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A Mother's Mind: Parental Mentalization in the Context of Early Parenting

Associations between parental reflective functioning, maternal mind-mindedness, parenting behaviour, and infant temperament

Dissertation

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1. Introduction

Becoming a mother and beginning a new parent-child relationship is not only a joyful event but also an emotional challenge and transformation. A representative survey on behalf of the Federal Centre for Health Education (Bundeszentrale für gesundheitliche Aufklärung; BZgA) has reflected the ambivalent feelings of expectant mothers during pregnancy. Despite the vast majority of expectant mothers feeling generally well during pregnancy, many of them (14–35%) also reported negative feelings when asked explicitly about specific emotional states (BZgA, 2006). It is well known that prenatal emotional distress can stretch into the postpartum period (Huber & Seelbach-Göbel, 2009), during which maternal mental health is especially vulnerable (Blum, 2007; Reck, 2014). However, outside of our professional field of research and clinical practice, the truth of ambivalences and struggles in mothers could evoke fierce reactions, as exemplified by the controversial reactions to the autobiographical book *A Life's Work: On Becoming a Mother* by the British-Canadian writer Rachel Cusk (2001). Cusk documented her difficult experience of early motherhood in an honest manner, including topics such as childbirth, breastfeeding, colic, sleep deprivation, nothing out of the ordinary. Nevertheless, people were angry about her and her book, as she later wrote: "Again and again people judged the book not as readers but as mothers, and it was judgment of a sanctimoniousness whose like I had never experienced." (Cusk, 2008). There is an ideal image of women as natural-born caregivers, and it seems hard for people to accept that motherhood is complex (Arendell, 2000) and that mothers are not always "good" and loving. Similar struggles were also experienced by mothers from the current dissertation project:

> But I can imagine that the basis is being laid for this "I'm OK. I'm allowed to be here" and so on. And I think that I can actually give him that quite well so far. In the moments where I can't give it to him anymore, when I get angry or he can just see it in my face, like, OK, mummy is really annoyed right now. Then I always think to myself, Oh, I hope this is not going to somehow ruin anything again. [...] Well, I definitely have difficulties admitting to myself that even mummy can't always be happy, can't always be patient. I mean, he has to learn to live with that. It's just that he won't always get positive reactions from people. And so, I always try to avoid it somehow, and that's probably why I'm just stressing myself out again.[1] (Anja[2], mother of a 7.5-month-old boy)

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[1] The block quotes in this dissertation are excerpts from interviews conducted for the current project. The participants' responses were all slightly smoothed out in the translation process.
[2] All the mothers' names were changed to protect the participants' identities.

In reality, a truly "good" mother is a "good enough" mother (Winnicott, 1965a). Her[3] capacity of reflecting on her own and her infant's feelings and negative experiences is crucial for her self-regulation and the co-regulation of her infant's affective states. Especially during infancy, as a critical phase of the self-regulation development in the context of dyadic, reciprocal interaction, the mother's ability to pick up and interpret the infant's cues is an essential part of the mutually regulating process (Beeghly & Tronick, 2011). Accordingly, parental mentalization research is interested in how mothers think and feel about themselves as mothers and about their infants and how the mother-infant relationship can succeed and support both mother and infant to adjust.

Early parent-child relationships involve highly interactional factors and processes, from physical to psychological, stretching from prenatal to postpartum (Rosenblum et al., 2019; Tronick & Beeghly, 2011). The emotional aspect of early relationships is the main subject in attachment research, which focuses on "developmental processes relevant to the basis of individual self-regulation or dysregulation" (Duschinsky et al., 2021, p. 6). The development of affect regulation is closely related to the quality of attachment relationships and later child development. Specifically, suppose parents[4] can make sense of their infant's experiences, thus show a certain level of mentalizing capacity, and interact with the infant in a way that helps the infant to cope and integrate early affective states. In that case, the relationship offers a supportive environment for the infant to develop self-regulation (Fonagy & Target, 1997; Zeegers et al., 2017). Hence, parental mentalization and parenting behaviour are central elements in early relationships during infancy and early childhood.

Besides the concept of sensitive parenting, attachment research of the past 30 years has increasingly focused on parental mentalization, which is a parent's ability to treat the child as a psychological agent (Sharp & Fonagy, 2008). For example, when a mother can envision her child's mental states underlying behaviour:

> Well, she was happy, because she always makes that sucking noise, and she (laughs) shouts out of joy. That's what she does. Or when we recently bought a baby seat for the bike. When I go faster with the bike, she does the same and is happy. And I always have the feeling that she's like, "faster, faster, faster" (laughs). And these are simply situations in which she, I always have the feeling, is clearly being recognised and is also

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[3] The pronouns she/her are used to refer to an individual mother to remind that this dissertation, as the vast majority of theoretical and empirical work in this area, considers motherhood with a traditional understanding of gender.
[4] This dissertation focuses on biological parents as the primary caregivers to the child. Therefore, the term "parent" and "caregiver" are used interchangeably.

happy about things, so that she makes these certain noises. (Julia, mother of a 10-month-old girl)

Parental mentalization represents an umbrella concept under which *parental reflective functioning* (PRF) and parental *mind-mindedness* (MM) are the most prominent constructs (Zeegers et al., 2017). Although both have been repeatedly examined with infant-parent attachment, PRF and MM have rarely been investigated in relation to each other and with indicators of early emotional development during infancy. Moreover, the seemingly clear link that highly reflective parents also show a higher quality of early parenting has not yet been sufficiently considered in a systematic manner based on previous research. A deeper understanding of the two constructs of parental mentalization and their associations with other elements of early parenting, psychosocial correlates, and early emotional development would further shed light on processes involved in infant-parent mutual regulation and provide orientation for future research to focus on particular aspects of these processes more specifically.

Therefore, this dissertation addresses associations between PRF and early parenting, the differentiation of PRF and MM, and the bidirectional relations between parental mentalization and infant temperament to explore potentially related factors and contribute to the theory building. Mothers' parental mentalization is the primary focus, although fathers' and generally parents' mentalizing capacities are also addressed.

1.1 Parental mentalization in the attachment context

Attachment research offers the broader framework for this dissertation. The term attachment is widely used, and its meaning has evolved and alerted over time and across contexts (Duschinsky, 2020). The core of *attachment* refers to John Bowlby's conceptualisation of a behavioural system in children to seek proximity to and care from their caregivers (Bowlby, 1982). An *attachment relationship* refers to a relationship context in which an individual seeks the availability of a familiar attachment figure when alarmed, such as a parent-child relationship (Duschinsky, 2020). Early attachment relationships form a basic sense of security for children and provide the environment for their brain development, which is linked with cognitive and interpersonal abilities (Fonagy & Target, 2005). More specifically, the maturation of infants' brain regulatory functions is experience-dependent and therefore directly organised through early experiences with attachment figures, especially the emotion-processing limbic system (Schore, 2001). Moreover, the evidence that genetic factors show very little influence on infant attachment further highlights the importance of the caregiving environment (Bokhorst et al., 2003).

One of the major concerns of attachment research is the "transmission gap". This gap was defined in an influential meta-analysis[5] by van IJzendoorn (1995), which showed that a large proportion of variance in the association between parental attachment classification (based on parental mental representation of their own attachment history) and infant attachment security could not be explained by parental sensitivity (based on parental behavioural competence in interaction with the infant) as suggested by early attachment research. Consequently, parental mentalization was introduced in this research context to explore how the parent's attachment-related mental capacity could help provide the environment for the child to develop a secure attachment (Fonagy & Target, 2005). *Parental mentalization* is defined as parents' mental capacity to interpret and understand their child's behaviours in terms of underlying mental states (Zeegers et al., 2017). In other words, parental mentalization research went beyond the questions about how parents are attached to their own caregiver or whether they show sensitive behaviour with their own children and considered the reflective component of parents' minds. Thus, the mentalizing question considers whether parents can understand the child's behaviours based on mental states and how that could promote the relationship quality with the child. Since then, decades of research on early relationships have indicated that it is essential that parents see their children as having their own minds and adapt parenting behaviours accordingly, thus highlighting the relevance of both parental mentalization and sensitive parenting (Zeegers et al., 2017).

Under the concept of mentalization, *reflective functioning* (RF) is one of the most prominent and defining constructs. RF refers to the mental capacity to understand one's own and others' behaviours in terms of envisioned mental states. Specifically, RF represents attachment-related mentalization and was first observed in parental narratives about experiences with their own caregivers while investigating how attachment patterns are transmitted intergenerationally (Fonagy et al., 1991). PRF mentioned earlier is a parenting-specific form of RF and shares the same theoretical foundation as RF. PRF will be differentiated in greater detail in Chapter 1.1.1.

The theory of mentalization by Fonagy et al. (2002) offers the theoretical foundation for RF or PRF and the theoretical framework for this dissertation. A crucial part of this theory centres around the development of the self and emotion regulation in early interactions with caregivers. Infants' affect states are considered to be constitutional and physical instead of distinctive emotion categories. The awareness and later understanding of emotions are achieved

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[5] See Duschinsky et al. (2021) for a critical reflection on the reasons why attachment research applied meta-analytic methods early on.

through parental *marked affect-mirroring*, a parental responsive behaviour that reflects selected infant affect expressions (Gergely & Watson, 1996). For instance, in the case of infant distress, the parent can match their[6] facial or vocal expression and reflect the affect back to the infant. By doing so, the parent acknowledges the infant's discomfort and signals support with their empathic presence. In this process, it is vital for the parent to mirror the infant's affect in a manner that is distinctive from the infant's own affect state, thus "marking" the affect, so that the infant can learn to recognise their own affect states without the initial intolerable quality and with an adequate self-other boundary (Fonagy et al., 2007). Hence, this parental capacity can transform the intense primary affect into a more mental or thinkable quality. This kind of repetitive affective experience with the parent can sensitise the infant to related internal-state cues that can ultimately be represented as meaningful self-state and connected to corresponding emotion categories (Fonagy et al., 2002). For such a helpful co-regulation, the parent needs to maintain a reflective stance instead of being emotionally overwhelmed. Hence, the parent's reflective capacity is crucial for both self-regulation and co-regulation. Moreover, through mentalization theory and the concept of RF, the relevance of parenting and the early development of the self are linked (Steele & Steele, 2008).

The theoretical background of mentalization is closely linked with psychoanalytic concepts such as containment, maternal holding and mirroring function, and their relevance for the early development of the self and psychic structure-building (Bion, 1962; Kohut, 1971, 1977; Winnicott, 1965b). Further, by connecting these concepts with findings from attachment research and cognitive developmental psychology, the mentalization theory provides opportunities to empirically investigate the fine-grained mechanisms of affect regulation and co-regulation in the early parent-child relationship.[7]

Besides PRF, parental MM is another prominent construct under the concept of parental mentalization (Zeegers et al., 2017) and refers to parents' tendency to treat their children as individuals with their own minds (Meins et al., 2001). MM aimed at the same question of the transmission gap and was developed to rethink and refine the construct of maternal sensitivity by Mary Ainsworth (Meins et al., 2001). The original assessment scale for maternal sensitivity contains merely general descriptions of different levels of sensitivity without specifying particular maternal behaviours or interactional contexts, which has likely led to inconsistencies

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[6] Besides the exception of the gender-specific reference to an individual mother, the singular "they" (they/them/their) is used in this dissertation to refer to a hypothetical person (in this case, a parent) whose gender identity is irrelevant within the context (American Psychological Association, 2020).

[7] It should be noted that this integration of psychoanalytic theories with empirical and cognitive developmental theories entails risks of reducing the conceptual complexity of all involved concepts, as suggested by Pedersen et al. (2014) in a critical reflection.

in the conceptualisation and measurement in subsequent empirical research, such as overemphasise on promptness instead of contextual appropriateness of maternal behaviour, or including other behaviours such as synchrony (Meins, 1999). Therefore, Meins et al. (2001) focused on the parental capacity to see things from the child's perspective as the core of Ainsworth's sensitivity concept and developed an assessment method to measure the extent of how parents can verbalise this capacity in a behavioural interaction with their child while considering the appropriateness of parental behaviour in a given interactional context. The MM concept and its assessment methods will be described in greater detail in Chapter 1.1.2.

Taken together, PRF and MM both emerged in the context of intergenerational transmission of attachment by zooming in on different aspects of parental factors, namely attachment-related mental representation and behavioural competence, as shown in Figure 1.
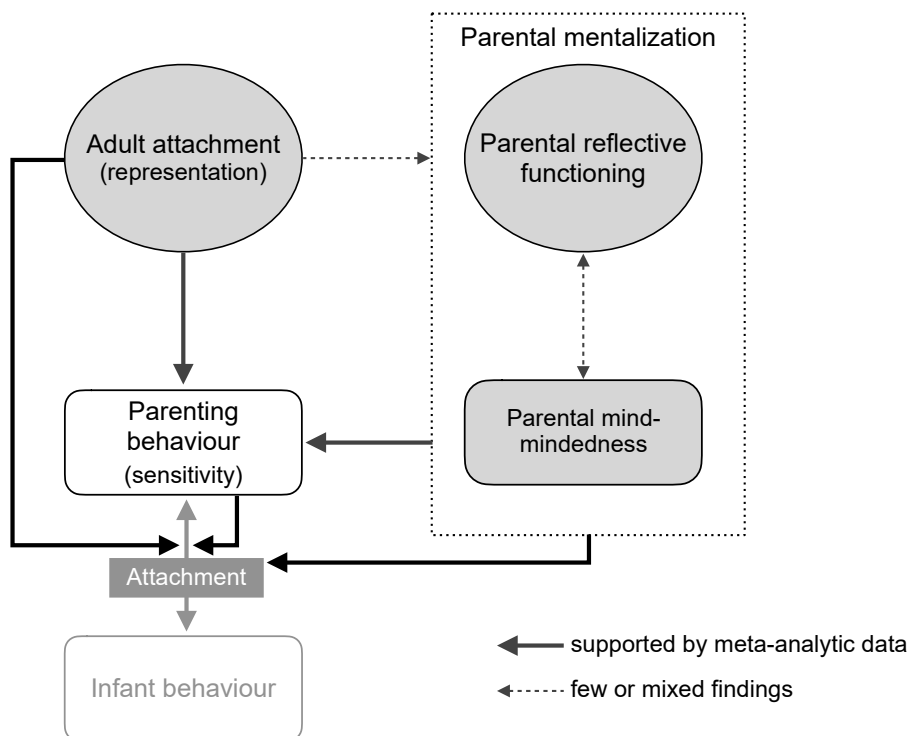
Figure 1 *Main constructs in the context of intergenerational transmission of attachment*

Note. This figure focuses on parental constructs and represents infant-centred constructs in a faded manner. Grey shapes refer to mental capacities, and white shapes refer to behavioural capacities. Adapted from "Sensitivity, security and internal working models: Bridging the transmission gap" by E. Meins, 1999, *Attachment and Human Development*, 1(3), p. 335. Copyright 1999 by Taylor & Francis.

While PRF captures a reflective component of parental mental representation, MM focuses on the mental component of sensitive parenting. However, the two concepts were developed separately and rarely compared directly. This paucity of direct comparisons is possibly due to

the fact that parental MM is theoretically rooted in developmental psychology (see Chapter 1.1.2), different from PRF. Contrasting PRF and MM constructs could help better understand the umbrella concept of parental mentalization and the mental capacities within the parent that contribute to parental co-regulation of the infant's affective states, which is generally essential for early relationships independent of child attachment as the outcome.

Further, as illustrated in Figure 1, the umbrella concept of parental mentalization has been shown to predict parental sensitivity (Zeegers et al., 2017). However, it is of particular interest how PRF, as located closer to mental representation, is linked with parenting behaviour in general. This link can be assumed considering the interactive nature of its underlying marked affect-mirroring process but has not been systematically addressed.

The relevance of understanding regulatory mechanisms involved in early attachment relationships lies in its predictive value on offspring developmental outcomes, such as self-regulation, emotion understanding, personality, and mental health (Thompson, 2016). As part of this context, parental mentalization has been frequently investigated in relation to infant attachment (Zeegers et al., 2017). However, it should be noted that the relevance of child attachment quality on later child development has been discussed controversially, especially between research and clinical practice, for example, regarding the practical value or meaning of laboratory-based attachment assessments in clinical settings or child protection practice (Duschinsky, 2020; Forslund et al., 2021; White et al., 2019). This controversy is partially due to "a diversity in the use of attachment concepts" (Duschinsky et al., 2021, p. 1). Some of the misunderstandings in the public discourse about attachment can be harmful in unsettling parents with the belief that only a secure attachment can ensure optimal child development, as pointed out by Meins (2017). She suggested that evidence-based information on infants' development in the relational context would be more helpful in supporting parenting.

