulated. The first hypothesis is that the classical still face effect will be found for the regulatory behaviors of the infant and the stress reactivity independently of the mothers risk status. It is hypothesized that the self-soothing behavior and arching and squirming behaviors of the infant will increase from baseline episode to still-face episode and will decrease during the reunion episode. The second hypothesis is that the mothers' reflective functioning predicts maternal sensitivity. The role of the risk status of the mother in this relation will be investigated since mothers with a risk status are expected to have lower levels of reflective functioning because they faced more (traumatic) life experiences. The third hypothesis is that maternal sensitivity is related to both the infant's regulatory behaviors and stress reactivity. It is predicted that high levels of maternal sensitivity are associated with higher levels of regulatory behaviors such as arching and squirming and self-soothing behavior. In addition the role of the mothers' risk status will be investigated since it is expected that mothers with a high risk status have lower levels of maternal sensitivity as a consequence of their lower levels of reflective functioning. The role of skin conductance levels will be explored since it is not

frequently investigated in these young infants. The fourth hypothesis concerns the infant's temperament. It is expected that the infant's regulatory behaviors are associated with the infant's temperament. Negative temperament is expected to be related with lower levels of regulatory behaviors.

Method

A Good Start: Study Background.

The current study is part of a larger longitudinal study into factors that may influence the early development of antisocial behavior and psychopathology in young children. Mothers in the age of 17-25 years, expecting their first child take part in five assessments. Their children took part in four assessments. The specific age range of the mothers was chosen because these mothers do not have access to special facilities. In the Netherlands there are several facilities for teenage mothers, the mothers younger than 17 years. It is expected that mothers above the age of 16 years can raise their child with the general facilities for all mothers. It is important to find out whether this is indeed the case. Therefore the development of children of mothers in the age of 17-25 years is investigated in a longitudinal study.

The first assessment consists of a home visit with mother during the third trimester of pregnancy, around 27 weeks. When infants were 6 months old the second home visit was carried out. Mother and infant were invited to the Babylab of Leiden University when the infants were 12 months old, for the third assessment. The fourth assessment was again a home visit at the time the infants were 20 months old. The fifth assessment took place when they were 30 months old at the Babylab of Leiden University. Mothers received a present for their infant and a gift card after each assessment. Ethical approval for the research protocol has been given by the Ethical Board of the Faculty of Social Sciences at Leiden University and the Dutch Medical

Ethical Committee (METC). Written informed consent was obtained from all participants.

Participants

The sample of the present study is composed of 52 mothers (M = 22.77 years, SD = 2.62) and their 6-month-old infants (M = 5.96 months, SD = .44). Both low risk (N = 29) and high risk (N = 23) mothers participated in the study. After the first home visit the risk status of the mother was determined based on (self-) reports. Mothers were given a risk status when there were questions about their self-reliance with, in addition, one of the following risk factors: 1) low education level, 2) low SES, 3) limited support or instable support of others, 4) single status or changing partners, 5) psychological problems, and 6) substance abuse.

The low risk mothers were significantly older than the high risk mothers $t(49) = 3.08$, $p < .01$. Three subtests of the Wechsler Adult Intelligence Scale (WAIS-III^{NL}; Wechsler, 1997) were performed by the mothers during the second home-visit, namely Digit Span, Vocabulary, and Matrix Reasoning. There was no difference in Digit Span $t(50) = 1.73$, $p = .09$, and Matrix Reasoning $t(50) = 1.11$, $p = .27$ between low risk and high risk mothers but there was a difference for Vocabulary, $t(49) = 3.38$, $p < .05$. Low risk mothers had higher scores on Vocabulary compared to high risk mothers. In addition, mothers differed significantly in educational level $\chi^2(1) = 8.15$, $p < .05$. Low risk mothers completed secondary school more often, and they reported financial problems less frequently: $\chi^2(2) = 12.18$, $p < .05$ compared to high risk mothers. Furthermore, low risk mothers were significantly more often living together with a partner compared to high risk mothers $t(49) = 4.93$, $p < .01$. Forty-four percent of the mothers did not use any alcohol during pregnancy while 54% used alcohol until they knew about their pregnancy. There was no difference in use of

alcohol between mothers with a low or high risk status $\chi^2(2) = 2.62$, $p = .27$. Sixty-five percent of the mothers did not smoke during their pregnancy, 19% smoked until they knew about their pregnancy, and 16% of the mothers were smoking at the time of the first home visit (around 27 weeks of pregnancy). High risk mothers smoked more often during their pregnancy compared to low risk mothers $\chi^2(2) = 9.62$, $p < .05$. Finally, high risk mothers more often had a psychiatric disorder compared to low risk mothers $\chi^2(1) = 6.32$, $p < .05$, as measured with the M.I.N.I. Internationaal Neuropsychiatrisch Interview (MINI, Van Vliet, Leroy, & Van Megen, 2000).

There were 24 boys and 28 girls in the study. The infants did not differ $t(46) = -1.07$, $p = .29$ with respect to developmental status as evaluated with the mental scale items of the Bayley Scales of Infant Development (BSID-II^{NL}; Bayley, 1993) at 6 months by a trained researcher. Scores were ranging from 57 to 145 ($M = 99.08$, $SD = 19.31$).

Participants were recruited from obstetric practices and pregnancy fairs. One of those pregnancy fairs is the so called 9-month fair. It is a fair for all pregnant women. The majority of the mothers lived in urban agglomerations in the Dutch Randstad.

Exclusion criteria Study inclusion criteria were that mothers were pregnant of their first child and were between 17-25 years of age. It was preferred if mothers were interviewed before 28 weeks of pregnancy. Furthermore, mothers had to be able to speak and read Dutch. It was preferred if the mother lived independently but mothers were not excluded when they lived at their parents' home. Mothers' intelligence quotient (IQ) had to be higher than 70. The professionals helping with the recruitment of study participants indicated whether the mothers' IQ was higher than 70 or not. Mothers were excluded when they needed intensive psychiatric care

because of drug addiction or because of severe psychiatric disorders such as schizophrenia. Mothers could not take part in the study when they had severe medical problems or when already during pregnancy it was known that the infant's development would be seriously compromised.

