How a mother processes her infant's distress: Cognitive pathways to maternal insensitivity

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A B S T R A C T

Maternal sensitivity is one of the most frequently considered influences on early infant development. Nevertheless, the cognitive foundations of maternal sensitivity have received little attention. Here, we present a social information-processing model of maternal insensitivity. The model posits that maternal processing of infant distress is determined by two components: Firstly, it is determined by stable implicit cognitive structures and secondly, by more transient event-dependent cognitive processes. The model integrates different cognitive pathways in response to infant distress. We critically evaluate evidence for our model and outline a research agenda to gain a refined understanding of the cognitive mechanisms behind maternal insensitivity.

1. Maternal sensitivity in the infant's first year of life

“A mother's behavior in interaction with her baby had significant influence on her baby's behavior and on the pathway along which his development proceeded” (Ainsworth, 1985). This was one of Mary Ainsworth's first conclusions from her observational studies of mothers and infants in Uganda and Baltimore. She pointed out that a key dimension of maternal behavior is her sensitivity in response to her baby. Maternal sensitivity describes a mother's ability to identify accurately, to interpret appropriately and to respond promptly to infant signals (Ainsworth, Blehar, Waters & Wall, 1978). A plethora of studies has shown that maternal sensitivity is one of the very first preconditions for an infant's adaptive cognitive, social, and emotional development (Ainsworth, Blehar, Waters, & Wall, 1978; Bigelow et al., 2010; Bornstein & Manian, 2013; De Wolff & van IJzendoorn, 1997; Leerkes & Crockenberg, 2006; Leerkes, 2010, 2011; Leerkes, Parade, & Gudmundson, 2011; Leerkes, Weaver & O'Brien, 2012; Zeifman, 2003). In particular, maternal sensitivity to infant distress is essential for the gradual development of infant self-regulation (McElwain & Booth-LaForce, 2006; Mesman, Oster & Camras, 2012). While the current literature focuses primarily on behavioral and physiological processes we aim to investigate the cognitive dimension of maternal sensitivity (Feldman, Weller, Zagoory-Sharon, & Levine, 2007). We try to answer the following questions: (1) which cognitive factors underlie maternal sensitivity? (2) What motivates a mother to respond sensitively to her infant? (3) And which cognitive processes enable her to identify and interpret her infant's signals appropriately?

1.1. The present review

The objective of the present review is threefold. First, we aim to identify specific maternal cognitive structures and processes as possible antecedents for maternal behavioral sensitivity. For this purpose we use the social information processing framework by Crick and Dodge (1994) as a heuristic to organize the empirical findings and to suggest a temporal ordering of cognitive structures, cognitive processes and behavior in the context of maternal insensitivity. Second, we critically discuss our empirical synthesis with regard to the robustness of evidence of our hypothesized model. Third, we suggest a research agenda aimed at understanding the role of maternal cognitive structures and cognitive processes for maternal behavioral sensitivity more comprehensively.

1.2. Maternal cognitions and maternal sensitivity

Presumably, maternal cognitions generate, organize and shape, but also moderate the nature and effectiveness of maternal caregiving practices. A number of studies confirm the importance of maternal cognitions in the context of caring for older children but only a few have investigated their role for caring for infants (Belsky, 1984; Bornstein, Hahn, & Haynes, 2011; Bugental & Johnston, 2000; Leerkes, 2010; Levy-Shiff, Dimitrovsky, Shulman, & Har-Even, 1998; Sadeh, Tikotzky, & Scher, 2010; Stein et al., 2012). Traditionally, in the field of early caregiving and infant mental health the cognitive approach to parental caregiving behavior is a rather less explored perspective.