Although illustrated in great detail by mentalization theory, the association between parental mentalization and children's early emotional development during infancy is still scarcely investigated empirically (Camoirano, 2017; McMahon & Bernier, 2017). Hence, this dissertation includes the development of infant temperament as a developmental outcome. Infant temperament has been linked with various aspects of child development and psychopathology (Zentner & Shiner, 2012). Although primarily rooted in biological factors, temperament still develops in early relationships, interacts with child attachment, and is therefore related to environmental influence in the context of early parenting (Belsky et al., 1991; Bokhorst et al., 2003; van IJzendoorn & Bakermans-Kranenburg, 2012).

In summary, this dissertation focuses on parental mentalization as a starting point for parental co-regulation and considers its relations to parenting behaviours (Chapter 1.2) and infant temperament (Chapter 1.3). Moreover, a direct comparison of PRF and MM aims to provide insights into various aspects of parental mentalization. The following sections (Chapter 1.1.1–1.1.4) will focus on PRF and parental MM constructs, their associations, and lastly, their psychosocial correlates and relation to parents' own attachment history.

1.1.1 Parental reflective functioning (PRF)

The original concept of RF is related to adults' early relationship with their caregivers and is commonly measured via RF coding using the Adult Attachment Interview (Fonagy et al., 1998; George et al., 1984). For differentiation, it will be referred to as *adult RF* hereafter. On the contrary, the later introduced PRF focuses specifically on parents' RF capacity to reflect on their own and their children's experiences in the current parent-child relationship and specifically, understand their own and their children's behaviours in light of the underlying mental states, as defined by Slade (2005).

Following the introduction of the concept, parents' adult RF and PRF have been linked not only with parent-child attachment security but also with further aspects of child social-emotional development such as mentalizing abilities, emotion regulation, adolescent adjustment, and mental health (Benbassat & Priel, 2012; Borelli et al., 2016; Ensink, Begin, et al., 2016; Esbjørn et al., 2013; Nijssens et al., 2020).

Although a number of empirical studies have investigated RF in parents, the concepts of adult RF and PRF often remain undifferentiated (Camoirano, 2017). However, differentiation is especially relevant since mentalization is, to some degree, relationship-specific, and PRF could also be influenced by child characteristics such as temperament due to the interactive nature of the parent-child relationship (Luyten, Nijssens, et al., 2017). Also, in transition to parenthood, the related mental representation undergoes a re-organisation to integrate the parental role (Solomon & George, 1996) so that parents' RF could evolve specifically in the relationship to the child. Consequently, PRF taps into the parent's reflective process within the current relationship context with the child more directly than the parent's adult RF (Fonagy & Target, 2005).

The central issue related to the understanding of PRF is its operationalisation because the construct is multidimensional and involves implicit and explicit mental processes regarding both cognition and affect within oneself or others (Luyten et al., 2019). Accordingly, the empirically revealed sub-dimensions of PRF vary depending on assessment methods (e.g., Luyten, Nijssens, et al., 2017; Smaling, Huijbregts, van der Heijden, et al., 2016). Specifically,

there is a significant difference between the interview and questionnaire measures. The most commonly used method to assess PRF is the Parent Development Interview-Revised (PDI-R; Slade, Aber, et al., 2004), a semi-structured interview that asks about a parent's experiences in their parental role, perception of the child and relationship to the child, as well as experience with their own parents. The standard coding procedure is the adapted RF coding for the PDI-R (PDI-RF; Slade, Bernbach, et al., 2004), which is based on verbatim transcripts of the interview. The standard overall score of PDI-RF reflects the parent's typical level of PRF capacity, indicating to what degree the parent could generally reflect on the complex interactions between mental states and behaviours using specific daily situations with the child. For example, when asked to describe a situation in which she and her child get along very well, a mother describes, "I sometimes sense what she wants to do and can I help her with it. And she thankfully accepts it and then has a lot of fun."[8]. In her description, the mother acknowledges and connects both her own and her child's mental states underlying both her own and her child's behaviours. Further, she recognises the impact of this mental and behavioural interaction leading to further mental states (in this case, the child having fun). In contrast, when asked the same question, another mother describes, "When she is tired, and then I just hold her in my arms, and she immediately falls asleep, and she really likes to cuddle."[8]. Here, the mother's description was mainly behavioural, and although she mentioned the child's mental state in the end, there was no apparent connection with other mental states or behaviours of neither herself nor her child. The PDI-RF coding will be described in greater detail in Study II (see Chapter 3.1.3). Scores for sub-dimensions could also be built using the PDI-RF to measure, for example, self-focused and child-focused PRF (Suchman et al., 2010), focussing on parents' reflection on their own or their child's experiences, respectively. Furthermore, the PDI-RF coding can also be applied to other interviews to assess the overall PRF.

Another frequently used alternative instrument is the Parental Reflective Functioning Questionnaire (PRFQ; Luyten, Mayes, et al., 2017). The questionnaire-based self-report measure of RF involves methodological difficulty because "individuals need to rely on their capacity for mentalizing in responding to questions about mentalizing" (Fonagy et al., 2016, p. 2). Thus, parents must take a meta-perspective to appraise their own mental states based on pre-selected statements (e.g., "I wonder a lot about what my child is thinking and feeling."). In contrast, in interviews, parents are required to mentalize about specific daily situations freely and are less able to control or appraise their narrative, on which the coding is based.

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[8] Examples from the current project.

Consequently, the two forms of operationalization would assess different aspects of PRF. This difference will be addressed in-depth in Study I (see Chapter 2).

1.1.2 Parental mind-mindedness (MM)

In order to act in a mind-minded way, parents must see their children as individuals with their own minds and be attuned to their children's internal states. Thus, MM is a subsequent manifestation of a "mother's representation of her infant's mental representation" (Meins, 1999, p. 335). At the same time, MM typically assesses the appropriateness of parental attunement through a combined observation of parent-infant behavioural interaction (Meins & Fernyhough, 2015). This combination of mental representation and behavioural appropriateness places MM in a critical position between mental and behavioural processes involved in early attachment relationships (Meins, 2013).

It is noteworthy that parental MM was developed not only to investigate the intergenerational transmission of attachment but, more importantly, to connect attachment security and cognitive development (social understanding in particular). Accordingly, the theoretical origin of MM is in developmental psychology, based on a Vygotskian approach (Meins, 1997). This approach highlights the crucial influence of social interaction on the development of higher mental functions (Vygotsky, 1978), especially the relevance of parental language. More specifically, children's understanding of others' minds is understood as a consequence of the internalised social speech from interpersonal interactions, which also characterises the dialogic nature of thinking (Fernyhough, 2008; Meins et al., 1998; Meins et al., 2003).

The body of research on MM has been growing in the past almost 25 years and is still offering more promising findings on its positive effect on child development (McMahon & Bernier, 2017). Previous research has linked MM to various child outcomes regarding cognitive and social-emotional development, such as attachment security, theory of mind, behavioural adjustment, and educational attainment (Bernier et al., 2017; Dollberg et al., 2020; Licata et al., 2013; Meins, 1997; Meins et al., 2019; Meins et al., 2003; Walker et al., 2012).

Similar to PRF, the meaning of MM is also closely related to its operationalization. In infancy, MM is primarily measured based on parental discourse in an observed parent-child interaction and captures parents' capacity to attribute internal states to their child's behaviour appropriately (Meins et al., 2001). For this purpose, parental comments on the child's putative internal states (e.g., emotions, intentions, preferences) are identified. These *mind-related comments* can be coded as either appropriate (hereafter *appropriate MM*) or non-attuned (hereafter *non-attuned MM*) to indicate parental comments as either an accurate reflection or a

misinterpretation of what the infant might be thinking or feeling, respectively (Meins et al., 2012). Moreover, the two types of mind-related comments do not represent two poles of the same dimension but rather two unrelated dimensions of parental MM (Meins, 2013). Meins et al. (2012) stressed that while appropriate MM overlaps with parental behavioural sensitivity, non-attuned MM captures subtle failures of parental attunement that could be different from the apparent behaviour. For example, if a mother takes away a toy that her infant was playing with actively. When the infant subsequently begins to cry, the mother attends to and comforts her infant while commenting, "Oh, you don't want to play anymore.". While the mother was showing behavioural sensitivity, she misinterpreted her infant's internal state (e.g., frustrated by the removal of the toy) and thus made a non-attuned mind-related comment. Accordingly, MM is a refinement of parental sensitivity by focussing on parents' ability to read the child's internal states that underlie child behaviour (Meins et al., 2001), as described earlier in Chapter 1.1. Both MM indicators have been shown to differentiate between child attachment patterns independent of parental sensitivity (Meins et al., 2012).

Besides the observational measure, there is an alternative interview measure based on a single open-ended question that asks parents to describe their children spontaneously (Meins & Fernyhough, 2015). The attributes used in the description are coded into several categories (e.g., mental, behavioural, physical). The *mental attributes* are mind-related and indicate parents' tendency to see their children in terms of mental states (e.g., will, interests, desires). This method is commonly used in studies on parents of children in preschool age or above. While the observational measure (hereafter *observed MM*) with the two indicators of appropriateness best reflects the conceptualisation of MM, the interview measure assesses a purely presentational indicator of MM without the appraisal of appropriateness (hereafter *representational MM*).

At this point, the initial illustration (see Figure 1) of parental factors in the context of intergenerational transmission of attachment can be further elaborated. As shown in Figure 2, parental MM includes a behavioural component and is therefore placed at the interface of parental mental and behavioural capacities.
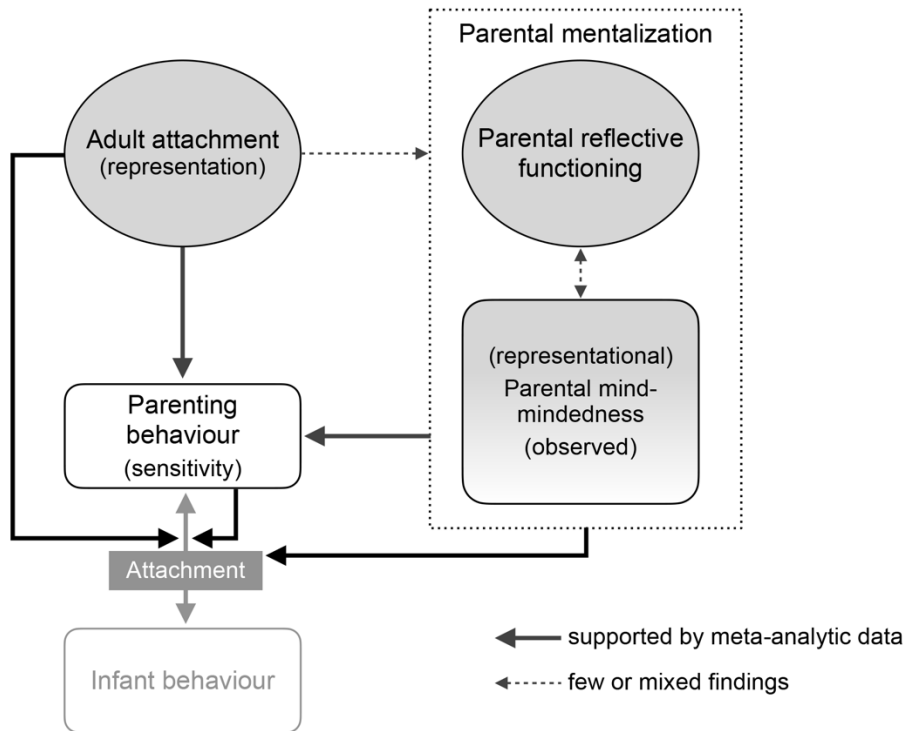
Figure 2 *Main constructs in the context of intergenerational transmission of attachment with extended detail on parental mind-mindedness*

Note. This figure focuses on parental constructs and represents infant-centred constructs in a faded manner. Grey shapes refer to mental capacities, and white shapes refer to behavioural capacities. The gradual shading in parental mind-mindedness indicates the implicated mental and behavioural capacity. Adapted from "Sensitivity, security and internal working models: Bridging the transmission gap" by E. Meins, 1999, *Attachment and Human Development*, 1(3), p. 335. Copyright 1999 by Taylor & Francis.

1.1.3 Associations between PRF and parental MM

Although PRF and the two forms of MM can be understood as closely related constructs of parental mentalization (Sharp & Fonagy, 2008), they capture different aspects of the mentalizing processes. Specifically, while observed MM captures "online" mentalization reflecting the behavioural spontaneity and accuracy in reference to the interactional context, PRF captures "offline" mentalization reflecting the representational complexity and relational dynamics. Further, representational MM also captures "offline" mentalization but reflects spontaneity and richness in parental descriptions (Demers et al., 2010; Yatziv et al., 2020). Nonetheless, PRF and both forms of MM are related to and expressed via mental state language and linked to awareness for internal states (Hill & McMahon, 2016; Slade, 2005; Tharner et al., 2016). Further, PRF and MM are, to some degree, specific within the current parent-child relationship (Larkin, Schacht, et al., 2020; Luyten, Nijssens, et al., 2017; Meins et al., 2014). However, there have been surprisingly few empirical attempts to address the link between the

two forms of parental mentalization in the past two decades (McMahon & Bernier, 2017), which could be related to the fact that the constructs are originated from two different theoretical traditions (psychoanalytic and developmental psychology) joined in the field of attachment research.

The few previous findings regarding the associations between adult RF in parents or PRF and MM have been mixed. Higher antenatal adult RF in mothers was correlated moderately with less non-attuned MM at 6 months postpartum, but not with appropriate MM in one of the early studies on this question (Arnott & Meins, 2007). In another earlier study, maternal parenting reflectivity (an adapted assessment for PRF using adult RF coding) was linked positively and moderately with appropriate MM at 7 months postpartum (Rosenblum et al., 2008). On the contrary, maternal adult RF was not associated with either of the two observed MM indicators at 3 or 6 months postpartum in two recent studies, although some of the results indicated a link between adult RF and neutral as well as negative valance of the mind-related comments (Bérubé-Beaulieu et al., 2016; Riva Crugnola et al., 2018). For PRF, there were a few very recent studies. In mothers of toddlers or preschool children, two studies showed that PRF correlated positively with appropriate and representational MM, with small- and medium-sized effects, respectively (Menashe-Grinberg et al., 2021; Yatziv et al., 2020). On the contrary, Dollberg (2021) found no significant correlations between PRF and observed MM indicators at 3 months postpartum. Moreover, Krink and Ramsauer (2021) found no significant correlations between PRF sub-dimensions measured via self-report and observed MM indicators in mothers of infants aged 3–10 months. The relation between PRF and MM is inconclusive based on these findings.

In fact, studies investigating the association between general theory of mind or mentalizing ability and observed MM have indicated a "competence-performance gap" in both children and adults (Barreto et al., 2016; Meins et al., 2014; Meins et al., 2006). This gap suggests that the mental capacity of recognizing mental states does not necessarily link to mind-minded behaviour directly (Zeegers et al., 2017). Barreto et al. (2016) argued that adult general mentalizing ability is independent of MM because MM is a relational construct specific to the parent-child relationship, while adult general mentalizing ability represents a basic cognitive-behavioural competence. However, the question remains whether and how PRF, which is also specifically related to the parent-child relationship, would be associated with MM.

1.1.4 PRF and parental MM in relation to psychosocial correlates and parents' own attachment history

The apparently complex relationship between PRF and MM described above indicates potential influence from other parental factors. Thus, investigating psychosocial correlates of PRF and MM could help understand differences and subsequently potential connections between the constructs (Barreto et al., 2016). Conceptually, PRF is closely related to emotion regulation and intrapsychic mechanisms (see Chapter 1.1). Accordingly, previous studies found that parents with greater difficulties in emotion regulation also showed lower levels of self-reported PRF (Schultheis et al., 2019; Wang, 2021). On the contrary, Goldberg (2011) found a counterintuitive positive association between mothers' self-reported PRF and self-reported emotion dysregulation, revealing potential biases in maternal self-appraisal. The author argued that higher levels of reported difficulties in emotion regulation could indicate greater self-knowledge. However, partially using the same sample as Goldberg (2011), experimental studies have demonstrated higher levels of maternal PRF to be linked with greater parenting-related distress tolerance, indicating its regulatory effect (Rutherford et al., 2015; Rutherford et al., 2013).