Procedure

A home visit was planned when the infants were 6 months old. Several tasks and questionnaires were administered during the home-visit. The home visit was planned at a time of the day that was comfortable for mother and infant. The researchers tried to plan the start of the home-visit half an hour before the expected wake-up time of the infant, so that the infant was alert at the moment of the assessments. Two weeks before the planned home visit several questionnaires were sent to the mother and the mother was asked to fill in these questionnaires just before the home visit. Mothers were asked to hand the questionnaires to the researchers during the home visit. A day before the home visit mother was given a reminding call for the appointment.

When the infant was awake at the start of the home-visit the researchers started with administering the infant tasks. If the infant was sleeping at the start of the home-visit, the mother was interviewed about the last trimester of the pregnancy, the babies' birth, and the first six months of the infants' life. During the assessment three subtests of the Wechsler Adult Intelligence Scale – III (WAIS-III^{NL}; Wechsler, 1997) were administered for an estimate of the mothers cognitive functioning.

One of the infants' tasks during the home visit was the Still Face Paradigm (SFP). During the SFP the skin conductance level of the infant was measured. After two play tasks a two-electrode system, measuring the skin conductance levels, were placed on the infant's feet while he/she was lying on a playmat. Each infant's SCL

was measured at baseline, during a two minute during infant movie, The Baby Einstein. Infants were lying on the play mat or sitting on the mother's lap while watching the video. This baseline assessment was necessary to measure the infant's skin conductance level while the infant was in a neutral state.

Still Face Paradigm The SFP followed directly on the baseline measurement. It is a standard procedure that can be used to evaluate the infant's emotion regulatory strategies and the characteristics of a dyadic interaction by assessing the infant's response to an interaction in which social norms are violated (Tronick, Als, Adamson, Wise, & Brazelton, 1978). The SFP is a unique instrument in assessing maternal sensitivity in a period of non-distress and distress (Conradt & Albow, 2010).

In most assessments a wooden frame with a mirror was placed on a table in the living room. Infants were placed in a car seat at the table between the wooden frames. The mother was asked to take place on a chair before the table, so that she could watch and play with their infant. Researchers explained to the mothers that they wanted to know how infants react when their parent is not responding to them after a period of play. Mothers were instructed to play 2 minutes with their baby, without toys and pacifier, as they would normally do. After 2 minutes of play the mother had to face their infant while having a neutral face. Mothers were instructed to watch their infant without responding and touching the baby for the 2 minutes. In the end, the mothers were told that the still-face episode had ended and that they were allowed to play again with their infant. The SFP was video recorded using a mirror so that it was possible to record the infant and the mother with one video camera.

Measures

Maternal reflective functioning A Dutch translation (Suurland & Smaling, 2011) of the Revised Pregnancy Interview (Slade, 2007 as described in Miller, 2008)

was held at the first home visit during the third trimester of pregnancy. The Pregnancy Interview is a semi-structured interview and it consists of 24 items. A trained researcher asked the mother about the emotional experiences of her pregnancy. The questions are about the mothers' thoughts of the baby and their view of the (present and future) relationship with the baby. Mothers thoughts, feelings and changes experienced in her relation with the baby's father are important themes in the interview. The interview was audio taped and after transcription coded by a reliable coder. The responses of the mother on the individual questions were coded along a continuous scale ranging from -1 to 9 (Slade, Patterson, & Miller, 2007). The lowest score (-1) is representing negative reflective functioning while the highest score (9) is representing full or exceptional reflective functioning. The RF scale of the PI has been validated in different studies using different samples (Grienenberger, Kelly, & Slade, 2005; Slade, Grienenberger, Bernbach, Levy, & Locker, 2005).

Maternal sensitivity

Mothers behaviors during the play and reunion episode of the SFP were coded from the video tape using a coding manual (Smaling, 2013) based on Miller and Sameroff (1998). Maternal sensitivity was coded in four categories: 0 (no sensitivity), 1 (minimal or low sensitivity), 2 (mixed or moderate sensitivity), and 3 (predominantly high sensitivity). Coders were trained with a set of video recorded SFP interactions of another study. After a successful training the inter-rater observer agreement of maternal sensitivity was .748 indicating a strong agreement. The SFP interactions of the current study were coded by two coders and 38% of the interactions were randomly selected to compute inter-observer agreement using the intraclass correlation. Intraclass correlation between both coders for maternal sensitivity over the SFP was .606, indicating that there was moderate agreement.

Infant regulatory behavior Infant behaviors were coded during the play, still-face, and reunion episode of the SFP using a coding manual (Suurland, 2013). Self-soothing behavior was coded using a four-point scale with 0 (no engagement), 1 (minimal/low engagement), 2 (moderate/mixed engagement), 3 (predominant/high engagement). Arching and squirming was coded using the following codes: 1 (no arching/squirming), 2 (minimal arching/squirming), 3 (moderate/mixed arching/squirming), 4 (predominant/intense arching/squirming). The coders were trained using a set of video recorded SFP interactions of another study. The reliability of the coders for arching and squirming was .793 and for self-soothing behavior .808, indicating that the coders after training had a strong agreement. Both coders coded the infant behaviors independently of the mother coding scale. Videos were randomly selected (38 %) to compute the interobserver agreement using the intraclass correlation. The interobserver agreement for self-soothing behavior over the SFP was .898, indicating that there was almost perfect agreement. For arching and squirming the agreement was also almost perfect (ICC = .853).

Infant temperament The infants' temperament was reported by mother using a short version of the Revised Infant Behavior Questionnaire (IBQ-R; Gartstein & Rothbart, 2003). The short version of the IBQ-R contains of 91 items divided over 14 scales. Mothers answered the questions on a 7-point Likert scale with (1) never, (2) almost never, (3) less than half of the time, (4) almost half of the time, (5) more than half of the time, (6) almost always, and (7) always. There was also an option 'not applicable'.