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1.3. Social information processing theory and its applicability to the field of maternal sensitivity

Can social information processing theory be applied to the field of maternal sensitivity? Originally, the approach was developed to describe children's processing of social situations. According to this model, an individual enters a situation equipped with latent stable and implicit cognitive structures formed by memories of past experiences. Crick and Dodge (1994) refer to these structures as an individual's database that influences a person's cognitive processing. As the first step in a social situation, social cues are encoded (perception and encoding stage). Then the individual interprets the cues (interpretation stage) and develops a motivational orientation as well as individual goals with regard to the social partner (motivation stage). At the end, the individual considers which action to take, often referring back to the individual database that is, integrated efficacy beliefs and previous experiences in similar social situations (response selection stage) (Crick & Dodge, 1994; Lemerise & Arsenio, 2000). In order to illustrate the application of the model to a mother-infant caregiving context, we refer to a case from our clinical experience:

In the context of diagnosing infant regulatory problems, a concerned mother told us that since the birth of her baby she had never had the feeling of being able to settle her baby. When her son started to cry, she did not pay attention to him because she thought that there was nothing she could do to stop him from crying. She felt that she could never please her son and said that his crying made her muscles tense. She mentioned that she repeatedly thought about laying her son outside in front of the main door to have some peace. This thought made her feel guilty so instead she changed rooms and left her son alone.

This example illustrates how the mother's diminished sense of self-efficacy (“never had the feeling of being able to settle her infant since his birth”) might underlie the way she processes his crying in many situations, and so represents a part of her individual database. At the encoding stage the mother reports not to pay attention to her infant's signals. At the interpretation stage she views her infant as impossible to please and at the motivation stage she admits that she often thinks of laying her son outside in front of the main door to have her peace. Her motivation to prioritize her need for peace makes her feel guilty and at the response selection stage leads her to change rooms and to leave the infant alone.

Hence, the social information processing framework helps to facilitate operationalizing the cognitions underlying maternal sensitivity: It helps to delineate cognitive structures and processes in attention, interpretation and motivation. Specific cognitive processes like attention, interpretation and motivation are accessible to experimental manipulation. This helps to investigate causality between maternal cognitions and maternal caregiving behaviors. Therefore, in our view the Crick and Dodge (1994) model represents a useful methodological approach to investigate the cognitive components of maternal insensitivity.

2. Empirical review

2.1. Maternal information processing of infant distress

2.1.1. Cognitive structures

Pregnancy and birth are a period of life during which a mother usually comes to prioritizing the infant. Daniel Stern referred to this process as the motherhood constellation (1998) and Donald Winnicott, several decades earlier, refers to this psychological condition as primary maternal preoccupation (1956). Both authors point to the excessiveness of maternal focus on the infant's concerns which might be regarded as pathological in all other stages except the first weeks postpartum. In this period, a mother's stable implicit cognitive structures are presumed to be modified and enriched, but also realigned, by actual experiences in the mother-infant interaction (Leerkes, 2010; Thun-Hohenstein, Wienerroither, Schreuer, Seim, & Wienerroither, 2008). As a result of the dynamics between lifetime acquired stable, implicit cognitive structures and postnatal processing and its outcomes, a mother is thought to further adapt her self-concept as a mother, her maternal self-esteem as well as her control and efficacy beliefs with regard to her caregiving capabilities (Farrow & Blissett, 2007). In the following, we discuss the influence of internal working models of attachment, representations about the infant, beliefs of maternal self-efficacy and attributional patterns on maternal sensitivity. These components build maternal cognitive structures with regard to caregiving and form the individual database of the social information processing framework.