On the other hand, MM is more closely related to behavioural sensitivity and the parenting context (see Chapter 1.1.2). Conceptually, MM implies the mental capacity of parents to recognise their child's mental states but is measured using the subsequent behavioural manifestation of this mental capacity. It can be assumed that other parenting-related cognitions, such as parenting efficacy, lie between the mental capacity and its performance (Bornstein et al., 2018). Parenting efficacy describes parents' belief in their own ability to perform caregiving-related tasks, which is essential to the subsequent parenting performance (Bandura, 1989; Vance & Brandon, 2017). Hence, higher parenting efficacy could potentially influence whether a parent who can recognise mental states would also articulate the relevant mental states and act accordingly in an interaction with the child, thus, show more mind-minded behaviour. Higher parenting efficacy has been linked with higher parenting quality (including sensitivity) and lower parenting stress (Fang et al., 2021; Jones & Prinz, 2005). Although there is little known about the direct link between MM and parenting efficacy, previous studies have also repeatedly linked higher MM quality to lower parenting stress (Demers et al., 2010; Larkin, Hayiou-Thomas, et al., 2020; McMahon & Meins, 2012; Walker et al., 2012). Further, Camberis et al. (2016) have linked maternal locus of control, including parenting efficacy, with observed MM.

Moreover, maternal psychosocial functioning usually includes current mood indicated by anxiety or depression, showing diverse empirical associations with PRF and MM. Specifically, PRF or its sub-dimensions have shown both significant positive and negative correlations with maternal depression in at- or high-risk samples, partially indicating potential influence from or interaction with other psychosocial risk factors such as parental psychopathology (Krink et al., 2018; Newman-Morris et al., 2020; Suchman et al., 2010). However, some studies also found no significant correlations between PRF and maternal depression in high-risk or community samples (Perry et al., 2015; Rutherford et al., 2013). Conceptually, PRF was developed out of the clinical framework for borderline personality disorder (BPD) and affective disorders (Bateman & Fonagy, 2015) and, thus, can be linked with maternal mood to some degree. For maternal MM, McMahon and Bernier (2017) have summarised in a narrative review that previous studies found either none or negative associations with maternal depressive symptoms. Due to its close conceptual relation to maternal sensitivity, it can be assumed that maternal MM might be associated with maternal depression that impairs maternal sensitivity (Bernard et al., 2018). For both PRF and MM, there is little known about their associations with maternal anxiety.

Another possibility to contextualise PRF and MM is to investigate their relations with parents' own attachment history. As described earlier, parental mentalization is linked with parents' experiences with their caregivers in the context of intergenerational transmission of attachment (see Chapter 1.1). More specifically, parents' own experiences with attachment figures are internalised as part of their mental representation of attachment relationships (Bretherton & Munholland, 2008). Parents with more coherent attachment-related mental representation or internalised positive experience with their own caregivers would be expected to have more affective and cognitive availability for psychological attunement to their children's internal states (Demers et al., 2010; Fonagy & Target, 2005).

This connection with parents' own earlier experience is already part of the conceptualisation and operationalisation of adult RF and PRF (Fonagy et al., 1991). Previous studies have linked adult RF and PRF with parental secure attachment or autonomous attachment representation with own caregivers (Arnott & Meins, 2007; Fonagy et al., 1991; Slade et al., 2005). The secure-autonomous classification of adult attachment refers to individuals who can discuss their attachment relationship history in an open and organised manner regarding positive and negative experiences (Fonagy et al., 1991). Thus, this classification indicates a well-balanced mental representation regarding one's own attachment history and partially implies one's reflective capacity to process their attachment experiences.

At the same time, there are also indications for a loose connection between PRF and parental attachment security (Luyten, Nijssens, et al., 2017). In other words, although secure parental attachment history facilitates the development of parents' reflective capacity to explore their own and their child's mental states, it does not guarantee high levels of PRF (Fonagy et al., 2007).

For MM indicators, previous studies demonstrated supporting and contradictory findings on their association with measures of parental attachment-related mental representation. Specifically, an autonomous state of mind or a coherent narrative regarding parents' own attachment experience have shown not only positive association with MM (Arnott & Meins, 2007; Demers et al., 2010) but also none (Arnott & Meins, 2007) or even negative associations (Bernier & Dozier, 2003; Milligan et al., 2015). Nevertheless, Tharner et al. (2016) found a positive association between paternal positive perception of caregiving by own mother (characterised by closeness, compassion, and understanding) and paternal representational MM. This finding supports the assumption that parents who experienced parenting by their own caregivers (especially their own mother) as caring could have internalised this experience (Tharner et al., 2016), which in turn promotes parents' ability to treat their own child in a caring and mind-minded manner. Nonetheless, besides differences in the MM measure (e.g., observed or representational, valence or richness of mind-related comments), previous studies have also shown a high heterogeneity of study settings (e.g., adolescent or foster parents, mothers or fathers).

Conceptually related to parents' own attachment history is the bonding experience with their caregivers. The concept of *bonding* is usually used to describe the affective bond from parent to child in the early years as part of the caregiving system that complements the child's attachment behavioural system (de Cock et al., 2016; Solomon & George, 1996). Parents' bonding experience with their caregivers is usually measured using recalled parenting by own parents (Parker et al., 1979), which indicates the parenting quality parents experienced with their own parents and has shown intergenerational repercussions through, for example, social learning from parents as role models or emotional experience with one's parents as attachment figures (Madden et al., 2015). Recalled parenting by own parents assessed retrospectively, especially by one's mother, has been linked with life-long mental health risk in oneself and offspring (Burns et al., 2018; Enns et al., 2002; Heider et al., 2006; Infurna et al., 2016) and was associated with maternal adjustment in the transition to motherhood and their own parenting (Göbel et al., 2020; Handelzalts et al., 2018; Madden et al., 2015). While aspects of

adult attachment history have oft been investigated in the context of mentalization, parents' bonding experience with their own caregivers has rarely been examined.

As PRF and MM play an essential role in predicting attachment-related outcomes and later child development, a better understanding of the link between PRF and MM regarding their overlap as well as difference could help understand underlying mechanisms of parent-infant mutual regulation (Hughes et al., 2017; Rosenblum et al., 2008). Taking maternal psychosocial functioning and recalled parenting by own mother into account could provide more insight into the potential link between PRF and MM. This question regarding the relation between PRF and MM as well as their respective correlates will be addressed in Study II.

1.2 Parenting behaviour in association with PRF during infancy and early childhood

Early parent-child interaction provides the primary social context for children and shapes their cognitive and social-emotional development, such as a sense of self, emotion regulation, mental health, and attachment security (Ainsworth & Bell, 1974; Beebe et al., 2010; Feldman, 2007; Fonagy & Target, 1997; Lyons-Ruth & Spielman, 2004; Sander, 1988). Thus, a variety of interventions to promote infant mental health target parental behaviours (Zeanah & Zeanah, 2019). Especially parental sensitivity has been a central determinant of child attachment security, although an early meta-analysis indicated that sensitivity should not be seen as an exclusive factor of parenting behaviour in this context (De Wolff & van IJzendoorn, 1997). The authors identified several other parental behaviours that were also shown to be relevant, such as positive attitude, mutuality, or synchrony. Moreover, as described earlier in Chapter 1.1, the concept and measurements of sensitivity include complex and diverse aspects of maternal interactive behaviour, such as reciprocity, contingency, or quality (Shin et al., 2008), and sensitivity can be expressed as a combination of, for example, emotional warmth, acceptance, and attunement (Rosenblum et al., 2019). Besides, Mary Ainsworth and colleagues originally developed more scales to measure maternal behaviour (cooperation, acceptance, and accessibility) that provided a broader understanding of parenting quality (Bretherton, 2013). In the context of early social-emotional development, it is ultimately about parenting behaviours that provide the appropriate social context for the child (Rosenblum et al., 2019).

In a typical parent-child interaction, both mental and behavioural states of parent and child relate to each other reciprocally (Brazelton et al., 1975). Nonetheless, especially in infancy, a lack of coordination or mismatches characterise the interactions, and both parent and child contribute to reorganizing the interaction (Tronick, 1989). Accordingly, it is crucial to repair daily interactive mismatches in the relationship (Kemp et al., 2016). Moreover, during the early years, parents have to adapt both mentally and behaviourally to the rapid

developmental changes of their children to maintain a helpful and supportive interaction (Feldman, 2007; Sander, 1962). In light of mentalization theory, PRF is the psychological process that underlies parental self-regulation and co-regulation, while parenting behaviour can be considered as a subsequent expression of PRF as well as a crucial pathway in the transmission of affect regulation from parent to child, as illustrated by the process of marked affect-mirroring (Slade et al., 2005; see Chapter 1.1). In other words, an interaction can only succeed or be repaired if parents can make sense of (difficult) behaviours and internal experiences of the child and respond to it accordingly through affectively attuned parenting behaviour (Grienenberger et al., 2005; Sharp & Fonagy, 2008). Particularly in infancy and early childhood, interactions are characterised by high dependency and intense emotionality that require more differentiated parental reflective ability and behavioural adaptation (Ensink et al., 2019). At this point, it should be stressed that children can also influence or react to parenting individually (Belsky & van IJzendoorn, 2017; Slagt et al., 2016). However, the current work only focuses on parental behaviour in association with PRF without the additional variance from the child's perspective (including child interactive behaviour or dyadic behavioural patterns such as synchrony) to keep the research question specific.

Various parental behaviours have been associated empirically with PRF, such as disrupted affective communication, sensitivity, tolerance of infant distress, emotion language use (Borelli et al., 2012; Ensink, Normandin, et al., 2016; Grienenberger et al., 2005; Rutherford et al., 2013). As part of a narrative review, Camoirano (2017) reported a positive association between adult RF as well as PRF and the quality of caregiving. However, the author also stressed the relevance of differentiating the two forms of RF. Additionally, the examined behaviours summarised under the quality of caregiving were considerably heterogeneous. In a meta-analysis, Zeegers et al. (2017) identified parental mentalization as a predictor for parental sensitivity. Notably, PRF was grouped with other related concepts under parental mentalization (i.e., mind-mindedness and insightfulness), only a few of the studies on parental mentalization and sensitivity assessed PRF (3 out of 18 studies), and the included samples showed high homogeneity (i.e., mainly Western community samples), partially due to the meta-analytic approach.

Further, although the association between parental mentalization or PRF and parenting quality appears to be clear, a recent meta-analysis on interventions for PRF improvement found no evidence for a significant improvement in parent-child interaction, partially due to the heterogeneity of behavioural measures (Barlow et al., 2020). The authors further noted that the behavioural improvement might not be merely grounded in an increase of sensitive parenting

but rather a reduction of disruptive parenting. In line with this, Bernier et al. (2014) stressed that a broadened view of parental behaviour is necessary to understand early attachment relationships better.

Overall, the specific contribution of PRF and its sub-dimensions to early parenting is still not fully understood. In this context, the variability of sociodemographic and psychosocial factors in the study settings is also relevant. Since PRF has often been investigated in high-risk samples, it is presumably essential to consider the influence of parental or environmental risks such as psychopathology and socioeconomic disadvantages (Sleed et al., 2020). However, there is no previous overview of parenting behaviours associated with PRF and whether the associations differ depending on other contextual factors. Therefore, Study I will provide a qualitative synthesis in the form of a systematic review that allows these differentiations.

1.3 Infant temperament development in association with parental mentalization

How active, reactive, affective, or sociable infants are, depends partially on their temperament. Theoretical conceptualisations for temperament are manifold (Shiner et al., 2012). The psychobiological approach emphasises individual differences in reactivity and self-regulation as components of temperament closely linked with each other (Rothbart, 1989). Infants' temperament is crucial for the experience and expression of their internal states. Although biologically rooted, early temperament interacts with environmental influence and forms a foundation for later child cognitive and social-emotional development, and mental health as well as overall health outcome (Derauf et al., 2011; Fox et al., 2005; Gartstein & Skinner, 2018; Larkin & Otis, 2019; Shiner et al., 2012; Sidor et al., 2017; Zeanah et al., 1997).

Regarding the early development of temperament, previous research has shown moderate stability with a rapid development during infancy, indicating a general increase in some temperament traits, such as anger and fear reaction, or negative affect (Braungart-Rieker et al., 2010; Costa & Figueiredo, 2011; Pauli-Pott et al., 2003; Sechi et al., 2020). Besides maturation, infants' temperament can be modulated through their experience with the caregivers (Bates et al., 2012; Pauli-Pott et al., 2004; Paulussen-Hoogeboom et al., 2007). Hence, the caregiver characteristics can also influence infant temperament development. There is evidence showing the regulatory effect of sensitive parenting on the development of infant reactivity (Braungart-Rieker et al., 2010; Sheese et al., 2007). Apart from direct parental interactive behaviour, past studies have also shown influencing factors such as maternal depression, anxiety, parenting stress, or social support (Aktar et al., 2017; Bridgett, Laake, et al., 2013; Hauser et al., 2012; Pauli-Pott et al., 2004; Reck et al., 2013; Rigato et al., 2020; Shapiro et al., 2020).

Overall, in association with the parenting environment, child negative emotionality has shown to be a relevant construct previously (Bates et al., 2012). Negative emotionality is at the core of the difficult temperament concept and part of the reactivity concept. It describes a child's tendency to experience distress to sensory stimulation with expressions of high levels of emotionality (or negative affects), such as anger, fear, sadness, or (un)soothability (Paulussen-Hoogeboom et al., 2007; Rothbart et al., 1994). Here, soothability is related to negative emotionality and describes the infant's recovery rate from fussing, crying, or distress in general when caregivers use soothing techniques (Gartstein & Rothbart, 2003). Moreover, regarding self-regulation, previous research has shown an intergenerational transmission from parent to child (Bridgett et al., 2015), which can be observed indirectly during infancy. For example, better maternal self-regulation was linked with lower infant negative emotionality, partially related to better infant self-regulation (Bridgett, Burt, et al., 2013).

Parental mentalization is an essential part of parental co-regulation, which could impact the development of child self-regulation. Parents with higher reflective capacity can anticipate and accordingly react to the child's negative affect, even in emotionally distressing situations, leading to a better parental co-regulation (Rutherford et al., 2013; Wong et al., 2017). Previous studies have linked high parental mentalization with positive child social-emotional development, such as child RF, emotional self-regulation, effortful control, social competence, or educational attainment (Bernier et al., 2017; Borelli et al., 2018; Gagné et al., 2018; Heron-Delaney et al., 2016; Meins et al., 2019; Salo et al., 2021; Senehi et al., 2018). In contrast, low parental mentalization was associated with child behavioural problems, both externalising and internalising (Borelli, Lai, et al., 2020; Colonnesi et al., 2019; Condon et al., 2019; Ensink, Normandin, et al., 2016; Esbjørn et al., 2013; León & Olhaberry, 2020; Meins et al., 2013). There was also evidence that parental mentalization additionally impacts the association between early temperament and later child behavioural problems. For example, Wong et al. (2017) reported a moderating effect of mothers' PRF on the association between infant negative affect and toddler behaviour problems. An and Kochanska (2020) found a moderating effect of paternal MM on the link between infant temperamental difficulty, paternal parenting, and child disregard for rules.

Despite the relevance of parental mentalizing capacities on later child development, the question remains whether and how parental mentalization could influence the early emotional development in infancy, apart from attachment. A parent with high mentalizing capacity could be more sensitive to the infant's cues, co-regulate, and modulate the infant's internal experiences through the affective relationship (Fonagy et al., 2007). On the other hand, the

infant's temperament and behaviour could also influence parental mentalizing capacity. For example, temperamentally "difficult" infants could cause chronic emotional distress and thus diminish parental mentalizing capacity (Sharp & Fonagy, 2008). However, studies on the potential association between parental mentalization and early temperament are still scarce. Vismara et al. (2021) found a moderate negative correlation between prenatal adult RF in mothers and a specific infant temperament trait (sadness) at 6 months postpartum. Smaling, Huijbregts, van der Heijden, et al. (2016) reported a small-sized positive association between the self-focused dimension of postnatal PRF and child negative emotionality at 20 months postpartum. They argued that self-focused PRF implies a self-absorption component that could negatively impact the maternal perception of the child's behaviour. For MM, there is little evidence on its association with child temperament with mixed findings. Previous studies showed that maternal observed MM was unrelated to concurrent infant temperament, indicating MM as a maternal cognitive-behavioural trait (Larkin et al., 2019; Lee, 2021; Meins et al., 2011). On the contrary, other studies found associations between maternal observed MM (especially non-attuned MM) and infant negative affect assessed using the Still-Face Paradigm (SFP; McMahon & Newey, 2018; Planalp et al., 2019).