The Sadness scale contains items about the general low mood of an infant. The Distress to Limitations scale refers to the baby's distress in several situations. The baby's approach to novelty is measured with the Fear scale. The Falling Reactivity

scale measures the rate of recovery from distress, excitement or general arousal. Together from these scales the dimension 'negativity'. The items of the Falling Reactivity scale were reversed before computing 'negativity'. Another aspect of temperament is 'regulatory' temperament. Regulatory temperament contains items from the following scales: Low intensity Pleasure scale, Cuddliness scale, Duration of orienting scale, and Soothability scale. The Low intensity Pleasure scale measures the amount of pleasure of an infant related to low stimulus intensity situations. The baby's expression of enjoyment is measured with the Cuddliness scale and the Duration of orienting scale is a scale which measures the baby's attention. The fourth scale, the Soothability scale, contains items about the baby's reduction of distress when the caregiver uses soothing techniques. Mothers were given the opportunity to ask questions while filling in the questionnaire. The IBQ-R is a representative method to measure temperament (Gartstein & Rothbart, 2003).

Skin conductance level. The Vrije Universiteit Ambulatory Monitoring System (VU-AMS; Klaver, De Geus, & De Vries, 1994) has been used to measure the infants' skin conductance levels. The two-electrodes were placed at the infants' feet as described before. The skin conductance level was measured using biopac EL507 electrodes. After placement of the electrodes, the electrodes were connected to the leads (e.g. cables) of the VU-AMS device. The electrodes were taped in order to prevent them for loosening. Also, the infants had to wear a sock, so that it was not possible for them to touch the electrodes.

The VU-AMS device is a system which can register the skin conductance levels of the infant. A serial cable is used to connect the VU-AMS device with the PC. The measurements of skin conductance level were controlled before the actual assessment started using the software package Data Analysis and Management

Software (DAMS). The SCL signal should be within 1 and 12 micro Siemens (µS). Before the actual measurement it was checked whether the infants show a response on an unexpected stimulus (e.g. clapping hands). The SCL is automatically computed by the DAMS program. SCL can differ between infants since it is influenced by the infants' skin and by the circumstances of the home-visit.

Statistical analysis

All analyses were conducted with IBM SPSS statistics (version 19). Data inspection was performed before the main analyses in order to check the assumption of normality. All variables were normally distributed and there were no significant outliers. The 6-month home visit was completed by 52 mother-infant dyads but there was one mother who refused to proceed the Still Face Paradigm. So, there were missing data for this mother and infant on the Still Face Paradigm, and they were excluded from further analyses. Missing data was listwise excluded.

Repeated measures analysis of variance has been carried out to investigate whether the still face effect is found for the current sample. The partial eta squared is used as effect size of the repeated measure analysis of variance.

Before conducting the simple linear regression analysis, Pearson correlations were calculated in order to assess the relation between the predictors and outcome variables. Mediation analysis has been used to assess whether the relation between the risk status of the mother and the regulatory behaviors of the infant was mediated by maternal sensitivity during the reunion episode of the Still Face Paradigm. This analysis is performed in four steps. First, a regression analysis is performed with the risk status of the mother as predictor and regulatory behaviors of the infant as dependent variable. This relation is investigated to assess the effect of the maternal risk status on the infants' regulatory behavior. Second, a regression analysis is

conducted with maternal sensitivity as dependent variable and risk status of the mother as predictor. The second step investigated whether there is a relation between the dependent variable and the possible mediator. In the third step, a regression analysis is carried out with the risk status of the mother as predictor, controlled for maternal sensitivity, and regulatory behaviors of the infant as dependent variable. The fourth step included a regression analysis with maternal sensitivity as predictor, controlled for risk status, with regulatory behaviors of the infant as dependent variable. Evidence for a mediation effect has been found if the first three steps are significant, and the fourth step is attenuated. The mediation effect has been checked with the Sobel test (Sobel, 1982):

$$z = \frac{ab}{\sqrt{b^2 s_a^2 + a^2 s_b^2 + s_a^2 s_b^2}}$$

Results

Descriptive and preliminary analyses.

In Table 1 the means, standard deviations, and skewness and kurtosis of all variables are displayed. All variables were normally distributed and there were no significant outliers. The correlations between all variables, the independent and the dependent variables, are presented in Table 2.

Repeated measures analysis of variance.

Repeated measures were conducted to investigate whether the Still Face Paradigm elicited a stress response in the infants and whether the classical still face effect is found in the current study.

The Still Face Paradigm has a significant effect on the arching and squirming behaviors of the infant, $F(3.22, 160.83) = 5.23$, $p < 0.01$. Since Mauchly's test indicated that the assumptions of sphericity had been violated, $\chi^2(9) = 21.43$, $p < .05$, multivariate tests were also reported ($\varepsilon = .80$). The results showed that arching and

squirming was significantly affected by the Still Face Paradigm, $V = .22$, $F(4, 47) = 3.36$, $p < .05$, $\eta^2 = .22$.

Table 1

Means, Standard Deviations, Skewness and Kurtosis All Variables.

	Mean	**SD**	**Skewness**	**Kurtosis**
1. Risk status mother	.44	.50	.24	-2.02
2. Reflective functioning	3.62	.878	.28	.09
3. Self-soothing behavior 1st minute play episode	1.02	1.07	.60	-.96
4. Self-soothing behavior 2nd minute play episode	.94	1.19	.81	-.96
5. Self-soothing behavior still face episode	1.00	1.14	.68	-1.03
6. Self-soothing behavior 1st minute reunion episode	.62	.92	1.33	.70
7. Self-soothing behavior 2nd minute reunion episode	.90	1.07	.86	-.58
8. Arching/squirming 1st minute play episode	.65	.87	1.15	.39
9. Arching/squirming 2nd minute play episode	.86	1.02	.87	-.45
10. Arching/squirming still face episode	1.06	1.17	.66	-1.10
11. Arching/squirming 1st minute reunion	.43	.73	1.70	2.44
12. Arching/squirming 2nd minute reunion	.69	.97	1.23	.37
13. Sensitivity play episode	1.92	.63	.06	-.36
14. Sensitivity reunion episode	1.69	.71	.54	-.83
15. Negativity (temperament)	2.62	.67	.87	.72
16. Regulatory (temperament)	5.13	.61	.19	-.92
17. SCL play episode	28.31	21.57	.31	-1.27
18. SCL 1st minute still face episode	29.48	22.01	.39	-1.02
19. SCL 2nd minute still face episode	30.65	21.49	.39	-.82
20. SCL 1st minute reunion episode	32.45	21.86	.32	-.86
21. SCL 2nd minute reunion episode	33.64	22.32	.31	-.88
22. BSID index	99.08	19.31	.17	.08