2.1.2. Internal working models

According to attachment theory internal working models of attachment are mental representations assumed to influence interpersonal information processing. They develop from infancy to adulthood and are presumed to be relatively stable and implicit (Belsky & Fearon, 2008; Bowlby, 1980; Bretherton & Munholland, 2008; De Wolff & van Ijzendoorn, 1997; Main, Kaplan, & Cassidy, 1985). They are also considered to influence the processing of infant distress in the early mother-infant interaction (Dykas & Cassidy, 2011; Main & Hesse, 1990). The theory of transmission of attachment classification postulates that if a mother has experienced sensitive caregiver responses to negative emotions in her childhood, she also feels confident to respond to distressing emotions in the interaction with her infant. Consequently, she assumes that distressing emotions are tolerable, acceptable and easily recovered from (Dykas & Cassidy, 2011; Laurent & Ablow, 2012). In contrast, if a mother has repeatedly experienced insensitive caregiver responses to negative emotions in her childhood she might be unable to cope with her infant's distress signals. This shows that transmissions of relationship-related experiences might exert their impact through biased cognitive processing and responding to interpersonal distress (Benolt, Zeannah, Parker, & Nicholson, 1997; Dykas & Cassidy, 2011; Laurent & Ablow, 2012).

2.2. Robustness of evidence

A meta-analysis of 10 observational studies by van Ijzendoorn (1995) showed with a moderate effect size such that mothers with secure internal working models displayed higher maternal sensitivity than mothers with insecure working models. However, it remains unclear how maternal internal working models lead to maternal sensitivity or insensitivity. The pathway of social information processing has not been experimentally investigated and, hence, is rather speculative. Dykas and Cassidy (2011) proposed a theoretical model in their narrative review stating that internal working models of attachment relate to the processing of social information across the lifespan. But up to now, there is no empirical evidence for a causal role of internal working models for the processing of infant related information in the early caregiving context. This could be done in an ethically
feasible way by experimentally examining the effects of interventions targeted at the maternal internal working models. If intervention effects on the processing of infant distress were found, internal working models could be recognized as causal factors with regard to maternal processing of infant distress. Preliminary findings for an association between maternal internal working models of attachment and processing of infant emotions have emerged recently (Leerkes & Crockenberg, 2002; Leerkes & Siepak, 2006; Leerkes, 2010). Since the findings are mostly correlational, additional work is needed to identify the specific cognitive mechanisms linking maternal internal working models and maternal sensitivity in response to infant distress. From a theoretical perspective, we emphasize the necessity to further specify and dismantle the different facets of the construct “internal working model” for operationalization in empirical experimental investigation.

2.3. Mental representations about the infant

How do maternal mental representations about the infant affect maternal sensitivity in response to infant distress? First experimental evidence for the influence of maternal expectations and mental representations of an infant on maternal behavioral sensitivity was obtained in a laboratory study of Donovan and Leavitt (1978). The authors told one group of participating mothers that a audiotaped cry was produced by an infant with a difficult temperament. The other group of mothers was told that the cry was produced by an infant with an easy temperament. Mothers in both groups were to stop the cry by pushing a relatively simple sequence of buttons. Mothers in the difficult-infant-group failed to stop the infant from crying (i.e., failed to push the sequence of buttons correctly) significantly more often than mothers in the easy-infant group. The authors concluded that a mother’s mental representations such as the labeling “difficult infant” undermined maternal performance in the experimental task. While it is speculative to translate the impaired maternal performance in this experiment to potentially lower degrees of maternal sensitivity, it nevertheless shows a susceptibility to feel helpless due to mother’s poor expectations of efficient settling behaviors of the “difficult infant”.

3. Robustness of evidence

Longitudinal studies have examined the stability of maternal representation of the infant from the pre- to the postnatal period (e.g., Benolt, Parker, & Zeanah, 1997; Zeanah et al., 1993). However, these studies only found that prenatal representations are predictive of postnatal descriptions of the infant. Maternal sensitivity has not been assessed in these studies. The only experimental evidence of a possibly causal role for maternal representations of an infant for maternal sensitivity comes from a laboratory study of Donovan and Leavitt (1978). Their approach is insightful and innovative but lacks ecological validity in the assessment of maternal sensitivity. Further experimental research is needed to evaluate the effect of maternal mental representations of the infant on behavioral sensitivity in response to infant distress.