Hence, an investigation of PRF and MM in relation to infant emotionality would reveal a potential interplay between parental mentalization and infant temperament. Moreover, potential predictive effects of PRF or MM on the development of infant temperament would add to the evidence on whether and how parental mentalization influences infant emotional development apart from attachment. These questions regarding concurrent relation and predictive associations between parental mentalization and infant temperament will be addressed in Study III.

1.4 Rationale and research objectives

1.4.1 Research project

This dissertation project was conducted as part of a prospective cohort study PAULINE (Prenatal Anxiety and Infant Early Emotional Development; principal investigator: Dr. med. Susanne Mudra) at the Department of Child and Adolescent Psychiatry, Psychotherapy and Psychosomatics of the University Medical Centre Hamburg-Eppendorf. Figure 3 shows the study design of the PAULINE study. Data analysed in this dissertation were derived from three assessment points: 3 weeks (T1), 7 months (T2) and 12 months (T3) postpartum. Data were collected from 2015 to 2019. The assessment for one of the main constructs of this dissertation (PRF) was added in early 2017. Hence, the sample for this dissertation project was a subsample

from the PAULINE study. The study protocol was approved by the ethics committee of the Hamburg Chamber of Physicians (PV5574).

3rd trimester of pregnancy (T0)	3 weeks postpartum (T1)	7 months postpartum (T2)	12 months postpartum (T3)
Mother (+ father) questionnaire	Mother questionnaire	Mother (+ father) questionnaire	Mother questionnaire
Mother clinical interview		Mother mentalization interview	
		Mother-infant interaction	Mother-infant interaction
	Newborn observation		
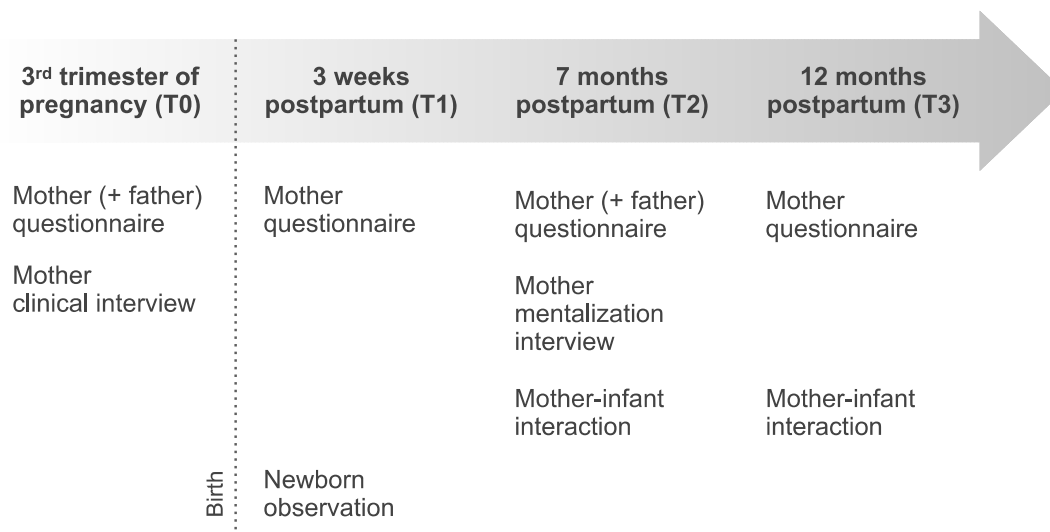
Figure 3 *Study design of the PAULINE study*

1.4.2 Description of the studies and research questions

The two forms of parental mentalization, namely PRF and MM, are the central constructs of this dissertation and investigated in three separate studies. First, a systematic review of current research synthesises the associations between PRF and early parenting behaviours while considering other influencing factors. This study aims to help better understand the PRF concept and the pathway from PRF as a mental capacity to parental behaviour. Second, an empirical study focuses on the differentiation of mothers' PRF and MM by contextualising the constructs in associations with other maternal characteristics. Third, another empirical study investigates the relations between mothers' PRF or MM and concurrent as well as later infant temperament.

In summary, the studies address three main parental constructs (i.e., PRF, MM, and parenting behaviour) in the early attachment relationship (see Figure 2) and an infant developmental outcome. The overall aim of the studies is to elucidate aspects of parental

mentalization involved in parental self-regulation and co-regulation and their potential influence on the infant while considering influence from other contextual factors. The examined constructs stretch from maternal characteristics to infant outcomes. The involved assessment points of the two empirical studies stretch from the early postpartum period to the end of infancy.

The following main research questions will be addressed by the three studies:

Study I: A systematic review of PRF and its association with parenting behaviours in infancy and early childhood

1. What are the associations between PRF along with its sub-dimensions and parenting behaviours in infancy and early childhood?
2. Do the associations between PRF and parenting behaviours vary depending on other contextual factors?

Study II: Differentiating PRF and MM – Associations with maternal psychosocial functioning and recalled parenting by own mother

3. What are the concurrent relations between PRF and MM indicators?
4. What are the associations between PRF, maternal psychosocial functioning (emotion dysregulation and current mood), and recalled parenting by own mother?
5. What are the associations between MM, maternal psychosocial functioning (parenting efficacy and current mood), and recalled parenting by own mother?

Study III: Mothers' parental mentalization and infant temperament development – Concurrent associations and predictive effects

6. What are the concurrent relations between parental mentalization (PRF and MM) and infant temperament (negative emotionality and soothability)?
7. Does parental mentalization (PRF or MM) predict later infant temperament (negative emotionality or soothability)?

In the following chapters (Chapter 2–4), the research objectives will be framed with more detail at the beginning of each study.

2. Study I: A systematic review of PRF and its association with parenting behaviours in infancy and early childhood[9]

The research findings reported in Chapter 1.2 have shown increasing evidence on the link between parental mentalization and parenting quality. However, a thorough search of the relevant literature yielded no systematic review about the associations between PRF and parenting behaviours thus far. Moreover, attention should be drawn to methodological issues related to the assessment, such as the operationalization of PRF and study settings, potentially leading to variations in the resulting associations. Identifying these potential differences and related factors would help future research to apply methods in a more targeted manner depending on specific research questions.

To this end, Study I aimed to provide a systematic overview of empirical studies on PRF and its association with parenting behaviours in infancy and early childhood (0–5 years of age). The following questions were addressed: (a) What are the associations between PRF along with its sub-dimensions and parenting behaviours? (b) Do the strengths and directions of associations between PRF and parenting behaviours vary depending on other contextual factors? Further, two related questions were also addressed: (c) Which instruments have been used to assess PRF? (d) Which parenting behaviours have been examined in association with PRF?

2.1 Methods Study I

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines (Moher et al., 2009; Shamseer et al., 2015) were followed for conducting this review. The protocol for this systematic review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) database (registration number: CRD42019137484).

2.1.1 Literature search

The following electronic bibliographic databases were searched in November 2018: CINAHL, PsycINFO, PSYNDEX, PubMed/MEDLINE, and Web of Science. The search was updated in June 2021. Furthermore, reference lists of eligible studies and review articles were screened. Google Scholar was also searched. Only the term "parental reflective functioning"

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[9] Study I is part of a publication: Stuhrmann, L.Y., Göbel, A., Bindt, C., & Mudra, S. Parental Reflective Functioning and its Association with Parenting Behaviours in Infancy and Early Childhood: A Systematic Review. *Frontiers in Psychology*, 13:765312. doi: 10.3389/fpsyg.2022.765312
Results of Study I were also part of a conference presentation: Stuhrmann, L. Y., Göbel, A., Bindt, C., & Mudra, S. (2021, June 22–26). *Taking a closer look at parental reflective functioning and caregiving behaviour in early parent-child relationship: A systematic review*. [Brief oral presentation]. World Association for Infant Mental Health 17th World Congress, hybrid (virtual & Brisbane, Australia).

and its variations were included in the search strategy to find all relevant references since parenting behaviours could be labelled differently. The searches were performed using the following search strategy: (parent* OR maternal OR paternal) AND (mentaliz* OR mentalis* OR reflective function*). The search strategy has been adapted for the syntax of each bibliographic database and additional German terms in the German-speaking database Psyndex. There were no restrictions regarding language and publication period.

Empirical studies were included if they a) were published as peer-reviewed journal articles, doctoral dissertations, or published master's theses, b) assessed PRF referring to one specific parent-child relationship postnatally, c) assessed parenting behaviour using objective observations of parent-child interaction, and d) reported statistical associations between PRF and observed parental behaviour. Regarding the last criterion, intervention studies should report either e) an association between the target variables both assessed pre-intervention, or f) an association between changes in both target variables from pre- to post-intervention. Self-report data of parental behaviour were not included since it might be influenced by parental perception (Herbers et al., 2017) and thus also by PRF.

Studies were excluded if (a) PRF was measured using instruments for the assessment of adult RF (e.g., RF coding on the Adult Attachment Interview), (b) parenting behaviour cannot be separated from child behaviour (e.g., synchrony), or (c) the sample contains children that are older than six years at the assessments of PRF or parenting behaviour. The age range of index children was limited to keep the development-specific implications of the current review focused on parent-child relationships in infancy and early childhood.

2.1.2 Study selection and data extraction

Studies identified from the literature search were screened in two steps. First, the titles and abstracts were screened to identify potentially relevant studies. Second, full texts of the studies identified in the first step were evaluated by two independent reviewers (the doctoral candidate LYS and another research associate from the PAULINE study team) based on the eligibility criteria. The inter-rater agreement was excellent ($\kappa = 0.80$). Disagreements between the two reviewers were resolved through discussion until a consensus was reached.

For the data extraction, a pilot-tested, standardized spreadsheet was used with pre-defined variables: authors and year of publication, research question, study design and sample, PRF instrument and administration details, parenting behaviour instrument and administration details, descriptive statistics for PRF and parenting behaviours, statistics for associations between PRF and parenting behaviours. Sample information included sample type (e.g., mother or father, community or high-risk), setting (e.g., location, recruitment setting or methods),

parents' and children's age. Additionally, information on psychosocial and contextual variables that impact the targeted associations were also included. Three authors of the included studies were contacted to request missing relevant data, and one of the authors replied.

2.1.3 Quality assessment

The methodological quality of the included studies was assessed using an adapted checklist based on the Effective Public Health Practice Project (EPHPP) checklist (Thomas et al., 2004). Because some of the items from the EPHPP checklist are not relevant for observational studies, criteria from the National Institute for Health and Clinical Excellence (NICE) public health guidance and the Cochrane Collaboration Risk of Bias Tool were additionally considered (Higgins et al., 2019; NICE, 2012). Further, ratings on three types of risk of bias were applied for a comprehensive overview of the study quality: selection bias, detection bias, and attrition bias. Detection bias was appraised on the outcome level, while the remaining aspects were rated on the study level (see Appendix I for the adapted checklist). Again, the two reviewers double rated 57% of the studies independently. The inter-rater agreement was again excellent ($\kappa = 0.79$). Disagreements were resolved through discussion.

2.2 Results Study I

Figure 4 shows the process of study identification, selection, and review. The systematic literature searches generated 1,266 references. After screening of 77 full-text articles, 16 studies were included in the final review.

Among all of the included studies, 14 were peer-reviewed articles, one was a doctoral dissertation, and one was a published master's thesis. Except for two studies from South Africa and Israel, all remaining studies were conducted in Western countries – Australia, Austria, Canada, Germany, Switzerland, the UK, and the USA. More specifically, almost half of the studies ($k = 7$) were from the USA. Sample sizes ranged from 26 to 163, with 44% of the sample sizes under 51, 44% between 51–100, and 13% over 100. Overall, $N = 1,076$ parent-child dyads were involved. While most studies focused on mothers, two studies were conducted with fathers ($n = 148$ in total). Nine of the included studies consisted of high- or at-risk samples, including mothers with substance abuse, interpersonal violence-related posttraumatic stress disorder (IPV-PTSD), postpartum depression, features of BPD, and mothers in prison. One study oversampled for women with childhood maltreatment, while one study included women with pregnancy risks. The remaining five studies were conducted with community samples without any specific risks. The involved children were aged up to 60 months. Specifically, only two studies included children over 36 months old. Table 1 shows details of the included studies.
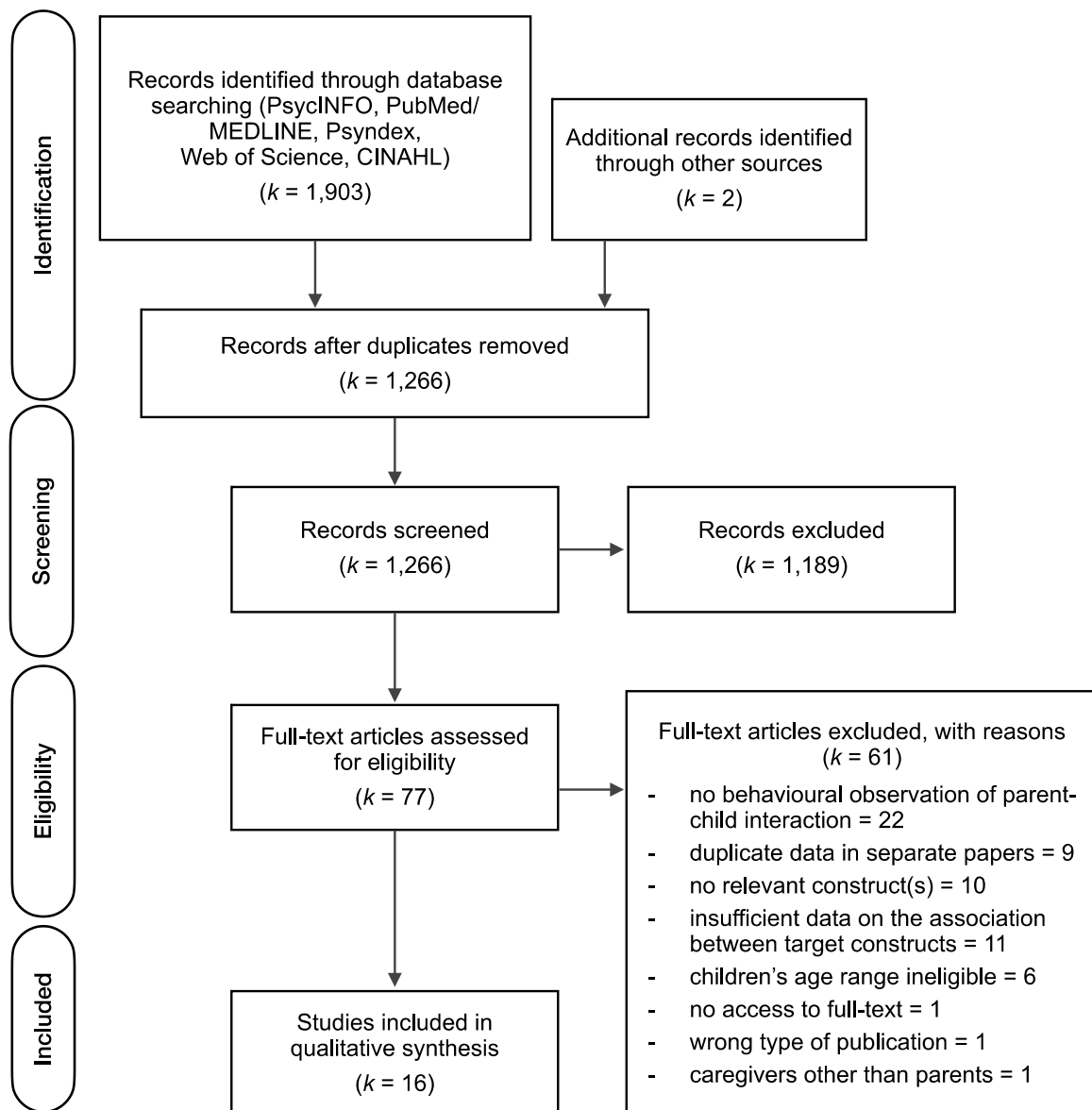
Figure 4 *PRISMA flow diagram of the systematic review process*