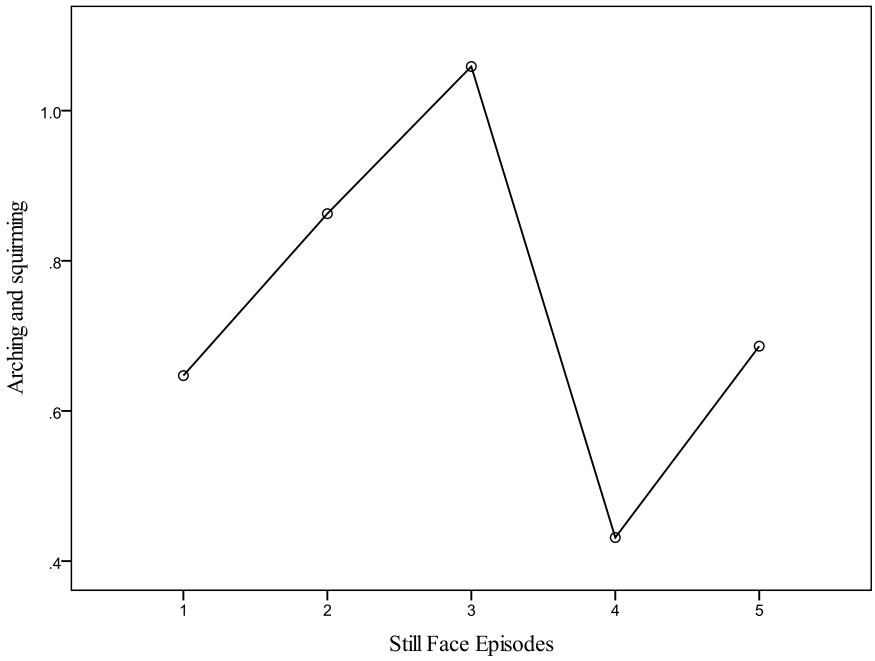
Table 2
Correlations between All Variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
RF	-.**40**																RF	Reflective Functioning			
SS.p	-.11	-.11															SS	Self-Soothing behavior			
SS.sf1	-.20	.13	.**36**														AS	Arching and Squirming behavior			
SS.sf2	-.13	.08	.24	**.57**													SEP	Sensitivity Play episode			
SS.r1	-.**41**	-.10	.**34**	**.45**	**.35**												SER	Sensitivity Reunion episode			
SS.r2	-.**37**	.07	.09	**.34**	**.49**	**.66**											NEG	Negativity Temperament			
AS.p	.18	-.10	.12	.06	-.12	-.12	-.**33**										REG	Regulatory Temperament			
AS.sf1	.01	-.03	-.11	-.09	-.24	.03	-.11	**.49**									SCL	Skin Conductance Level			
AS.sf2	.05	.02	-.07	-.09	-.24	.12	-.02	**.39**	**.69**								BSID	Bayley Scale Ontwikkelingsindex			
AS.r1	.04	-.11	.20	.12	-.12	.09	.03	.**37**	.27	.27							p	Play episode SFP			
AS.r2	.21	-.03	-.11	.04	.00	-.25	-.17	**.56**	**.48**	**.30**	**.32**						sf1	Still Face 1st minute SFP			
SEP	**-.46**	**.52**	.06	.27	.14	.21	.21	-.13	.11	.20	-.28	-.17					sf2	Still Face 2nd minute SFP			
SER	**-.32**	**.33**	.17	.22	.00	.**38**	.23	-.15	-.14	.00	-.08	**-.41**	**.58**				r1	Reunion episode 1st minute SFP			
NEG	.23	.01	-.01	-.06	-.18	-.24	-.15	.20	.19	.16	-.01	.23	-.13	**-.32**			r2	Reunion episode 2nd minute SFP			
REG	.04	.19	-.**33**	-.01	.07	-.01	.13	-.04	-.03	.00	.10	-.13	.05	.07	-.23						
SCL.p	.07	-.06	-.10	-.07	.02	-.18	.06	.07	-.03	.23	-.05	.04	-.10	-.21	.22	.03					
SCL.sf1	.09	-.09	-.11	-.06	.04	-.20	.03	.07	.01	.24	-.06	.05	-.12	-.25	.22	.02	**.98**				
SCL.sf2	.08	-.07	-.08	-.04	.01	-.17	.01	.11	.11	**.30**	-.06	.08	-.07	-.25	**.29**	.02	**.95**	**.98**			
SCL.r1	.11	-.09	-.09	-.06	.01	-.19	-.01	.09	.11	.27	-.05	.11	-.09	**-.30**	**.35**	.00	**.94**	**.96**	**.99**		
SCL.r2	.15	-.09	-.06	-.07	.03	-.22	.01	.06	.06	.20	-.03	.17	-.12	**-.33**	**.36**	.00	**.93**	**.94**	**.96**	**.99**	
BSID	.04	.19	-.**33**	-.01	.07	-.01	.13	-.04	.91	.74	.40	.98	.31	.91	.52	.81	.17	.21	.23	.23	.22

Note: Significant correlations ($p < .05$) are displayed in bold face.

In Figure 1 the pattern of arching and squirming behaviors of the infant over the Still Face Paradigm is displayed. The arching and squirming behaviors of the infant increased during the still face. In the first minute of the reunion, the arching and squirming behaviors decrease, and during the second minute of the reunion the arching and squirming behaviors of the infant return to the same level as in the play episode of the SFP.

Figure 1. Arching and squirming pattern over the Still Face Paradigm.