3.1. Control and efficacy beliefs

Control and efficacy beliefs relate to expectations and actual experiences in the early caregiving context. They encompass, for example, the maternal sense of self-efficacy in handling challenges of early caregiving such as settling a crying infant (Donovan & Leavitt, 1985). Throughout the development of the mother-infant relationship, caregiving experiences are thought to be accumulated and stored into long-term memory in the form of efficacy beliefs. They are therefore considered an important component of latent stable and implicit cognitive structures underlying maternal behavioral sensitivity (Crick & Dodge, 1994). A mother who repeatedly experiences diminished control for example, in the soothing context, may develop a stable tendency to assess events as being out of her control. This, in turn, results in feelings of helplessness.

Maternal self-efficacy is defined as mother’s expectation of her ability to successfully care for her infant (Jones & Prinz, 2005; Teti & Gelfand, 1991). The degree of maternal self-efficacy is assumed to be related to maternal behavioral competence (Teti & Gelfand, 1991). Several studies suggested that a negative infant temperament may undermine the development of postnatal maternal efficacy (Leerkes & Crockenberg, 2002; Papoušek & von Hofacker, 1998). However, other studies did not find any negative relations between infant temperament and self-perceived maternal efficacy (Halpern & McLean, 1997). Troutman, Moran, Arndt, Johnson, and Chmielewski (2012) reconciled these contradictory findings by investigating the effects of infant temperament on maternal efficacy in more detail. The authors showed that temperamentally negative emotionality per se did not compromise maternal self-efficacy perceptions. Instead, infant’s unsoothability was a much stronger predictor of maternal self-perceived inefficacy. If mothers succeed to soothe their highly reactive infant, their self-efficacy might increase due to frequent experiences of success which, according to Bandura (1982), most influentially impact the increase of self-efficacy cognitions (James-Roberts, 2012).

Donovan and Leavitt (1985) conducted a series of laboratory experiments to examine the effects of learned helplessness and maternal inefficacy on maternal physiological sensitivity. They manipulated maternal efficacy experiences with a laboratory task where one group of mothers could easily stop an infant from crying by pressing a simple sequence of buttons and a second group could not stop the same infant from crying despite their efforts. Subsequently, the mothers repeated the task. Now, all mothers were able to stop the infant’s cry. The authors found that the second group of mothers who presumably felt helpless showed difficulties stopping the infant cry in comparison to the first group. These results imply that repeated experience of helplessness and failure in the mother-infant context may lead to decreased sensitivity. Considering aspects of ecological validity, these conclusions may be interpreted with caution. Nevertheless, these experimental studies point to the dynamics of underlying experiences of helplessness and their influence on maternal self-perceived efficacy and interactive behavior.

The degree of perceived self-efficacy also depends on whether a mother attributes her infant’s expressions of distress as a positive specific communication of a need or as a negative global and internal trait of infant difficulty. Thus, the mother will either feel in control or out of control of her infant’s distress signals (Leerkes et al., 2014). Through this mechanism, maternal attributions might also affect the assessment of infant temperament (Mertesacker, Bade, Haverkock, & Pauli-Pott, 2004; Rothbart & Bates, 2006). Power, Gershenhorn, and Stafford (1990) examined the development of maternal perceptions of infant’s temperamental difficulty. Analyses revealed dynamics between maternal attributions, maternal inflexibility attitudes in the early caregiving context and maternal perceptions of infant temperament. Maternal inflexibility was defined as a strict adherence to caretaking schedules. The authors found that mothers who revealed inflexible attitudes rated their infants’ temperament as more difficult than mothers with more flexible attitudes. Power et al. (1990) suggest that if inflexible mothers fail to impose their need for controlling caretaking procedures on the rhythm of their infants’ needs, they may perceive their infants as difficult and attribute such difficulty to stable, internal and global causes. The authors further reasoned that such attributions might cause mothers to infer the existence of a stable personality factor in their infant beyond the mothers’ control, possibly leading to enhanced frustration and decreased levels of maternal self-efficacy (Bugental & Johnson, 2000; Donovan & Leavitt, 1978).