Table 1 *Overview of the included studies*

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Buttitta, 2019, USA	Cross-sectional	$N = 77$ father-toddler dyads	Community sample, part of a larger study examining mothers' experiences parenting young toddlers at the Pomona College, California; toddlers' age in months M (SD), range: 23.72 (3.69), 17–31	PDI-RF (child-focused, adapted); 3.33 (0.67)	NCAST Teaching Scale; Autonomy support (SEN to cues): 8.90 (1.25) Social-emotional support (SEGF): 7.45 (1.30)	Pearson correlation path analysis regression-based moderation analysis regression-based mediation analysis	Child-focused PRF w/ Autonomy support $r = .22$ (ns.) Social-emotional support $r = .04$ (ns.); path child-focused PRF effect on Social-emotional support $b = .50*$ ($p = .02$) path child-focused PRF effect on Autonomy support $b = .11$ ($p = .61$); interaction between family income and child-focused PRF effect on Social-emotional support $b = -.15$ ($p = .22$) interaction between family income and child-focused PRF effect on Autonomy support $\Delta R^2 = .10$, $b = -.34**$ ($p = .008$); child-focused PRF (predictor) effect on Social-emotional support (mediator) $b = .439$ ($p = .07$)
Dawson, 2018, South Africa	Cross-Sectional	$N = 50$ mother-infant dyads	At-risk sample, part of an evaluation study of a home visiting project in Alexandra Township; infants' age in months M, range: 4.6, 2.76–15	PDI-RF; descriptive data not reported	Ainsworth sensitivity scale & MBQS-mini, using free-play & interaction tasks; descriptive data not reported	Pearson correlation	PRF w/ Ainsworth SEN $r = .24$ ($p = .09$) MBQS-mini SEN $r = .02$ ($p = .91$)

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Dollberg, 2021, Israel	Cross-Sectional	$N = 68$ mother-infant dyads	Community sample, part of a larger cohort study, including women with pregnancy risks; infants' age in months M (SD): 3.84 (0.86)	PDI-RF at 3 months pp; 4.39 (1.36)	CIB (SEN) at 3 months pp; 4.28 (0.49)	Pearson correlation regression-based mediation analysis	PDI-RF w/ SEN $r = .14$ (ns.) path PRF (mediator) effect on SEN (outcome) ns. (no coefficients reported)
Dunckel, 2003, USA[a]	Cross-Sectional	$N = 34$ mother-infant dyads	Community sample in New York City; infants' age in months range: 4–7.5	Highpoints/ Lowpoints Interview using PDI-RF coding; 4.97 (0.91)	PCIS (Quality of interaction) using free-play; 3.84 (0.77)	Pearson correlation	PRF w/ Quality of interaction $r = .021$ $(p = .91)$
Ensink, 2019, Canada	Longi-tudinal	$N = 88$ mother-infant dyads	Community sample in a French-Canadian city	Mini-PRFI at 6 months pp; 4.46 (1.40)	DIP scale (INSEN) at 6 months pp, using interaction task; 2.74 (2.47)	Pearson correlation hierarch-ical linear regression regression-based mediation analysis	PRF w/ INSEN $r = -.24*$ $(p = .03)$; PRF effect on INSEN $\Delta R^2 = .02$, ß $= -.24*$ $(p = .04)$; path PRF (predictor) effect on INSEN (mediator) $b = -0.41*$
Grienenberger, 2005, USA	Longi-tudinal	$N = 45$ mother-infant dyads	Community sample, first-time mothers, part of a project to explore various aspects of early mother-infant attachment relationships in New York City	PDI-RF at 10 months pp; descriptive data not reported	AMBIANCE (disrupted affective communication) at 14 months pp, using the Strange situation; 3.33 (1.67)	Pearson correlation	PRF w/ Overall level of disrupted affective communication $r = -.481***$ $(p < .001)$

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Hasselbeck, 2015, Austria[b]	Cross-Sectional	$N = 71$ father-child dyads	Community sample, Project "Parenting and co-parenting in infancy"; children's age in months range: 12–32	PDI-RF; 3.12 (0.88) 3.6 as "cut-off"	EA Scales (SEN) using picture book situation; descriptive data not reported	t test; path analysis	Higher SEN in high PRF group compared to low PRF group $t(65) = -3.03^{**}$, $d = 0.78$; path PRF effect on SEN $b = 0.25$ ($p = .11$)
Huth-Bocks, 2014, USA	Longi-tudinal	$N = 115$ mother-infant dyads	Oversampled for mothers w/ childhood maltreatment, Maternal Anxiety during the Childbearing Years project (MACY)	PDI-RF at 16 months pp; 4.40	MIPCS at 7 months pp, using free-play & teaching task; positive parenting in free-play: 3.45 teaching task: 3.21 hostile/intrusive parenting in free-play: 1.74 teaching task: 2.08	Pearson correlation	PRF w/ positive parenting in free-play $r = .33^{***}$, $r_{part} = .22^*$ in teaching task $r = .21^*$, $r_{part} = .13$ (ns.) PRF w/ hostile/intrusive parenting in free-play $r = -.28^{**}$, $r_{part} = -.18$ (ns.) teaching task $r = -.16$ (ns.), $r_{part} = -.06$ (ns.) (partial correlations: controlled for family income risk and maternal age)
Krink, 2018, Germany	Cross-Sectional	$N = 50$ mother-infant dyads	Risk sample (mothers w/ pp depression), part of an intervention study at a university medical centre; infants' age in month range: 3–10	PRFQ; PM: 1.80 (0.73) CMS: 3.39 (1.22) IC: 5.87 (0.84)	Mini-MBQS-V using SFP; 0.74 (0.21) in SFP play episode 0.62 (0.31) in SFP re-engagement episode	Pearson correlation	PRF dimension PM w/ SEN in SFP play episode $r = .18$ (ns.) re-engagement episode $r = -.12$ (ns.) PRF dimension CMS w/ SEN in SFP play episode $r = -.16$ (ns.) re-engagement episode $r = -.08$ (ns.) PRF dimension IC w/ SEN in SFP play episode $r = -.04$ (ns.) re-engagement episode $r = -.01$ (ns.) changes in SEN between play and re-engagement episodes w/ PRF dimension PM $r = -.24^*$ PRF dimension CMS $r = .03$ (ns.) PRF dimension IC $r = .02$ (ns.)

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Newman-Morris, 2020, Australia	Cross-sectional	$N = 61$ mother-infant dyads	High-risk sample (mothers w/ BPD features) in New South Wales; infants' age in month M (SD): 5.3 (3.2)	PDI-RF; 4.2 (1.3)	EA Scales using free-play; SEN: 4.5 (1.5) STRU: 4.0 (1.3) NON-INTRU: 4.1 (1.4) NON-HOST: 4.9 (1.6)	Pearson correlation regression-based moderation analysis	PDI-RF w/ SEN $r = -.12$ (ns.) STRU $r = -.23$ (ns.) NON-INTRU $r = -.22$ (ns.) NON-HOST $r = -.33$**; interaction between PDI-RF and distorted maternal representations effect on NON-HOST $\Delta R^2 = .058$, $b = .04$* ($p = .027$)
Perry, 2015, Australia	Longi-tudinal	$N = 26$ mother-infant dyads: $n = 11$ high-risk $n = 15$ comparison	High-risk group (mothers in opiate substitution treatment) and comparison group w/o risk status	PDI-RF at 6 months pp; high-risk: PDI-RF: 5.00 (1.23) comparison: PDI-RF: 4.67 (1.07)	EA Scales at 6 months pp, using free-play; high risk: SEN: 5.60 (.65) STRU: 5.70 (.57) NON-INTRU: 6.50 (.00) NON-HOST: 7.00 (.00) comparison: SEN: 5.33 (3.89) STRU: 5.21 (1.12) NON-INTRU: 6.33 (.25) NON-HOST: 6.92 (.20)	Pearson correlation	Postnatal PRF w/ SEN $r = .14$ (ns.) STRU $r = .00$ (ns.) NON-INTRU $r = -.12$ (ns.) NON-HOST $r = -.08$ (ns.)

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Schechter, 2008, USA	Cross-sectional	N = 41 mother-toddler dyads	At-risk sample (dyads referred to Infant-Family Service for evaluation);	WMCI-RF (w/ additional probes) at first visit;	AMBIANCE at second visit (1–2 weeks later), using free-play & separation–reunion segments;	Linear regression model	PRF effect on Overall level of disrupted affective communication, coefficient not reported (p > .4)
			children's age in month M, range: 32, 8–50	3.3 (1.3) range: 0–5	4.90 (1.43) range: 1–7		
Sleed, 2013, UK	Pre-post, intervention evaluation	N = 163 mother-infant dyads: n = 88 IG, n = 75 CG	High-risk sample (mothers in Mother and Baby Unit in prisons); infants' age in month M (SD), range: 4.9 (4.5), 0.2–23.0 in IG 4.4 (4.6), 0.1–18.5 in CG	PDI-RF at baseline & post-treatment; baseline: 3.18 (1.38) in IG 3.59 (1.47) in CG post-treatment: 3.54 (1.57) in IG 3.15 (1.33) in CG	CIB (PE) at baseline & post-treatment, using free-play; baseline: 19.63 (3.8) in IG 20.34 (2.9) in CG post-treatment: 19.13 (2.7) in IG 19.30 (3.2) in CG	Pearson correlation	PRF w/ PE at baseline r = .232* change (baseline to post-treatment) in PRF w/ change in PE r = .075 (ns.)

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Suardi, 2020, Switzerland	Cross-sectional	$N = 56$ mother-toddler dyads: $n = 33$ IPV-PTSD $n = 75$ non-IPV-PTSD	At-risk group (mothers w/ IPV-PTSD) and comparison group (mothers w/o IPV-PTSD) in the metropolitan Geneva area; toddlers' age in month M (SD): 27.5 (9.1) in IPV-PTSD group 26.7 (8.3) in non-IPV-PTSD group	WMCI-RF (with additional probes) at first visit; 4.33 (1.08) in IPV-PTSD group 4.57 (0.66) in non-IPV-PTSD group	CARE-Index using free-play at second visit (2–3 weeks later); IPV-PTSD group SEN: 5.06 (1.46) CONTR: 3.33 (1.71) UNRESP: 2.91 (1.77) non-IPV-PTSD group SEN: 6.00 (1.04) CONTR: 2.22 (1.24) UNRESP: 2.30 (1.49)	Pearson correlation multiple regression analysis	WMCI-RF w/ SEN $r = .36$ ** $(p = .007)$ in the whole sample $r = .34$** in IPV-PTSD group $r = .33$** in non-IPV-PTSD group WMCI-RF w/ CONTR $r = -.19$ (ns.) in the whole sample $r = -.23$ (ns.) in IPV-PTSD group WMCI-RF w/ UNRESP $r = -.23$ (ns.) in the whole sample $r = -.20$ (ns.) in IPV-PTSD group; WMCI-RF effect on SEN $\beta = .33$** $(p = .008)$
Suchman, 2010, USA	Baseline of an RCT (pilot study)	$N = 47$ mother-child dyads	High-risk sample (mothers with drug use disorders), the Mothers and Toddlers Program (MTP), in a small and ethnically diverse north-eastern city, children's age in month: 17.68 (13.82)	PDI-RF; self-focused: 3.15 (.76) child-focused: 3.36 (.62)	NCAST Teaching Scale; SEN to cues: 8.50 (1.39) CON SEN to cues: 4.39 (.79) RESP: 8.04 (1.23) CON RESP: 3.45 (1.04) SEGF: 7.25 (1.65) CON SEGF: 1.59 (.87) CGF: 12.10 (2.04) CON CGF: 3.77 (1.49)	Multiple linear regression	Self-focused PRF effect on SEN to cues $R^2 = .10$, $\beta = .37$* CON SEN to cues $R^2 = .07$, $\beta = .31$ (ns.) RESP $R^2 = .00$, $\beta = .01$ (ns.) CON RESP $R^2 = .06$, $\beta = -.28$ (ns.) SEGF $R^2 = .08$, $\beta = .33$* CON SEGF $R^2 = .05$, $\beta = .27$ (ns.) CGF $R^2 = .08$, $\beta = .34$* CON CGF $R^2 = .10$, $\beta = .37$* child-focused PRF effect on SEN $R^2 = .01$, $\beta = -.08$ (ns.) CON SEN $R^2 = .00$, $\beta = -.07$ (ns.) RESP $R^2 = .02$, $\beta = -.18$ (ns.) CON RESP $R^2 = .00$, $\beta = -.01$ (ns.) SEGF $R^2 = .05$, $\beta = .25$ (ns.) CON SEGF $R^2 = .05$, $\beta = .25$ (ns.) CGF $R^2 = .00$, $\beta = -.02$ (ns.) CON CGF $R^2 = .00$, $\beta = .06$ (ns.)

First author, year, country	Study design	Sample size	Setting & sample characteristics	Instrument & descriptive data PRF M (SD)	Instrument & descriptive data parenting behaviour M (SD)	Statistics used	Associations PRF & parenting behaviours
Suchman, 2018, USA	RCT	$N = 84$ mother-child dyads	High-risk sample (mothers in the outpatient treatment for substance abuse), the Mothering from the Inside out (MIO) parenting therapy, at a substance abuse treatment centre located in a small north-eastern city; children's age in month M (SD), range: 27.92 (14.88), 11–60	PDI-RF at baseline and post-treatment; baseline self-focused: 2.94 (0.65) child-focused: 3.18 (0.59) post-treatment self-focused: 2.98 (0.61) child-focused: 3.32 (0.55)	CIB (SEN) at baseline, post-treatment and 3-month follow-up, using Curiosity Box Paradigm; baseline: 3.50 (0.73) post-treatment: 3.49 (0.78) 3-month follow-up: 3.44 (0.76)	Hierarchical regression analysis	Effect on change in SEN at 3-month follow-up: change (baseline to post-treatment) in self-focused PRF $R^2 = 0.00$, ß = 0.01 (significance & p-value not reported) change in child-focused PRF $R^2 = 0.02$, ß = 0.14 (significance & p-value not reported)

Note. w/ = with; w/o = without; ns. = not significant (if p-value not reported); pp = postpartum; vs. = versus; IG = intervention group; CG = control group; RCT = randomized controlled trial; BPD = borderline personality disorder; IPV-PTSD = interpersonal violence-related posttraumatic stress disorder; PDI-RF = Parent Development Interview-revised with reflective functioning coding; PRF = parental reflective functioning; Mini-PRFI = Mini-Parent Reflective Functioning Interview; PRFQ = Parental Reflective Functioning Questionnaire; PM = Pre-mentalizing modes; CMS = Certainty about mental states; IC = Interest and curiosity in mental states; WMCI-RF = Working Model of the Child Interview with reflective functioning coding; NCAST = Nursing Child Assessment Satellite Training; MBQS/-V = Maternal Behaviour Q-sort/revised; PCIS = Parent/Caregiver Involvement Scale; DIP = Disconnected and Extremely Insensitive Parenting; AMBIANCE = Atypical Maternal Behavioural Instrument for Assessment and Classification; CIB = Coding Interactive Behaviour; EA = Emotional Availability; MIPCS = MACY Infant–Parent Coding System; CARE-Index = Child-Adult Relationship Experimental Index; SFP = Still-Face Paradigm; SEN = Sensitivity; SEGF = Social-emotional growth fostering; INSEN = Insensitivity; STRU = Structuring; NON-INTRU = Non-intrusiveness; NON-HOST = Non-hostility; PE = Positive engagement; INTRU = Intrusiveness; CONTR = Controlling; UNRESP = Unresponsive; RESP = Response to distress; CON = Contingency; CGF = Cognitive growth fostering.

[a] Doctoral dissertation. [b] Published master's thesis.

* $p < .05$; ** $p < .01$; *** $p < .001$. p-value specified in the table if reported.

Regarding the quality assessment rating, nine studies were of high methodological quality, while the remaining seven were of moderate quality. The most mixed ratings were on attrition bias followed by selection bias because one-third of the studies had either (a) a moderate rate of drop-out or missing data, or (b) an incomplete report of this information, and most of the studies had relatively small sample sizes. The sample sizes and attrition rates are common in this research field, mainly using time-consuming measures and longitudinal study designs. For detailed ratings, see Table 2.

Table 2 *Methodological quality (risk of biases and overall quality) of the included studies*

First author, year	Selection bias	Detection bias	Attrition bias	Overall quality
Buttitta, 2019	M	L	L	H
Dawson, 2018	M	L	L	H
Dollberg, 2021	M	L	M	H
Dunckel, 2003	H	M	L	M
Ensink, 2019	L	L	M	H
Grienenberger, 2005	H	L	M	M
Hasselbeck, 2015	M	L	H	M
Huth-Bocks, 2014	L	H	L	M
Krink, 2018	M	H	L	M
Newman-Morris, 2020	M	L	L	H
Perry, 2015	H	L	M	M
Schechter, 2008	M	M	L	H
Sleed, 2013	M	M	H	M
Suardi, 2020	M	L	M	H
Suchman, 2010	M	L	L	H
Suchman, 2018	L	L	L	H

Note. The ratings are based on an adapted Effective Public Health Practice Project checklist. L = low; M = moderate; H = high.

2.2.1 Assessment instruments for PRF

Table 3 shows detailed information on the five instruments used to assess PRF in the included studies.