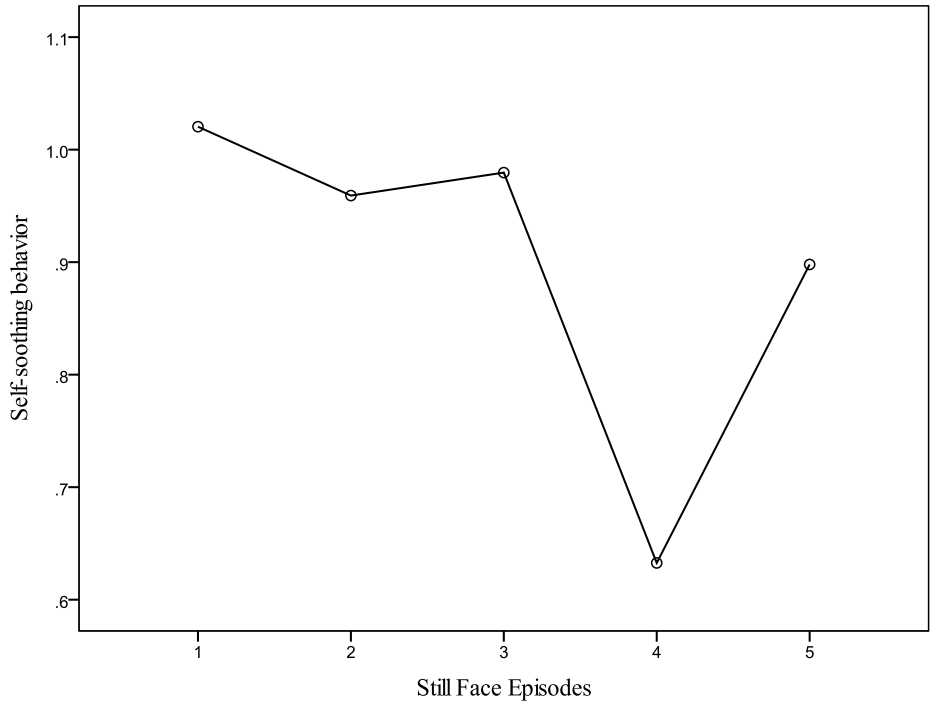
Additionally it was investigated whether there was a difference in arching and squirming behaviors for infants of low risk mothers and infants of high risk mothers. There was no significant different significant effect on the arching and squirming behavior of the infant during the Still Face Paradigm for infants of low and high risk mothers, $F(3.23, 158.33) = .751$, $p = .53$. Since the assumption of sphericity had been violated $\chi^2(9) = 20.35$, $p < .05$, the multivariate tests are additionally reported ($\varepsilon = .81$). The results show that arching and squirming was not significantly different

affected by the Still Face Paradigm for infants of low or high risk mothers, $V = .05$, $F(4, 46) = .56$, $p = .69$.

For self-soothing behavior the same analysis was done. The results indicate that the Still Face Paradigm did not affect the self-soothing behavior patterns of the infants $F(3.26, 156.46) = 1.64$, $p = .18$. Because the violation of sphericity $\chi^2 (9) = 27.80$, $p < .05$, multivariate test are also reported ($\varepsilon = .82$). These results show that the self-soothing behavior pattern of the infant is affected by the Still Face Paradigm $V = .19$, $F(4, 45) = 2.66$, $p < .05$, $\eta^2 = .19$.

It was investigated whether this effect was different for infants of low or high risk mothers. The self-soothing behavior patterns on the Still Face Paradigm did not differ significantly for infants of low or high risk mothers $F(3.24, 152.23) = 1.23$, $p = .30$ and the same result is found with the multivariate tests $V = .11$, $F(4, 44) = 1.33$, $p = .27$, which were reported since the assumption of sphericity had been violated $\chi^2 (9) = 27.69$, $p < .05$, ($\varepsilon = .81$).

Figure 2. Self-soothing pattern over the Still Face Paradigm.



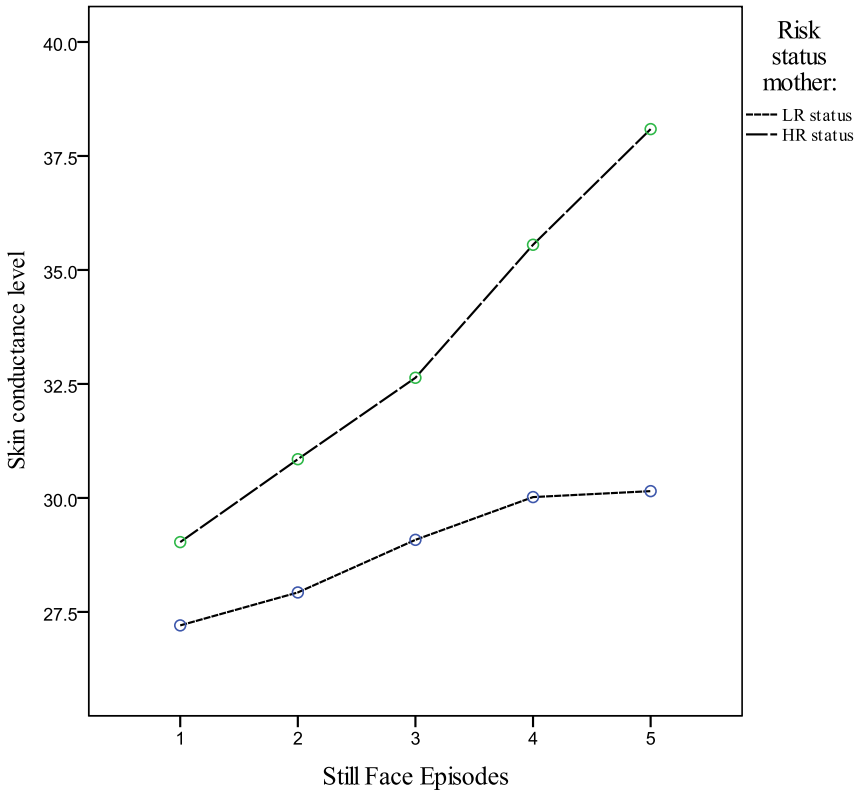
In Figure 2 the self-soothing behavior pattern over the SFP is presented. After the still face, the self-soothing behaviors of the infant decreased to a minimal level. During the second minute of the reunion the self-soothing behaviors of the infant increase almost to the normal level during the play episode.