3.2. Robustness of evidence

Apart from variability in conceptualizations of maternal self-effi-
cacy, measurement relying heavily on self-report and the lack of research exploring causality also make it difficult to identify the role of maternal self-efficacy in the early caregiving context. The only experimental investigation was conducted by Donovan and Leavitt (1985). They manipulated maternal self-efficacy and examined its effect on maternal behavior in a laboratory task (pushing a sequence of buttons to stop an audiotaped infant cry). Such maternal behavior in a laboratory cannot be equated with maternal sensitivity. Thus, the direction of influence between maternal self-efficacy and maternal sensitivity needs to be clarified in longitudinal and experimental research designs. Best evidence is derived from studies with multiple assessment methods such as observation and self-report.

3.3. Cognitive processes

In the postnatal period, stable and implicit maternal cognitive structures are assumed to interact with event-dependent cognitive processing in order to organize maternal behavior in the early mother-infant relationship. Event-dependent cognitive processing - perception and encoding, interpretation, motivational orientation and response selection - are reviewed in the following paragraphs.

3.3.1. Perception and encoding

The perception and encoding stage is assumed to be the first stage of social-information processing and is therefore a cornerstone for all later stages (Crick & Dodge, 1994). Attentional processing of infant signals is characterized by a bias towards infant distress in comparison to infant non-distress. For example, healthy pregnant women show greater difficulty in disengaging their attention from photographs of distressed infant faces than from neutral or happy faces of infants in comparison to depressed pregnant women (Pearson, Cooper, Penton-Voak, Lightman & Evans, 2010). From an evolutionary perspective, this finding suggests the existence of an approach motivation to infant distress signals that develops during pregnancy and ensures maternal engagement with negative infant signals directly after birth. Such prioritized processing of infant negativity at the automatic processing stage might be considered the first marker of maternal sensitive behavior in the early caregiving context. The development of such an attentional bias to automatically focus attention on infant signals of distress may represent the cognitive basis for intuitive parenting behaviors (Papousek & Papousek, 1983) that are assumed to be part of a biologically determined co-regulatory system. Further research is needed to confirm the results of favored processing of infant distress signals. Research on neural activation in response to infant distress further corroborates a bias for infant distress. Mothers display striatal, thalamic, orbitofrontal and anterior cingulate activation that are presumed to underlie reward, motivational and approach processes in response to audiotapes of infant distress (Kim et al., 2011; Kringelbach et al., 2008).

3.3.2. Interpretation of infant signals

Infant distress might be described on a positive-negative dimension or in more specific terms such as aversive, spoiled or manipulative (Leerkes, 2010; Leerkes et al., 2014). Zeifman (2003) investigated the relationship between maternal personality factors and maternal description of infant crying sounds. Mothers who scored high on the personality factor “conscientiousness” rated cries as more aversive, spoiled and manipulative. Since conscientiousness is associated with a high need for control, these mothers may evaluate their infants’ crying as an uncontrollable state and also expect their infants to be able to control and master his or her distress (Azar & Rohrbeck, 1986). Such high need for control might lead mothers to believe that infants should learn to control their emotions and that it is within their power to control their expressions of distress. According to the authors, mothers might even insinuate that a crying infant is trying to control them. Such attitudes are strongly associated with hostile interpretations of infant distress (Azar & Rohrbeck, 1986; Berlin, Dodge, & Reznick, 2013; Leerkes, 2011; Zeifman, 2003).