Most of the studies ($k = 11$) used the PDI-RF coding on the PDI-R. Three of these studies (Buttitta et al., 2019; Suchman et al., 2018; Suchman et al., 2010) investigated PRF sub-dimensions using a two-factor model of the PDI-RF: self-focused and child-focused PRF (see also Chapter 1.1.1). The self-focused dimension consists mainly of questions regarding a parent's emotional experience of parenting (e.g., "How has having your child changed you?"), while the child-focused dimension consists of questions primarily regarding the child's mental

states (e.g., "Has your child ever felt rejected?"). The latter dimension also contains questions regarding the dynamics in the mental processes of parent and child in relation to each other (e.g., "Tell me about a recent time when you and your child really clicked."). One study slightly adapted the composition of the child-focused PRF (Buttitta et al., 2019).

Additionally, the PDI-RF coding was applied for an adapted version of the Working Model of the Child Interview (WMCI) in two studies and a self-developed Highpoints/ Lowpoints Interview in one study. Both interviews were not established instruments for assessing PRF, so that their validity remained questionable (Dunckel, 2003; Schechter et al., 2008).

Furthermore, one study developed the Mini-Parent Reflective Functioning Interview (Mini-PRFI; Ensink et al., 2019), referring more strongly to a specific parent-child interaction situation prior to the interview and focusing more on the child's temperament. The PDI-RF coding was also applied for this interview. An average admission duration of only 15 minutes makes the application of this instrument time-saving.

Table 3 *Assessment instruments for PRF used in the included studies*

Instrument	Dimensions/Subscales used	Scoring
PDI-R	Total Self-focused Child-focused	Addendum to the RF scoring manual for PDI-R, from –1 (anti-reflective) to 9 (exceptional RF)
Mini-PRFI	Total	
WMCI adapted	Total	
Highpoints/Lowpoints Interview	Total	
PRFQ	Pre-mentalizing modes (6 items) Certainty about mental states (6 items) Interest and curiosity in mental states (6 items)	From 1 (strongly disagree) to 7 (strongly agree), subscale sum scores

Note. Only dimensions/subscales used in the included studies are listed in this table. PRF = parental reflective functioning; PDI-R = Parent Development Interview-Revised; RF = Reflective Functioning; Mini-PRFI = Mini-Parent Reflective Functioning Interview; WMCI = Working Model of the Child Interview; PRFQ = Parental Reflective Functioning Questionnaire.

Lastly, one included study (Krink et al., 2018) used the self-report PRFQ with three subscales. *Pre-mentalizing modes* capture a non-mentalizing stance that reflects a parent's inability to reflect on the child's mental states (e.g., "Often, my child's behaviour is too confusing to bother figuring out."). *Certainty about mental states* captures a parent's ability to recognize the opaque nature of mental states (e.g., "I always know what my child wants."). *Interest and curiosity in mental states* capture a parent's active interest in understanding the child's mental states (e.g., "I wonder a lot about what my child is thinking and feeling."). A

particularly high or low response on the certainty or the interest scales indicates non-optimal mentalizing (e.g., overinterpreting or lack of interest in the child's mental states). Accordingly, the scale scores are recoded to indicate that a highly reflective parent would be interested in but not too certain about mental states and show a low level of non-mentalizing stance.

2.2.2 Observation instruments for parenting behaviours

Of all included studies, five focused solely on sensitivity, while one study focused on insensitivity, five on multiple behaviours, two on disrupted affective communication, one on positive engagement, and one on positive as well as hostile/intrusive parenting.

Despite the heterogeneity of the behavioural measures, the parenting behaviours can be ultimately categorised into positive (e.g., sensitive, warm, affectionate, and supportive) and negative (e.g., insensitive, disruptive, controlling, and unresponsive). The generic categories of positive and negative parenting were previously identified empirically as distinct constructs with different determinants and influences on offspring outcomes (Belsky, 1984; Dallaire et al., 2006; Simons et al., 1990). Thus, they do not represent two poles of the same dimension and are not mutually exclusive.

Ten instruments for the observation of parenting behaviours were identified. Some of the instruments assess both parent and child behaviour. Further, not all subscales of the respective instruments were used. For a better overview, only the subscales regarding parental behaviour used in the included studies are described in the following. Table 4 shows detailed information on these instruments.

The Emotional Availability Scales (EA Scales; Biringen, 2008; Biringen et al., 2000) and the Coding Interactive Behaviour (CIB; Feldman, 1998) were used in three studies, while the Atypical Maternal Behavioural Instrument for Assessment and Classification (AMBIANCE; Bronfman et al., 1999), the Nursing Child Assessment Satellite Training (NCAST) Teaching Scale (Barnard & Eyris, 1979), and the Maternal Behaviour Q-sort mini (MBQS-mini and Mini-MBQS-V; Moran, 2009; Pederson et al., 2009) were used in two studies, respectively. In one included study, Sleed et al. (2013) generated their own subscales of the CIB due to insufficient internal consistency of the original subscales in their sample.

Table 4 *Observation instruments used in included studies*

Name	Constructs/subscales used	Scoring
Ainsworth sensitivity scale	Sensitivity	From 1 (highly insensitive) to 9 (highly sensitive)
AMBIANCE	Overall level of disrupted communication	From 1 (high normal) to 7 (disrupted communication with few or no ameliorating behaviours)
CARE-Index Toddler version	Sensitivity Controlling behaviour Unresponsive behaviour	Scores range from 0 (insensitive) to 14 (outstandingly sensitive)
CIB	Parent positive engagement (5 items) Maternal sensitivity (12 items)	5-point scale for frequency and intensity from 1 to 5, sum scores of the respective items

DIP	Insensitivity
	    Disconnected parenting behaviour
	    Extreme parental insensitivity
		9-point scale from 1 to 9 each time insensitive behaviours occur; total score by averaging two subscale scores

EA Scales Infancy/Early childhood version 3rd and 4th edition	Sensitivity Structuring Non-intrusiveness Non-hostility	7-point Likert scale from 1 (low EA) to 7 (high EA)
MBQS-mini/ Mini-MBQS-V	Sensitivity	Correlation between the descriptive sort and a criterion sort of a prototypically sensitive mother: $r = -1.0$ (least sensitive) to 1.0 prototypically sensitive

MIPCS	Positive parenting
	    Behavioural sensitivity
	    Engagement
	    Flexibility
	    Warmth
	    Affective sensitivity
	    Positive affect
	Negative parenting
	    Overcontrolling/Intrusiveness
	    Hostility
		5-point Likert scales, scores for each of the two constructs by averaging respective subscale scores

NCAST Teaching Scale	Sensitivity to cues (11 items) Response to distress (11 items) Social-emotional growth fostering (11 items) Cognitive growth fostering (17 items) Contingency rating for each of the subscales	Binary items on occurrence and non-occurrence of specific behaviours rated by 0 (no) and 1 (yes), subscale sum scores & contingency scores

PCIS	Quality of interaction (defined as maternal behavioural sensitivity)
	    Quality
	    Appropriateness
	    General impression of the interaction
		5-point scale from 1 to 5, composite score by averaging subscale scores

Note. Only constructs/subscales used in the included studies are listed in this table. AMBIANCE = Atypical Maternal Behavioural Instrument for Assessment and Classification; CARE-Index = Child-Adult Relationship Experimental Index; CIB = Coding Interactive Behaviour; DIP = Disconnected and Extremely Insensitive Parenting; EA = Emotional Availability; MBQS-mini = Maternal Behaviour Q-sort mini; Mini-MBQS-V = Mini Maternal Behaviour Q-sort revised; MICS = Mother Infant Coding System; MIPCS = MACY Infant–Parent Coding System; NCAST = Nursing Child Assessment Satellite Training; PCIS = Parent/Caregiver Involvement Scale.

The remaining instruments have been used in one of the included studies, respectively: the original sensitivity scale by Ainsworth et al. (1974), the Child-Adult Relationship Experimental Index (Crittenden, 2006), the Parent/Caregiver Involvement Scale (Farran et al., 1986), the Disconnected and Extremely Insensitive Parenting (DIP) scale (Out et al., 2009), and the Maternal Anxiety during the Childbearing Years (MACY) Infant-Parent Coding System (MIPCS; Huth-Bocks et al., 2014). The original sensitivity scale by Ainsworth was used in one study together with the MBQS-Mini. Part of the PCIS was used to aggregate a score for quality of interaction defined as maternal behavioural sensitivity (Dunckel, 2003). The MIPCS was developed in the context of the MACY study to evaluate parental, infant, and dyadic interactive behaviours associated with attachment formation (Huth-Bocks et al., 2014).

Most of the instruments are related to attachment theory and overlap in their conceptualisations, whereas the NCAST Teaching Scale was developed to detect children's health and developmental problems. The included studies used various interaction situations between parents and their children, from unstructured free-play to highly structured tasks such as teaching tasks or the SFP (Tronick et al., 1978). Parents were usually asked to teach their children to perform a specific activity (e.g., stacking blocks) in teaching tasks. The SFP is structured into three separate episodes in the following order: play, still-face, and re-engagement episode. Only the NCAST Teaching Scale was consistently applied with a structured teaching situation of 5 minutes (Oxford & Findlay, 2013).

2.2.3 Associations between PRF and parenting behaviours

Overall, 11 studies investigated the overall level of PRF, while three studies examined two PRF sub-dimensions based on the PDI-RF. One study investigated three PRF dimensions based on the PRFQ. Most of the studies ($k = 11$) focused on positive parenting constructs, whereas the remaining studies ($k = 5$) examined negative parenting constructs only or additionally. In the following section, the associations with parenting behaviour will be reported separately for the PRF sub-dimensions. Table 5 shows a simplified summary of the reported associations using PDI-RF coding for a better overview.

Table 5 *Simplified summary of reported associations between PRF and parenting behaviours*

| | PDI-RF coding | | | | | | PRFQ[b] | |
	overall		self-focused		child-focused		pre-mentalizing modes	
Positive parenting								
Sensitivity	Dawson, 2018	ns					Krink, 2018[c]	✓
	Dollberg, 2021	ns						
	Dunckel, 2003	ns						
	Newman-Morris, 2020	ns						
	Perry, 2015	ns						
	Hasselbeck, 2015	✓						
	Suardi, 2020	✓						
Sensitivity to cues			Suchman, 2010	✓	Suchman, 2010	ns		
					Buttitta, 2019	✓		
Social-emotional growth fostering			Suchman, 2010	✓	Suchman, 2010	ns		
					Buttitta, 2019	✓		
Cognitive growth fostering			Suchman, 2010	✓	Suchman, 2010	ns		
Response to distress			Suchman, 2010	ns	Suchman, 2010	ns		
Structuring	Perry, 2015	ns						
Non-intrusiveness	Perry, 2015	ns						
Non-hostility	Perry, 2015	ns						
Positive parenting[a]	Huth-Bocks, 2014	✓						
Positive engagement	Sleed, 2013	✓						
Negative parenting								
Insensitivity	Ensink, 2019	✓						
Disrupted affective communication	Grienenberger, 2005	✓						
	Schechter, 2008	ns						
Hostile/intrusive parenting	Huth-Bocks, 2014	✓						
Controlling	Suardi, 2020	ns						
Unresponsive	Suardi, 2020	ns						

Note. ns = reported associations not significant; ✓ = at least one significant association reported. PRF = parental reflective functioning; PDI-RF coding = reflective functioning coding adapted for the Parent Development Interview-Revised (applied with various interview methods); PRFQ = Parental Reflective Functioning Questionnaire.
[a] Study-defined parenting behaviour. [b] The PRFQ was only used in one study so that only the subscale with significant association is shown in the table due to space restrictions. [c] This study also found nonsignificant associations between Sensitivity and the other two subscales of the PRFQ, namely Certainty about mental states, Interest and curiosity in mental states (not shown in the table due to space restrictions).

Associations with overall PRF

Five out of the seven studies investigating the link between overall PRF with maternal sensitivity found no statistically significant association, including samples with and without psychosocial risk status, a South African at-risk sample, and an Israeli sample including pregnancy risks (Dawson et al., 2018; Dollberg, 2021; Dunckel, 2003; Newman-Morris et al., 2020; Perry et al., 2015). The remaining two studies showed partially mixed findings: Suardi et al. (2020) reported a significant medium-sized positive correlation between overall PRF and sensitivity among mothers with and without IPV-PTSD. The predictive effect of PRF on sensitivity was confirmed in a subsequent multiple regression analysis independent of IPV-PTSD. In a community sample of fathers, Hasselbeck (2015) found that the group with high PRF showed significantly higher paternal sensitivity than those with low PRF, with a large effect size. In subsequent multivariate path analysis, however, PRF showed no significant association with paternal sensitivity.

The overall PRF was not significantly correlated with maternal structuring and non-intrusiveness in two studies with psychosocial high-risk mothers and mothers without risk status (Newman-Morris et al., 2020; Perry et al., 2015). Further, in one of the two studies, the overall PRF was significantly correlated with maternal non-hostility, showing a medium-sized effect (Newman-Morris et al., 2020).

A small-sized positive correlation between overall PRF and positive engagement was found at baseline in an intervention study with high-risk mothers (Sleed et al., 2013). However, the change in PRF from baseline to follow-up was not significantly correlated with the change in positive engagement.

The overall PRF was significantly and positively correlated with another study-defined positive parenting in two different interaction situations (free-play and teaching) among mothers with and without childhood maltreatment, showing small- to medium-sized effects (Huth-Bocks et al., 2014). In the same study, the overall PRF was significantly negatively correlated with maternal hostile/intrusive parenting in only one interaction situation (free-play), showing a small-sized effect. After controlling for sociodemographic factors, a partial correlation between overall PRF and positive parenting in one interaction situation (free-play) was the only one that remained significant. Notably, PRF was assessed at 16 months postpartum after assessing maternal behaviour at 7 months postpartum. The reversed direction of assessing mental and behavioural constructs indicates that mothers who showed more positive parenting also demonstrated higher PRF later on.

The association between overall PRF and maternal disrupted affective communication with their infants was examined in two studies. One of them (Schechter et al., 2008) found no significant association using a linear regression model in a high-risk sample. The other study (Grienenberger et al., 2005) reported a medium-sized negative correlation in a community sample, meaning mothers with higher levels of PRF had shown less disrupted behaviour.

One study investigated the overall PRF and its association with maternal insensitivity using multiple statistical methods in a community sample (Ensink et al., 2019). Besides a small-sized negative correlation, PRF has also shown a significant negative effect on insensitivity in a hierarchical regression model, meaning a higher PRF level predicted a lower insensitivity level. Furthermore, this effect remained significant in a regression-based mediation model, demonstrating that an increase in PRF predicted a decrease in maternal insensitivity.

Associations between overall PRF and maternal controlling behaviour and unresponsive behaviour have shown to be nonsignificant among mothers with and without IPV-PTSD (Suardi et al., 2020).

Associations with child-focused and self-focused PRF

Both maternal and paternal child-focused PRF have shown no significant, independent, or direct associations with sensitivity to child's cues (using a teaching task) in two studies with a high-risk and a community sample, using various statistical methods (Buttitta et al., 2019; Suchman et al., 2010). However, Buttitta et al. (2019) revealed a moderating effect of child-focused PRF on the link between family income and paternal sensitivity to cues, thus linking child-focused PRF indirectly to paternal behaviour. More specifically, family income was positively associated with paternal sensitivity to child's cues only for fathers with low child-focused PRF.

In the same two studies, child-focused PRF has also shown mostly nonsignificant associations with social-emotional growth fostering using various statistical models, except one significant link with paternal child-focused PRF in a path analysis (Buttitta et al., 2019; Suchman et al., 2010).

Child-focused PRF was not significantly related to maternal response to child's distress and cognitive growth fostering, using multiple linear regression analyses in an intervention study with a high-risk sample (Suchman et al., 2010). In the same study, self-focused PRF was not significantly associated with maternal response to distress but was significantly associated with sensitivity to cues, social-emotional growth fostering, and cognitive growth fostering, with small-sized effects. Overall, the child-focused and self-focused PRF have shown almost

opposite effects on maternal behaviours in this study, indicating a positive effect of self-focused PRF on maternal parenting.

Furthermore, the improvement in child-focused PRF has shown a positive, small-sized effect on the improvement in maternal sensitivity, whereas the improvement in self-focused PRF showed no effect in another intervention study with a high-risk sample (Suchman et al., 2018). However, it was unclear whether maternal PRF made a significant contribution independent of the improvement in maternal representation of the caregiving relationship in the statistical model.