In the end the pattern of skin conductance levels over the Still Face Paradigm were investigated. It has been found that the skin conductance level of the infant is affected by the Still Face Paradigm $F(1.95, 95.67) = 13.86$, $p < 0.01$. Since Mauchly's Test of Sphericity is significant and thus the sphericity is violated $\chi^2(9) = 128.41$, $p < .05$, multivariate test are also reported ($\varepsilon = .49$). The same results is found with the multivariate tests $V = .33$, $F(4, 46) = 5.71$, $p < .01$, $\eta^2 = .33$.

A significant difference is found for skin conductance level patterns over the Still Face Paradigm between infants of low and high risk mothers $F(2.01, 96.39) = 4.00$, $p < 0.05$. The assumption of sphericity has been violated $\chi^2(9) = 120.38$, $p < .05$ and therefore multivariate test are reported ($\varepsilon = .50$), indicating a marginal significant difference between infants of the low and high risk mothers $V = .19$, $F(4, 45) = 2.56$, $p < .10$, $\eta^2 = .40$.

In Figure 3 the skin conductance levels of the infants over the Still Face Paradigm were displayed for infants of low and high risk mothers separately. Infants of both groups showed a same level of skin conductance at the start of the SFP while infants of high risk mothers showed increased skin conductance levels compared to infants of low risk mothers. The infants of low risk mothers had an almost stable skin conductance level during the reunion episode while the infants of high risk mothers showed an increased skin conductance level from the first minute to the second minute of the reunion episode.

Figure 3. Skin conductance levels over the Still Face Paradigm.



Linear regression analysis

The second hypothesis that reflective functioning is predicted by maternal sensitivity is tested with linear regression analysis. Reflective functioning is a significant predictor of sensitivity during the play episode of the SFP $F(1, 47) = 17.48$, $p < .001$ and sensitivity during the reunion episode $F(1, 47) = 5.91$, $p < .05$ (see Table 3). Sensitivity increases as the level of reflective functioning increase, both during play and during reunion ($\beta = .521$, $p < .001$, and $\beta = .334$, $p < .05$). The models explained respectively 27% and 11% of the variance in the relationship between reflective functioning and sensitivity during the play and reunion episode of the SFP.

Table 3

Linear Regression Analysis: Reflective Functioning as Predictor and Maternal Sensitivity during the Play and Reunion Episode as Dependent Variable.

Predictor variable	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Reflective functioning	Sensitivity play	.378	.090	.521	< .001	.521	.271
	Sensitivity reunion	.269	.111	.334	.019	.334	.112

A difference was found for the level of reflective functioning in mothers with a high status and low risk status $t(48) = 2.86$, $p < .05$ with higher reflective functioning scores for mothers of the low risk group. The role of the maternal risk status in the relationship between reflective functioning and sensitivity is further investigated with a linear regression analysis. The risk status of the mother predicted reflective functioning and this relation was completely mediated by sensitivity during the play episode $F(1, 47) = 9.39$, $p < .05$ (see Table 4) while sensitivity during the reunion episode was not found as a mediator, although the model was significant $F(2, 46) = 4.96$, $p < .05$ (see Table 5). The mediation effect of sensitivity during the play episode in the relation between the risk status of the mother and reflective functioning is confirmed with the Sobel test ($p < .05$, $z = 2.56$).

Table 4

Linear Regression Analysis: Maternal Risk Status as Predictor of Reflective Functioning with Sensitivity during the Play Episode as Mediator.

	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Step 1	Reflective functioning	-.608	.232	-.357	.012	-.357	.128
Step 2	Sensitivity play episode	.717	.172	.521	< .001	.521	.27
Step 3	Sensitivity play episode	.622	.192	.451	.002	.431	.290
	Reflective functioning						
Step 4	Reflective functioning	-.261	.232	-.153	.276	-.160	
	Sensitivity play episode						

Table 5

Linear Regression Analysis: Maternal Risk Status as Predictor of Reflective Functioning with Sensitivity during the Reunion Episode as Mediator.

	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Step 1	Reflective functioning	-.608	.232	-.357	.012	-.357	.128
Step 2	Sensitivity reunion episode	.415	.171	.334	.019	.334	.112
Step 3	Sensitivity reunion episode	.296	.177	.238	.102	.239	.177
	Reflective functioning						
Step 4	Reflective functioning	-.466	.243	-.274	.061	-.272	
	Sensitivity reunion episode						

The third hypothesis about the relation between maternal sensitivity and the regulatory behaviors is tested with linear regression analysis. No associations were found between maternal sensitivity during the play episode and the infants' regulatory behaviors during the SFP. The SCL was not associated with maternal sensitivity during play or maternal sensitivity during the reunion episode. Contrasting to the period of play, maternal sensitivity during the reunion episode of the SFP was

associated with self-soothing behavior during the first minute of the reunion and with arching and squirming during the second minute of the reunion.

A significant relationship $F(1, 48) = 8.33$, $p < .05$, has been found between maternal sensitivity of the mother during the reunion episode and the infant's self-soothing behavior during the first minute of the SFP reunion episode ($\beta = .38$, $p < 0.01$) with an explained variance of 15% (see Table 6). Maternal sensitivity during the reunion of the SFP has been found as significant predictor of arching and squirming behavior of the infant during the second minute of the reunion $F(1, 49) = 9.86$, $p < .05$ ($\beta = -.41$, $p < .05$).

Table 6

Linear Regression Analysis: Sensitivity during the Reunion Episode as Predictor of Regulatory Behaviors of the Infant during the Reunion.