3.3.3. Motivational orientation

Motivational orientation in the processing of infant distress signals can be categorized into infant-oriented motivation and mother-oriented motivation (Dix, 1991; Leerkes, 2010). Infant-oriented motivation comprises the intention to soothe the infant, to establish a secure relationship and attachment, the appreciation of infant’s emotions, interpreting crying as an infant’s means of communication, and the promotion of infant’s social competence and self-regulatory skills (Leerkes, 2010; Leerkes et al., 2014). In contrast, mother-oriented motivation comprises the minimization of infant distress because it upsets and troubles the mother or it interferes with her productivity, directive control of infant emotions, the desire to present herself as a good mother, the emphasis on physical needs and cognitive development over emotions and the principle of never spoiling an infant (Leerkes, 2010). A strong maternal self-focus undermines behavioral sensitivity after birth because mothers with this focus have limited resources to accurately interpret their infants’ signals of distress and frequently respond with withdrawal or avoidance behavior due to the perceived averseness of infant crying (Stein, Lehtonen, Harvey, Nicol-Harper & Craske, 2009). Motivational orientation in response to infant crying seems to be very relevant for maternal sensitivity. In one study it predicted the developing attachment system independent of observed maternal sensitivity (Leeerkes et al., 2011). That is, infants of mothers who prioritized their infants’ needs were more likely to develop a secure attachment than infants of mothers who prioritized their own needs. Leerkes (2010) argues that infant-oriented emotional goals in response to infant crying attenuate the detrimental effect of a negative reactive infant temperament on maternal efficacy. Mothers who primarily act on their infant’s behalf and appreciate infant distress signals as a guide to sensitivity do not feel severely threatened by infant distress. They are likely to respond with sensitive regulatory support and approach. Similar to an infant oriented motivation is the theoretical construct of mind-mindedness by Meins, Fernyhough, Arnott, Leekam, & Rosnay (2013). It represents the mothers attunement to infant internal states which might be strongly associated with interpretation of infant signals (Meins, Fernyhough, Arnott, Leekam, & Rosnay, 2013).

3.3.4. Response selection

Response selection is determined by all previous stages of information processing (Crick & Dodge, 1994). If a mother has processed her infant’s signals and clarified her goals in a specific context, she is hypothesized to evaluate her perceived self-efficacy by referring to her stored stable and implicit efficacy beliefs of her competence as a mother. We suggest that she integrates these beliefs and evaluates whether she will succeed in a particular caregiving behavior in response to her infant. If the answer is “yes”, the mother will likely perform her intended behaviors. However, if the answer is “no”, the mother might generate alternate responses that she considers more manageable, such as avoidance behavior. The strong interrelation between the different stages of cognitive processing is illustrated by associations between maternal attitudes and maternal caregiving behaviors in the context of excessive infant crying. Zeifman (2003) investigated the association between maternal infant rearing attitudes and delay to react to an excessive cry of an infant. Mothers with self-centered rigid infant rearing attitudes waited longer to pick up their crying infant. Similarly, a strong aversion to infant crying might lead mothers to respond, ignore, escape or aggress, depending on the processing of the situation and on her dispositional, habitual cognitions and action tendencies (Zeifman, 2003). Maternal self-oriented motivation in the caregiving context and the prioritization of the mother’s own needs are the best predictors of behavioral insensitivity in the form of behavioral avoidance, withdrawal and intrusive control (Dix, 1991; Leerkes, 2011).
3.4. Robustness of evidence