Associations with PRFQ dimensions

One study closely examined dimensions of the PRFQ and maternal sensitivity in an at-risk sample during the play and the re-engagement episode of the SFP separately (Krink et al., 2018). Although no significant correlation between the constructs could be found in each SFP episode separately, the results showed a significant, small-sized correlation between pre-mentalizing modes and decreased maternal sensitivity between the two SFP episodes. The decrease of maternal sensitivity indicated the effect of emotional distress induced by the re-engagement after a still-face situation. Further, the certainty and the interest subscales were not significantly correlated with maternal sensitivity.

Summary of the reported associations

Overall, only a few studies have investigated the association between PRF and negative parenting behaviours. For both positive and negative parenting constructs, the effect sizes of the association with PRF and its sub-dimensions are mainly small to nearly medium. Only one study found a large-sized effect (Hasselbeck, 2015), while two studies found medium-sized to nearly large-sized effects, all using bivariate statistical methods (Ensink et al., 2019; Grienenberger et al., 2005; Newman-Morris et al., 2020). Six studies reported associations based on both bivariate and multivariate statistical methods, of which over half of them revealed a considerable alteration of the bivariate effect (Buttitta et al., 2019; Hasselbeck, 2015; Huth-Bocks et al., 2014; Newman-Morris et al., 2020). The altered effects highlight the relevance of other influencing factors. Moreover, the child-focused and self-focused PRF have shown differentiated effects depending on the study setting.

2.2.4 Influencing factors on the associations

A substantial effect of contextual factors was particularly well demonstrated by Buttitta et al. (2019). In their study, the association between paternal PRF and parenting only turned

significant when controlled for maternal PRF (measured the interest subscale of the PRFQ) and sociodemographic factors such as paternal education level, age, and family income. Additionally, maternal PRF was positively linked with paternal sensitivity to cues ($b = .44$, $z = 2.32$, $p = .02$), on which paternal PRF did not show a significant effect. Moreover, paternal sensitivity to cues was associated significantly with the interaction between child-focused PRF and family income, which was not the case for paternal social-emotional growth fostering (Buttitta et al., 2019). In another study, the correlation between PRF and maternal behaviour was markedly reduced when controlled for family income and maternal age, although the effect with positive parenting appeared to be more robust (Huth-Bocks et al., 2014).

The potential effect of differences in observation settings was shown in two studies. The findings by Krink et al. (2018) indicate a stronger association between concurrent PRF and parenting behaviour under emotional distress. In contrast, the findings by Huth-Bocks et al. (2014) indicate a stronger association between preceding maternal positive parenting under less emotional distress (free-play versus teaching task) and PRF measured nine months later.

The included study from South Africa indicated that differences in the effect size and significance level of the correlations between PRF and maternal sensitivity could be grounded in the cultural implications of the assessment methods (Dawson et al., 2018). By comparing two different measurements of maternal sensitivity, the authors reported a near-significant, nearly medium-sized association of PRF with sensitivity assessed by Ainsworth's original scale, while the small-sized association with sensitivity assessed by MBQS-mini was far from reaching the significance level. Despite the substantial overlap between the two coding schemes, the MBQS-mini contains detailed criteria regarding culturally specific aspects of the interaction, such as verbal responsiveness, whereas Ainsworth's original scale offers a more holistic picture of maternal sensitivity (Mesman & Emmen, 2013).

The majority of the included samples consisted of mothers related to certain psychosocial risk factors, indicating differences between sample types. Using the same behavioural assessment, Grienenberger et al. (2005) showed a nearly large-sized correlation between PRF and maternal behaviour in a community sample, whereas Schechter et al. (2008) found no significant association in a high-risk sample of mothers exposed to interpersonal violence. The latter study suggested, among other things, that the absent association could be related to the overly low variability of PRF and maternal behaviour that were both indicating low PRF and low parenting quality in their high-risk sample. Moreover, Buttitta et al. (2019) found positive effects of child-focused PRF on parenting behaviours in a community sample of fathers. In contrast, child-focused PRF showed no significant effects on the same parenting

behaviour constructs (assessed using the same instrument) in a high-risk sample of substance-using mothers (Suchman et al., 2010). Instead, self-focused PRF in the high-risk sample had shown a positive effect on maternal behaviours. The authors argued that the self-focused questions in the PDI-R refer to difficult affective experiences and are therefore emotionally more challenging than the child-focused questions. Since substance use can be understood as a dysfunctional way of emotion regulation, reflecting these questions could be a more vital and meaningful mental capacity in the association with parenting behaviour among parents with substance use problems.

Nonetheless, two direct comparisons between at- or high-risk and comparison groups showed no significant difference in the association between PRF and maternal behaviours. Perry et al. (2015) compared PRF and maternal behaviours in a high-risk group of substance-abusing mothers and a comparison group without current substance use problems. Their results indicated no significant group differences regarding neither PRF nor parental behaviour. Suardi et al. (2020) compared mothers with and without IPV-PTSD and also found no significant difference in the association between PRF and maternal behaviour. However, both studies had small sample sizes that did not allow more complex statistical analyses for additional exploration.

As part of psychosocial risks, parental psychopathology is also related to PRF and, therefore, potentially impacts parenting behaviour. While one of the studies linked pre-mentalizing modes with maternal postpartum depression ($r = .44$, $p = .001$), another study demonstrated a paradoxical positive link between higher levels of BPD features and PRF ($r = .47, p < .01$) potentially due to hypermentalizing, which is relatively typical for BPD (Krink et al., 2018; Newman-Morris et al., 2020). Nonetheless, the latter study additionally demonstrated a buffering moderating effect of PRF in interaction with distorted maternal representations on maternal non-hostility (Newman-Morris et al., 2020).

Lastly, the two studies using paternal community samples showed relatively low levels of PRF compared to maternal samples and limited findings on its effect on paternal behaviours (Buttitta et al., 2019; Hasselbeck, 2015).

2.3 Discussion Study I

This systematic review synthesised empirical studies on PRF and its association with parenting behaviours during infancy and early childhood. Besides statistical data on the strength and direction of the associations, this review also summarised the assessment instruments and addressed other contextual factors that have shown a substantial influence on the associations.

Although most of the studies examined the overall PRF, three studies focused on its sub-dimensions. Further, there were various parenting behaviours, the majority of which can be categorised as positive parenting. In total, there were more results on parental sensitivity than on other behaviours. Most of the studies ($k = 10$) reported significant associations between PRF and parenting behaviours in the theoretically expected directions, with small- to medium-sized effects, using various statistical methods.

Nonetheless, the associations varied considerably depending on the PRF sub-dimensions, different observation settings, environmental factors, and sample types. Specifically, compared to lower distress conditions, there are indications that the association between PRF and parenting behaviours tends to be more robust under emotional distress as well as in more difficult life circumstances with less socioeconomic or emotional resources. Furthermore, PRF sub-dimensions assessed using PDI-RF seem to have different effects depending on sample characteristics.

2.3.1 Multidimensionality of PRF in association with parenting quality

Several studies indicated that the link between PRF and parenting varied depending on the dimensionality of PRF. The sub-dimensions of PDI-RF differentiate the relational focus and contain more dynamic aspects of the relationship, whereas the PRFQ dimensions aim to measure more generic key features of PRF representing mental processes that are already considered in the PDI-RF coding (Luyten, Mayes, et al., 2017).

Regarding the PDI-RF sub-dimensions, two intervention studies revealed that the predicting effect of the self-focused and child-focused PRF on parenting quality varied depending on whether the intervention effect was taken into account. Specifically, without the intervention effect, only higher *self-focused* PRF in high-risk mothers was linked with higher parenting quality, whereas only the improvement of *child-focused* PRF through mentalization-based intervention predicted a behavioural improvement (Suchman et al., 2018; Suchman et al., 2010). One related issue to these findings could be a difference in the rate of change for PRF and parenting behaviour (Sleed et al., 2013). More specially, behavioural changes may take longer to become evident than changes in PRF (Barlow et al., 2020). Accordingly, it would be necessary to adjust the interval and frequency of post-treatment follow-ups to determine whether and how the changes in both constructs are related to each other. For more frequent follow-up assessments, new instruments developed for less time-consuming PRF assessments could be helpful, such as the Mini-PRFI described earlier or the Reflective Functioning Five Minute Speech Sample that is currently being validated (Adkins et al., 2021). Moreover, the difference in the rate of change could also apply to the self-focused and child-focused

dimensions of PRF, especially since self-focused PRF contains complex reflections upon mothers' own negative emotional experiences that could be particularly difficult for high-risk mothers to assess.

The included study using the PRFQ (Krink et al., 2018) indicated a specific role of pre-mentalizing modes in the association with maternal sensitivity under emotional distress in their clinical sample. This finding is in line with the conceptualization of pre-mentalizing modes being characteristic for parents with RF impairments that are often associated with a variety of psychopathology (Luyten, Mayes, et al., 2017). Moreover, a higher level of maternal pre-mentalizing modes has been previously linked with children's early regulatory problems and parenting stress (Georg et al., 2018). Taken together, this indicates the specific adverse impact of the non-mentalizing stance for less sensitive parenting in clinical samples with disruptions in the early mother-child relationship. These mothers might have difficulties "to enter into the subjective world of the child" (Luyten, Mayes, et al., 2017) due to the present symptoms or the stress induced by the symptoms of themselves or their infants. This reflective difficulty manifested as pre-metalizing mode could become one of the crucial factors influencing maternal behaviour.

It should be noted that there are methodological issues related to the factorial structures of the PDI-RF and the PRFQ. Inconsistency exists regarding the PDI-RF sub-dimensions. The two-factor model applied in our included studies was only developed in a small high-risk sample with relatively low internal consistency (Suchman et al., 2018; Suchman et al., 2010) and did not entirely fit other samples (Borelli et al., 2016; Buttitta et al., 2019). Besides the two-factor model, another three-factor model additionally contains a relation-focused dimension (Smaling, Huijbregts, van der Heijden, et al., 2016). Thus, the effect of the improved child-focused PRF on maternal behavioural change through the intervention mentioned above could also be understood as an improved maternal understanding of not only their infants' internal states but also the interactional processes with their infants.

Furthermore, the focus of parental reflection during the PDI-R is not limited to the focus of the interview questions. Parents could reflect upon both their own or their children's mental states at any time throughout the interview, and the PDI-RF coding takes both aspects into account. For example, if a mother was asked whether her child ever felt rejected, she could also talk about her own feelings or thoughts related to this question without details about her child's possible mental states. Thus, it is difficult to determine whether a higher score on the self-focused or child-focused interview question is also qualitatively connected to the parent's reflection with the respective focus.

In the case of the PRFQ, the structural validity of many available language versions is still unknown, including the version used in the included study (Krink et al., 2018). Specifically, studies indicate that the original three-factor structure could not be consistently confirmed in some language versions (Lee et al., 2020; Pajulo et al., 2018). Additionally, the internal consistencies of the subscales were partly low or questionable in previous studies (Burkhart et al., 2017; Georg et al., 2018; Krink et al., 2018). Differences in factorial structures might imply cultural differences and shed light on further details of the associations between PRF and parenting behaviours.

2.3.2 Associations with positive and negative parenting

Nearly all of the parenting observation instruments in this review had a theoretical background related to attachment theory. Although many were labelled differently, most of the behaviours were directly or indirectly related to the broader concept of parental sensitivity, which has been defined and operationalised beyond the original conceptualisation by Mary Ainsworth in past research (Mesman & Emmen, 2013). Since the labelling of parenting behaviours varies depending on theoretical context and operationalisation, the constructs were only referred to as they were labelled in the respective instruments.

In summary, 14 parenting behaviours were examined. Most of the findings across all included studies were on parental sensitivity. Statistically significant associations were found between PRF and most behaviours, except structuring, non-intrusiveness, response to distress, controlling, and unresponsiveness.

Studies in the current review indicate that PRF and its sub-dimensions were generally positively associated with positive parenting behaviours (e.g., sensitivity, social-emotional growth fostering, non-hostility) and negatively associated with negative parenting behaviours (e.g., disruptive affective communication, insensitivity). The reported effects were mainly small. However, negative parenting constructs were rarely examined. Only maternal insensitivity has shown the most robust significant association with PRF using multiple statistical methods (Ensink et al., 2019). Further, the two included studies examining both positive and negative behaviours demonstrated only significant links between PRF and positive parenting behaviours (Huth-Bocks et al., 2014; Suardi et al., 2020). This finding is in line with a study on prenatal PRF, in which the predictive effect of PRF has only been shown to be significant on positive parenting behaviour in multivariate analyses despite the significant bivariate correlations with both positive and negative parenting behaviours (Smaling, Huijbregts, Suurland, et al., 2016). Nonetheless, even with parental sensitivity, most of the included studies found none or limited associations. Although somewhat unexpected, this

finding is in line with the variations in effect sized due to inconsistent sensitivity measures described by Zeegers et al. (2017) and the "loose coupling" between parental attachment security, PRF, and parental sensitivity described by (Luyten, Nijssens, et al., 2017), indicating influence from other related factors.

2.3.3 Contextual factors

The findings highlight that further personal and environmental factors could substantially influence the associations between PRF and parenting behaviours. In many included studies, the significance and effects of the associations differed between bivariate and multivariate analyses.

Notably, the interaction effect between paternal PRF and family income was only shown in association with sensitivity to child's cues and not with social-emotional growth fostering (Buttitta et al., 2019). Sensitivity to child's cues in the NCAST Teaching Scale measures how parents can structure the task for their children and respond to their children's interactive cues. Thus, Buttitta et al. (2019) argued that this behaviour captures a rather cognitive capacity in the parent-child interaction that might be more affected by socioeconomic hardship than social-emotional growth fostering. Similarly, PRF is related to cognitive capacities such as executive function and can be impaired by chronic stress (Yatziv et al., 2020). There is also evidence of a negative link between PRF and long-term unemployment, which is related to social exclusion and isolation (Sleed et al., 2020). Taken together, PRF can show a protective effect against the negative impact of socioeconomic hardship on specific parenting behaviour, while the overlap of cognitive aspects of PRF and specific parenting behaviour could particularly interact with the parental socioeconomic environment.

Moreover, the link with the partner's PRF indicates a complex interplay between maternal and paternal PRF in predicting parenting behaviour, which should yet be further investigated (Cooke et al., 2017). For example, recent studies demonstrated the relevance of parents' RF when reflecting on the couple relationship and the triadic interaction between both parents and the child to be connected with PRF, indicating mutual influences from mothers and fathers (Borelli, Slade, et al., 2020; León & Olhaberry, 2020).

Further, the cultural background needs to be considered. The difference between two behavioural measures in association with PRF (Dawson et al., 2018) is in line with empirical findings of cultural differences regarding parental mentalization and parent as well as child factors in the assessment of attachment-related behaviours (Dai et al., 2019; Voges et al., 2019). Particularly in collectivistic cultures, the significant meaning of others' minds and appropriate

behaviour according to social expectation in parenting context have shown to be different than in individualistic cultures (Aival-Naveh et al., 2019; Fujita & Hughes, 2021; Lee et al., 2020).

The observational setting is another important contextual factor. It can be assumed that PRF is stronger related to parenting behaviour measured in emotionally more challenging situations. The context-specific nature of mentalizing ability suggests that PRF would increase with a moderate level of emotional arousal and decrease if the arousal becomes critically stressful (Fonagy & Luyten, 2009). Thus, PRF can be a protective factor in case of moderate child distress or parenting stress. This protective effect was partly supported by one of the included studies (Krink et al., 2018). Especially a direct effect of interactional distress on maternal behaviour appears to be related to PRF. This finding highlights the regulatory effect of PRF, particularly because parental sensitivity has shown to be lower in less naturalistic interaction situations (Branger et al., 2019), so that higher parental mental capacity is required. In a moderately distressed situation under less naturalistic conditions, reflective parents would cope better and not be overwhelmed by their own heightened emotions, as other experimental studies have demonstrated (Rutherford et al., 2015; Rutherford et al., 2013). There is evidence that this is even the case for prenatal PRF (Smaling, Huijbregts, Suurland, et al., 2016). The findings by Huth-Bocks et al. (2014) indicate a more robust association between PRF and maternal behaviour in free-play situation than teaching task, though the reversed assessment time points for PRF and parenting behaviour limit the interpretability of this result. Overall, the findings highlight the importance of observation settings to identify underlying patterns of the association between PRF and parenting quality.