Predictor variable	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Sensitivity reunion	Self-soothing behavior 1st minute reunion	.502	.174	.384	.006	.384	.148
	Arching and squirming 2nd minute reunion	-.561	.179	-.409	.003	-.409	.167

The role of the risk status of the mother in the relation between maternal sensitivity and the infants' regulatory behaviors is investigated with linear regression analysis. The risk status of the mother predict significantly the arching and squirming behavior of the infant during the second minute of the SFP reunion $F(2, 48) = 5.44$, $p < .05$ with an explained variance of 19%. This relation was completely mediated by the mothers' sensitivity during the SFP reunion (see Table 7). The mediation effect was tested with the Sobel test which was marginally significant, $p = .05$ ($z = 1.92$).

In addition, a relationship has been found between the risk status of the mother and the self-soothing behaviors of the infant during the 1st minute of the SFP reunion $F(2, 47) = 5.11$, $p < .05$ with an explained variance of 18% of the complete mediation model (see Table 8). The Sobel test was marginally significant, $p < .10$ ($z = -1.77$). The relation between risk status of the mother was completely mediated by the sensitivity of the mother during the reunion episode of the SFP.

The fourth hypothesis could not be tested since no association was found between the infant's temperament and regulatory behaviors.

Table 7

Mediation Analysis: Sensitivity during the Reunion as Mediator in the Relation Between the Risk Status of the Mother and Arching and Squirming Behavior of the Infant during the Second Minute of the Reunion.

	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Step 1	Arching and squirming 2nd minute SFP reunion	.552	.265	.285	.043	.285	.081
Step 2	Sensitivity reunion	-.567	.185	-.402	.003	-.402	.161
Step 3	Sensitivity reunion Arching and squirming 2nd minute SFP reunion	-.482	.195	-.352	.017	-.322	.185
Step 4	Arching and squirming 2nd minute SFP reunion Sensitivity reunion	.278	.276	.144	.318	.131	.185

Table 8

Mediation Analysis: Sensitivity during the SFP Reunion as Mediator in the Relation between the Risk Status of the Mother and Self-Soothing Behavior of the Infant during the First Minute of the SFP Reunion.

	Dependent variable	*B*	SE_b	β	*P*	$part^2$	R^2
Step 1	Self-soothing behavior infant 2nd minute reunion SFP	-.576	.254	-.311	.028	-.311	.097
Step 2	Sensitivity reunion episode	-.567	.185	-.402	.003	-.402	.161
Step 3	Sensitivity reunion episode Self-soothing behavior infant 2nd minute reunion SFP	.405	.187	.310	.036	.286	.179
Step 4	Self-soothing behavior infant 2nd minute reunion SFP Sensitivity reunion episode	-.353	.266	-.191	.190	-.176	.179

Discussion

The current study investigated the relation between reflective functioning and maternal sensitivity during the Still Face Paradigm. Furthermore, it was examined whether maternal sensitivity was associated with the regulatory behaviors of the infant during the SFP. Finally, the role of the risk status of the mother and the role of the infants' temperament has been studied. A classical still face has been found for the arching and squirming behaviors of the infant. The arching and squirming behaviors of the infant increased from the play to the still face episode and decreased during the reunion episode. A divergent effect has been found for the self-soothing behaviors of the infant. The SFP affected the self-soothing behaviors of the infant but the pattern was different from the classical still face effect since the level of self-soothing did not increase from the play to the still face episode. After the still face episode, the level of self-soothing behavior did decrease, as was expected. Furthermore the skin

conductance level was affected by the SFP. It was different from the classical still face effect since there was no decrease in skin conductance level after the still face episode.

Additionally, reflective functioning predicts maternal sensitivity during the play and reunion episode of the SFP. The risk status of the mother does not play a role in this relationship since the relation between the risk status of the mother and reflective functioning is completely mediated by maternal sensitivity during the SFP. Maternal sensitivity during the reunion of the SFP is associated with a several regulatory behaviors of the infant during the reunion of the SFP. Maternal sensitivity during the reunion predicted the self-soothing behavior of the infant during the first minute of the reunion and it predicted also the arching and squirming behaviors of the infant during the second minute of the reunion episode. The risk status of the mother did not play a role because the relation between the risk status of the mother and the infants' regulatory behaviors were mediated by maternal sensitivity. Beside the association between maternal sensitivity and the self-soothing behaviors during the first minute of the reunion of the SFP and the arching and squirming behaviors during the second minute of the reunion of the SFP no other associations between maternal sensitivity and infants' regulatory behaviors were found. The infants' temperament was not associated with the infants' regulatory behaviors.

The still face effect.

In line with the hypothesis and previous research the still face effect is found for arching and squirming behaviors of the infant (Conradt & Albow, 2010; Mesman, Van IJzendoorn, & Bakermans-Kranenburg, 2009). The current study examined arching and squirming behaviors specifically while others studies investigated arching

and squirming as a part of a general behavior pattern. For this reason, the results of the current study cannot be compared with many other studies.

The behavioral pattern found for self-soothing behavior was different from that found in other studies using the still-face paradigm (Conradt & Albow, 2010; Tarabulsy et al., 2003). The definition of self-soothing behaviors in Tarabulsy et al. (2003) differed from the definition used in the current study, so this can possibly explain the difference. Tarabulsy et al. (2003) defined self-soothing behavior as self-comforting behavior and gazing away from mother while these were two separate aspects in the current study. In the current study self-soothing behavior was defined as self-comforting behavior and not as gazing away.

The increasing SCL levels over the SFP, found in the current study are in line with the results found in Ham & Tronick (2006) since they also found in their pilot study an increasing skin conductance level over the whole SFP. As there are no other studies that examined skin conductance levels in 6-month-old infants during the SFP, the results of the current study are preliminary.

Reflective functioning and maternal sensitivity.

In line with the hypothesis, reflective functioning predicted maternal sensitivity during the play and reunion episodes of the SFP. Grienenberger, Kelly & Slade (2005) indicated already that there was an association between maternal reflective functioning and maternal behavior so this was confirmed in the present study. The same association was found in Rosenblum, McDonough, Sameroff, and Muzik (2008). They discussed that parenting reflectivity contributed to maternal behavior. Since the association between maternal reflective functioning and maternal sensitivity has not yet frequently been examined the results of the present study are explorative.