For the present purpose there is the difficulty that some studies examine cognitive processing of infant distress for example, attentional processing of infant emotional faces, but do not include a measure of maternal behavioral sensitivity. Thus, we cannot be certain whether the findings concerning cognitive distortions actually predict or at least relate to behavioral insensitivity (Pearson, Cooper, Penton-Voak, Lightman, & Evans, 2010; Thompson-Booth et al., 2014). Only Pearson, Lightman, and Evans (2011) used a longitudinal study design in their investigation of prenatal cognitive attentional processing of infant distress faces and postnatal self-reported quality of the relationship with the mother’s own infant. Evidence for interpretation biases are gained from studies investigating different samples with different risk factors, e.g. mothers with high risk of maltreating their infants, mothers with postnatal depression or pregnant women in response to unfamiliar infant cry stimuli (Arteche et al., 2011; Azar & Rohrbeck, 1986; Berlin et al., 2013; Field, et al., 1993; Gil, Teissèdre, Chambres, & Droit-Volet, 2011; Leerkes, 2011; Stein et al., 2010; Zeifman, 2003). Assessments of the nature of interpretation (positive vs. negative or in more qualitative terms: hostile, manipulative or spoiled) as well as processing level of interpretation (automatic vs. conscious) vary markedly between studies. Additionally, only one study assessed maternal sensitivity (Leerkes, 2011). Therefore, it is important to first measure interpretation of infant distress and behavioral sensitivity longitudinally or to manipulate interpretation of infant distress experimentally. This would enable the evaluation of the causal role of interpretations for behavioral sensitivity in response to infant distress. Furthermore, there is a need for concurrent studies by various research groups, which homogeneously assess interpretation patterns with a comparable measurement across different samples and assess interpretation patterns with different methods (e.g. automatic vs. conscious tasks, different interpretation categories, e.g. positive vs. negative) within the same sample. Only then we might gain a clear and differentiated understanding of the nature of interpretation and its causal effects on different degrees of maternal sensitivity. Motivational orientation in response to infant distress is nearly exclusively elucidated empirically by the research group of Leerkes (Leerkes et al., 2014; Leerkes, Parade, & Burney, 2010; Leerkes, 2011, 2010; Leerkes & Burney, 2007). Their insightful approach seems to be inspired by the conceptual ideas of Dix (1991) about an affective organization of parenting. The evidence base for response selection in response to infant distress is even sparser. Only one correlational study investigated how different rearing attitudes in mothers are associated with response latency when the infant cries (Zeifman, 2003). A long latency to intervene might reflect maternal insensitivity (Ainsworth et al., 1978).

4. A social information processing approach to maternal insensitivity

4.1. Integration of evidence and research perspectives

Based on the integrative review of maternal cognitions and their impact on the processing of infant signals, we applied a social information processing model to the area of maternal insensitivity which includes all the empirical findings discussed here (see Fig. 1).

The proposed model incorporates different cognitive pathways to maternal insensitivity. It proposes influences of lifetime acquired stable, implicit cognitive structures such as maternal internal working models of attachment, representations about the infant, efficacy beliefs and attributional patterns. Furthermore, it incorporates event-dependent cognitive processing which, in an assumed interaction with stable, implicit cognitive structures, shapes maternal behavioral sensitivity in a given situation. In accordance with the social information processing framework offered by Crick and Dodge (1994), we collected empirical findings of maternal cognitive processing which might precede maternal insensitivity into the following stages: Disengagement of attention and attentional avoidance in response to infant distress appears in the perception/encoding stage. The negativity bias shows its effects in the interpretation stage. The increased self-focus characterizes the motivational orientation stage. Maternal behaviors such as avoidance, withdrawal and intrusive control arise in the response selection stage. Since we integrated findings from diverse populations with different profiles of risk factors (e.g., mothers, pregnant women etc.), our model is not deterministic. Different components of the model are derived from studies with different samples. In a first approach to dismantle maternal sensitivity into its cognitive and behavioral components, we propose a probabilistic framework. In other words, not all processing stages of the model would have to be biased as described here in order to result in maternal insensitive behavior in response to infant distress. Sometimes it might be sufficient for a mother to feel overwhelmed by the demands of caregiving for her infant when cognitive processing is disturbed in only a few stages of the model. For example, a mother who has repeatedly experienced difficulties in soothing her infant might develop a stable sense of herself being ineffectual so that her motivation is more self-oriented. She would then respond to her infant with avoidance in order to escape from feelings of helplessness. This example shows that maternal insensitivity might be promoted by the interaction of a stable disposition (cognitive structure), such as a diminished sense of maternal self-efficacy and a self-oriented motivation (cognitive process) to head off further feelings of helplessness in the mothering role. Our probabilistic framework could be regarded as a structuring aid for empirical evidence in the first place.

Our model presents the different stages of information processing in a simplifying linear fashion. It is unknown whether some steps are more important than others, how steps influence each other and where the strongest relations appear, but this is a starting perspective for further research. The model also allows for nonlinear processing where stages are skipped or information flows backwards through the processing stages and is reprocessed (Crick & Dodge, 1994; Loehr & O’Leary, 2005). The backward loops in information processing often reinforce cognitive distortions and thereby maternal insensitivity on a behavioral level.

5. Limitations

Even though the model is rather complex, it does not reflect the complexity of maternal sensitivity in different populations at different point in time and under different conditions. It is still unknown how the cognitive antecedents of maternal insensitivity interact to develop maternal insensitivity. Which factors are causal? Which are conditional and which are just correlational with regard to the outcome? Do cognitive risk factors for maternal insensitivity concur in an additive, interactive or synergistic manner? Having dismantled the broad concept of maternal sensitivity into its cognitive and behavioral components, our model could facilitate future research addressing these questions. However, due to the focus on cognitive processes, discussing the very important strand of research of synchrony between mother and infant as a behavioral and physiological manifestation of maternal sensitivity was beyond the scope of this review (e.g. Beebe et al., 2010).

6. Conclusions

Although our social information processing model of maternal insensitivity is empirically derived, not all components and suggestions of the model have received empirical support to the same extent. Although some cognitive pathways are plausible, due to the lack of experimental study designs it is not possible to draw causal inferences of cognitive risk factors for the outcome of maternal insensitivity. Furthermore, in primary research, replication of empirical findings is quite rare. Our synopsis is based on the social information processing theory, which has received substantial empirical support with regard to
aggressive child behavior, including experimental intervention studies on cognitive processing in aggressive children (Crick & Dodge, 1994).

Furthermore, it needs to be noted that researchers use different terminologies for the same issue based on the underlying psychological theory. Bowlby, for example, conceptualized attachment theory by relating to perspectives of ethology and primate research (Harlow & Zimmermann, 1958). In developmental neuroscience the investigation of neural correlates of maternal sensitivity with the help of brain imaging technology further validates first quasi-experimental findings of preferential processing of infant distress in pregnant women (Conradt & Ablow, 2010). For example, research has shown that a mother who displays more sensitivity in response to her infant’s cry in a laboratory observation also shows greater activation in brain regions associated with reward processing and approach motivation in response to her infant’s cry (Musser, Kaiser-Laurent, & Ablow, 2012). Therefore, empirical findings from different perspectives might represent a validating criterion for several proposed cognitive processes preceding different degrees of maternal sensitivity. For our model we integrated findings from attachment theory, such as cognitions in the form of internal working models, self-efficacy theory, social information processing theory and cognitive neuroscience.

Are we able to conclude that a clear picture of maternal sensitivity is emerging from the first pioneering empirical findings of Ainsworth and concurrent evidence from cognitive science, neuroscience and behavioral observations? Partly yes, since research has not only confirmed the effects of maternal sensitive behavior on infant development, but has also started to dismantle the concept of maternal sensitivity into cognitive and behavioral components. Returning to the questions from the introductory paragraph we conclude that there are several cognitive structures and processes underlying maternal sensitivity. Infant-directed motivational orientation is one of the most important preconditions for maternal sensitive caregiving behaviors. Finally, an attentional orientation to infant distress signals is one of the first markers for maternal sensitive behaviors in response to infant distress.

Our framework facilitates the study of specific cognitive risk factors for maternal behavioral insensitivity in specific populations. The next steps for understanding the mechanisms behind maternal insensitivity should comprise multidimensional assessment and longitudinal and experimental studies. Maternal sensitivity is the core element of early caregiving while maternal cognitions and cognitive processes in response to infant distress probably are its pacemakers.

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