The role of the risk status of the mother was investigated in relation to reflective functioning and maternal sensitivity. It was found that high risk mothers had lower scores of reflective functioning as was expected due to the fact that these mothers face more challenges in their life (Slade, 2007). The relation between the maternal risk status and reflective functioning was completely mediated by maternal sensitivity. So, the risk status of the mother on its own does not predict the level of maternal reflective functioning but the level of maternal sensitivity is found a predictor of reflective functioning. As far as known, no other studies examined this relationship so the results of the present study give an indication of the relationship between reflective functioning and maternal sensitivity but these findings have to be replicated in other studies.

Maternal sensitivity and infants' regulatory behaviors.

In line with the hypothesis an association was found between maternal sensitivity and arching and squirming during the second minute of the reunion of the SFP and self-soothing behavior during the first minute of the SFP reunion. Maternal sensitivity predicted these behaviors. No association was found between the other regulatory behaviors of the infant such as arching and squirming during the play, still face, and first minute of the reunion and self-soothing behavior during the play, still face, and second minute of the reunion. This result is not in line with the hypothesis and earlier research (Mesman, Van IJzendoorn, & Bakersman-Kranenburg, 2009). It is also different from the results of Mesman, Linting, Joosen, Bakermans-Kranenburg, & Van IJzendoorn (2013) who examined individual differences in the reaction patterns of infants on the SFP at 3 and 6 months of age. It was found that the SFP behaviors of the infants showed robust expected patterns but that there were substantial variations in these patterns as a consequence of differential susceptibility

for maternal sensitivity in infants with difficult temperament and infants with a more easy temperament. Possibly, these effects have not been found in the current study because of the relatively small sample size.

It is noteworthy, that no association was found between maternal sensitivity and the skin conductance levels of the infant during the SFP. Studies that found a relation between maternal sensitivity and infant stress reactivity used another measure of stress reactivity namely cortisol levels (Blair, Granger, Willoughby, Kivlighan, et al., 2006; Feldman, Granat, Pariente, Kanety, Kuint, & Gilboa-Schechtman, 2009). So it is possible that measuring skin conductance level is not an appropriate measure of stress reactivity in such young infants. There are several factors that can possibly influence the measurement of skin conductance level such as the infants' skin , but also the circumstances during the measurements. The circumstances for the home-visits varied, for example with respect to time of the day, and temperature and these factors can all cause differences in skin conductance levels.

Infants' temperament and regulatory behaviors.

Contrasting with the hypothesis, no association was found between the infant's temperament and regulatory behaviors. These results are contrasting with Braungart-Rieker, Garwood, Powers, and Nataro (1998) who found that self-comforting behavior during the still face was associated with negative temperament in infants at the age of 4 months. It is also different from Yoo and Reeb-Sutherland (2013) who report an association with negative engagement during the reunion and negative infant temperament in 5-month-old infants. Maternal report was used to examine the infants' temperament in these studies. The results of the present study are in line with the study of Tarabulsy et al. (2003) who discussed that the maternal report of infant difficultness did not predict infant affect or self-soothing behavior during the still-face

at the age of 6 months. In addition, Cohn, Campbell, and Ross (1991) did not find any association between maternal reports of the infant's irritability and the infant's behavior during the SFP at the age of 2, 4, and 6 months. A possible explanation that no association is found between the infant's temperament and regulatory behaviors is differential susceptibility for maternal sensitivity, as discussed earlier (Mesman, Linting, Joosen, Bakersmans-Kranenburg, & Van IJzendoorn, 2013). In their study the infants' temperament was measured with another questionnaire, a short form of the Infant Characteristics Questionnaire (ICQ; Bates, Freeland, & Lounsbury, 1979), compared to the current study. The infants' temperament was at 3 months of age by maternal report.

Additionally, there was no association between the infant's temperament and skin conductance level while an association was found in other studies (Gunnar, 1998; Van Bakel & Risken-Walraven, 2004). These studies used other measures of stress reactivity namely cortisol levels in stead of skin conductance levels. One still has to take into account the possibility that measuring skin conductance levels in such young infants is not an appropriate measure to examine stress reactivity, due to measurement problems.

Limitations

Several limitations should be considered interpreting the results of the current study. A first remark is about the measurement of skin conductance levels in infants. The skin conductance levels of the infants in the present study varied strongly, and, as discussed earlier, skin conductance level in these young infants can be influenced by several factors. This has to be taken into account interpreting the results of the current study.

Second, a comment must be made about the sample size. In the analyses a distinction is made between low risk and high risk mothers. Both groups contained fewer than 30 participants, so caution is needed with respect to the interpretation of the differences according to the maternal risk status. Moreover, because of the relatively small sample sizes it was not possible to make distinctions between individual infant characteristics such as temperament.

A third limitation concerns the measurement of the infants' temperament with the IBQ-R (2003). Mothers filled in the questionnaire before or during the home-visit at 6 months. Researchers noticed that it was difficult to fill in this questionnaire for high risk mothers since they were not familiar with observing their infant in such a way, that they could answer the questions. Sometimes the questions were hard to understand and mothers needed further explanations of the statements made in the questionnaire.

Future directions

As the relation between reflective functioning and maternal sensitivity has not been widely investigated it is necessary that the results of the present study will be replicated. The same is true for the results according to the stress reactivity measurements. It is interesting to investigate more mother-infant dyads so that individual infant characteristics such as temperament can be examined with respect to differential susceptibility. It is recommended to examine the infant temperament not only with maternal reports. In addition to maternal reports it is useful to observe the infants' temperament in play sessions.

Conclusions

The results of the present study indicate that maternal reflective functioning predicts maternal sensitivity during the SFP. Lower levels of maternal reflective

functioning were found for mothers with a high risk status. Higher levels of reflective functioning predicted higher levels of maternal sensitivity. Maternal sensitivity, in turn, is related to infant regulatory behaviors during the reunion of the SFP. It is known that reflective functioning can be improved in mothers. Probably, the improvement of reflective functioning can influence maternal sensitivity in a positive manner. Maternal sensitivity has a positive influence on the regulatory behaviors of infants and appears to influence their emotional development. In this way, the current study has some specific implications for improving the infants' emotional development.

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