2.3.4 Sample types as an influencing factor

In the context of early parenting, at- or high-risk samples often involve histories of early adversity or trauma, substance use, psychopathology, and poverty, which are linked with RF impairment (Luyten, Mayes, et al., 2017; Slade et al., 2019). Especially in early childhood at the age of 0–5 years, the child's high level of dependency could activate emotional difficulties in parents with their own inner conflicts, leading to lower parenting quality. Although the two direct comparisons between at-risk and comparison groups in this review showed no significant difference (Perry et al., 2015; Suardi et al., 2020), group comparisons might reveal different associations when PRF sub-dimensions are taken into account. For example, there is evidence of an indirect effect of psychosocial risk factors on maternal parenting through prenatal PRF (Smaling, Huijbregts, Suurland, et al., 2016). Besides the effect of financial hardship mentioned above, the effects of psychosocial risks were not investigated directly in the included studies.

Furthermore, although PRF affects parenting independent of parental psychopathology, impairments in mentalizing ability are linked to most forms of mental disorders (Luyten et al., 2020; Rostad & Whitaker, 2016). The included studies showed that the association between PRF and parental psychopathology is also likely to vary depending on the type and severity of psychopathology (Krink et al., 2018; Newman-Morris et al., 2020). Besides the reported paradoxical positive link between BPD features and PRF, there is also evidence that ordinary maternal postpartum blues might promote the development of early mother-infant attachment, in which the PRF is conceptually embedded, due to heightened maternal emotional sensitivity and related dyadic reciprocity (Bydlowski et al., 2013). On the other hand, another included study hypothesised that PRF might not be directly associated with parenting behaviour when severe psychopathology is present (Schechter et al., 2008). Instead, maternal mental representation could be more directly associated with parenting behaviour in this context (Newman-Morris et al., 2020; Schechter et al., 2008).

Moreover, in at- or high-risk samples, the limited variance and non-normal distribution of the PDI-RF scores are relevant (Sleed et al., 2020). Findings suggest that an effect in the association could be hard to find when study samples show a limited range of PRF scores due to related psychosocial risk factors (Schechter et al., 2008). Low levels of PRF are commonly observed in high-risk samples such as mothers with substance abuse (Adams, 2020; Hakansson et al., 2018), leading to difficulties detecting statistical effects. Nonetheless, maternal adult RF has shown mediating effect on the link between maternal experience of childhood maltreatment and substance use severity (Macfie et al., 2020). Thus, the improvement of PRF might also help high-risk mothers in their self-regulation to process adverse early experiences. It might be meaningful to apply different measures of different types of maternal mentalizing ability to detect this effect.

Finally, maternal and paternal samples should be recognised as having partially distinct patterns of association between PRF and parenting. Differences between mothers and fathers in levels of PRF and interaction patterns with the infant were also found in other studies (Cooke et al., 2017; Feldman, 2003; Pajulo et al., 2015; Pazzagli et al., 2018). The differences between maternal and paternal samples are consistent with previous studies showing an independent attachment relationship between an infant and each parent (Fonagy & Target, 1997; van IJzendoorn & De Wolff, 1997). The lower PRF level in fathers compared to mothers could be partially linked with differential socialisation regarding the gender role, resulting in lower emotional awareness and expression among men (Cooke et al., 2017). Nevertheless, paternal RF shows a unique influence on child development (Benbassat & Priel, 2015). Societal

circumstances and gender role expectations (e.g., possibility of paternity leave, role as financial provider) should be considered while investigating paternal PRF and parenting, such as the amount of time spent with the child directly (Brown et al., 2012).

2.3.5 Strengths and limitations

The current review has several strengths and limitations. This is the first systematic review focussing on the specific construct of PRF and a variety of parenting behaviours to analyse potential underlying patterns of their associations. Further, the consideration of the assessment instruments enables not only a deeper understanding of the associations but also valuable methodological orientations for future research. Additionally, the current review included different sample types to reveal meaningful differences in the investigated association in various study settings. Nonetheless, this could be seen as a limitation of this review at the same time due to potential confounders related to the sample types. To keep the research question focused, parental behaviour that could not be separated from child behaviour were not included, such as synchrony or dyadic attunement. This approach, however, limits the interpretation of the current findings since the child's perspective is also important in this context. Regarding the systematic search, grey literature sources could only be considered to a limited extent to help reduce reporting bias. On the other hand, including grey literature could also introduce bias (regarding representativity of the sample or methodological quality). Further, the methodological quality assessment has been adapted to the research context and does not represent a definite rating of the study qualities. Lastly, only two studies were conducted in a non-western country, although studies from several European countries, Australia, New Zealand, and the USA were included. Hence, the cultural generalizability of the current findings is limited.

3. Study II: Differentiating PRF and MM – Associations with maternal psychosocial functioning and recalled parenting by own mother

This study addressed the relation between two constructs of parental mentalization (PRF and MM) and their psychosocial correlates while taking mothers' early experience with their own mother into account. Previous findings described earlier (see Chapters 1.1.3 and 1.1.4) have shown the relevance of assessment methods that reflect fine-grained differences on the theoretical level. Thus, Study II assessed PRF using the standard interview method and MM using observation and interview methods reflecting observed and representational MM,

respectively. Moreover, observed MM included two indicators, namely appropriate and non-attuned MM.

The first aim of this study was to investigate the relations between PRF and MM indicators. It was hypothesised that PRF would be positively associated with MM, meaning higher levels of PRF would be linked with higher scores of representational and appropriate MM and lower scores of non-attuned MM.

The second aim was to broaden the understanding of PRF and MM and their potential associations with other maternal characteristics, including maternal psychosocial functioning (emotion dysregulation, parenting efficacy, and current mood) and recalled parenting by own mother. Besides representational MM, only appropriate MM was investigated for this aim since non-attuned MM represents an independent dimension of observed MM with distinct correlates. For PRF, it was hypothesised that emotion dysregulation would show negative and recalled parenting by own mother as optimal would show positive predictive relevance. For MM, it was hypothesised that parenting efficacy and recalled parenting by own mother as optimal would show positive predictive relevance. The associations with maternal current mood (i.e., depression and anxiety) were explored.

3.1 Methods Study II

3.1.1 Study design and participants

This study utilised a longitudinal, mixed methods[10] design with two assessment points from the PAULINE study: 3 weeks (T1) and 7 months (T2) postpartum. The data were collected from mid-2016 to early 2019. Besides self-report questionnaires, an interview and a laboratory behavioural observation were used. Participants of the PAULINE study were recruited upon initial presentation for their birth registration at the university medical centre after referral by their obstetrician or midwife in the third trimester of pregnancy. Pregnant women were included if they had a singleton pregnancy and sufficient German language skills. Mother-infant dyads were excluded if they met any of the following criteria: maternal chronic infections, substance abuse, or severe pregnancy complications, and premature birth ($< 37^{th}$ week of pregnancy) or very low birth weight (2500g).

The subsample for this dissertation project originally consisted of 80 healthy mother-infant dyads, from which three mothers only gave consent for the questionnaire-based survey

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[10] There are a number of definitions for the term *mixed methods*, which is used here to refer to the combination of qualitative and quantitative approaches in the research method, data collection and analysis procedures (Johnson et al., 2007).

and were therefore excluded from this study involving interview and behavioural data. Of the remaining 77 mothers, one did not provide sufficient data. Hence, the participants were $N = 76$ healthy mother-infant dyads. For the outcome measures at T2, 13 mothers did not participate in the interview mainly due to scheduling difficulties, and 12 mother-infant dyads had no video material on the free-play interaction due to missing lab visit, infant fussiness during the lab visit, or because the mother spoke a language other than German with the infant.

The age of the mothers ranged from 24 to 43 years old ($M = 33.91$, $SD = 3.23$) at study intake. The age of the infants ranged from 6 to 10 months ($M = 7.03$, $SD = 0.68$) at T2. Overall, the majority of the mothers were well educated and had an average to high household income. Over half of the infants were reported as firstborn and male. Details of the sociodemographic and obstetric characteristics are listed in Table 6. All the mothers were the primary caregiver of their infants.

Table 6 *Sociodemographic characteristics of study participants*

Variable	*n*	*n* (%)
Parity	76	
Primiparous		41 (53.9)
Multiparous		35 (46.1)
Planned pregnancy	71	
Planned		56 (78.9)
Unplanned		15 (21.1)
In a romantic relationship at T0	73	72 (94.7)
Educational level at T0	74	
Main or middle school		4 (5.4)
High school		14 (18.9)
University degree		56 (75.7)
Monthly household income[a] at T0	74	
≤ 1000 €		1 (1.4)
1001–2000 €		5 (6.8)
2001–4000 €		17 (23.0)
≥ 4001		51 (68.9)
Infant gender	76	
Female		33 (43.4)
Male		43 (56.6)

Notes. T0 = third trimester of pregnancy (at study intake).
[a] Household net income including child benefit.

3.1.2 Procedure

The participants filled out a set of questionnaires that were sent by post at each assessment point. At T2, the mothers were contacted by email to schedule a 90-minute lab visit at the university medical centre. During the lab visit, a 15-minute free-play session between mother and infant was conducted and videotaped. An interview for the PRF assessment was

then scheduled and administered with the mothers via home or lab visit. The interview had a duration of approximately 1 hour on average. In two cases, the interview was conducted by telephone. The participants were not compensated financially. As a token of gratitude, the participants were given a small bag of mother-infant products at each assessment point.

3.1.3 Measures

Primary measures

Mothers' PRF was assessed at T2 using the PDI-R short version (Slade, Aber, et al., 2004). The translation was based on an existing German version of the interview with minor adaptations (Müller-Göttken et al., 2014; Stuhrmann et al., 2017). The semi-standardised interview consists of 29 questions on the mother's (a) perception of her infant as well as her relationship with her infant (e.g., "Describe a time in the last week when you and [child's name] really 'clicked'."), (b) experience of her own motherhood (e.g., "What gives you the most pain or difficulty in being a parent?") and (c) with her own parents (e.g., "How do you think your experiences being parented affect your experience of being a parent now?"). The questions were divided into permit and demand questions, meaning questions that permit (but do not explicitly ask) and questions that require the parent to demonstrate RF capacity. Following the PDI-RF coding procedure, only the 14 demand questions were coded (Slade, Bernbach, et al., 2004). Four general categories of PRF and respective subcategories (not listed here) were considered: (A) Awareness of the nature of mental states, (B) The explicit effort to tease out mental states underlying behaviour, (C) Recognising developmental aspects of mental states, and (D) Mental states in relation to the interviewer. During a first read-through, mental state words that indicate mental experience were identified (e.g., think, want, worried, happy). With this first impression of the whole interview, demand questions were coded in-depth during a second read-through. Here, the focus was to determine whether the parent indeed mentalized (i.e., reflected on mental states). A PDI-RF code was assigned if the parent demonstrated mentalization according to any of the (sub)categories. Each demand question was assigned a score based on the number and quality of the identified subcategories. The overall PRF score was assigned based on the judgment of the coder supported by scores of all the demand questions and a set of descriptions about PRF capacity for each scale point to reflect the parent's most typical level of mentalization. The score ranges on an 11-point scale from –1 (*negative or bizarre PRF*) to 9 (*exceptional PRF*), with a score below 5 reflecting negative to limited PRF and a score of 5 or above reflecting moderate to high PRF. The interviews were audiotaped and transcribed verbatim following a set of adapted transcription rules based on Kuckartz et al. (2008). All the

transcripts were controlled by at least one person other than the transcriber and then coded by the doctoral candidate (LYS), while 27% of the transcripts were double coded by a second coder (also a psychology doctoral candidate at the time) who was blind to the participants' information. Both coders had a research background related to psychoanalytic theories and were trained in PDI-RF coding at the Anna Freud Centre in London, UK, with good to excellent reliability. After an initial set of coding with discussions between the coders, the interviews were coded independently. The inter-rater agreement for the PDI-RF total score was good (ICC = 0.74). For exemplary excerpts from the coded interviews, see Appendix II.

Maternal MM was assessed using two assessment methods to capture different aspects of MM and to help understand the potential link between maternal mental representation and behaviour in this context. The observation method captures both representational and behavioural processes, while the interview method is purely representational (see Figure 2).

Observed maternal MM was assessed at T2 using a videotaped 15-minute free-play situation during the lab visit. The mothers were instructed to play with their infants in a way they would usually do at home. A set of age-appropriate toys was provided. The mother-infant dyads were mostly positioned in the centre of the room but were free to move around if they wanted. One person of the research team stayed in the corner of the room to operate a portable camera without directly looking at the mother-infant dyads throughout the play session. This setting was inevitable to ensure the quality of the video materials due to technical issues. Observed MM was coded following the manual by Meins and Fernyhough (2015). Maternal speech during the play sessions was transcribed verbatim and divided into separate comments. Potential mind-related comments were identified during a first read-through of the transcript. A comment is mind-related if it (a) includes an explicit internal state term to comment on what the infant may be thinking, experiencing, or feeling or (b) reflects the parent talking on the infant's behalf. Mind-related comments typically include the infant's desires, preferences, cognitions, or emotions. Subsequently, the coder assigned the mind-related comments as appropriate and non-attuned according to the behavioural observation during a second read-through while watching the video material. Appropriate mind-related comments reflect the infant's current internal state linked with the infant's activity (e.g., "Which one do you want to play with?" when the infant was looking back and forth between several toys). Non-attuned mind-related comments do not match with or are unrelated to the infant's current activity (e.g., "Do you want to roll over?" when the infant was engaged in playing and showed no sign of wanting to roll over). Scores for both observed MM indicators were calculated as the proportion of the total comments made by the mother during the interaction to control for verbosity. All

the transcripts were controlled by at least one person other than the transcriber and coded by the doctoral candidate who was trained by Professor Elisabeth Meins at the University of York, UK. Over half of the transcripts (52%) were double coded by two psychology students who were trained by the doctoral candidate and blind to the participants' information. After coding an initial set with discussions, especially regarding language differences, the transcripts were coded independently. The inter-rater reliability was excellent (ICC = .93 for the number of appropriate mind-related comments, ICC = .98 for the number of non-attuned mind-related comments). For exemplary excerpts from the coded interaction transcripts, see Appendix III.

Representational maternal MM was also assessed at T2 using one permit question from the PDI-R: "I'd like to begin by getting a sense of the kind of person your child is. So, could you get us started by choosing three adjectives that describe your child?" Each of the adjectives was followed up by an additional question: "Does an incident or memory come to mind with respect to [adjective]?". The MM coding procedure was adapted due to language differences and the alternative interview question compared to the original entirely open-ended question "Can you describe [child's name] for me?" (Meins & Fernyhough, 2015). During a first read-through, each attribute and examples the mother used to describe the infant was marked and classified into one of the four categories: (a) mental (e.g., "She is curious." or "So he tries to understand, I think, what is that and how does that work."), (b) behavioural (e.g., "She is active." or "He laughs a lot."), (c) physical (e.g., "She is teething at the moment." or "He is a typical second child."), and (d) general (e.g., "He is very sweet."). If an example for an attribute includes several infant behaviours to illustrate a related situation, the single behaviours were not separated into different behavioural attributes because the single behaviours added no additional aspect to the description if separated. For instance, a participant described her daughter as "funny" and used an example to illustrate this attribute: "*She throws the ball*, and I fetch it and carefully throw it back to her. Then *she always laughs*. And *she always throws it again*.". The three single behaviours (in italic) only make sense when treated as a whole in the described situation and are therefore counted as one behavioural attribute. The coded attributes were double-checked in a second read-through. *Mental attributes* are the representational MM indicator, which was calculated as a proportion of the total attributes used by the mother to control for verbosity. The transcripts were all coded by the doctoral candidate, while 48% was double coded by a trained psychology student who was blind to the participants' information. The inter-rater reliability was excellent (ICC = 0.98 for the total number of attributes and the number of mental attributes). For an example of coded interview transcripts, see Appendix IV.

Secondary measures

Sociodemographic information was assessed via self-report at each assessment point, including socioeconomic status, relationship status, and obstetric history, as reported in Chapter 3.1.1.

Maternal psychosocial functioning included maternal emotion dysregulation, parenting efficacy, and current mood (depression, state anxiety).

Maternal recalled parenting by own mother during the first 16 years of life was assessed at T1 using the Parental Bonding Instrument (PBI; Parker et al., 1979). It consists of 25 items, assessing the dimensions of *Care* (12 items, e.g., "Enjoyed talking things over with me") and *Overprotection* (13 items, e.g., "Tried to control everything I did"). The items are rated on a 4-point scale ranging from 0 to 3. Higher scores indicate higher levels of recalled care or overprotection by own mother. Using the established cut-off values by Parker (1983) for the subscales Care (27.0) and Overprotection (13.5), the participants were categorised into four groups: optimal parenting (high care and low overprotection), affectionate constraint (high care and high overprotection), affectionless control (low care and high overprotection), and neglectful parenting (low care and low overprotection). Subsequently, the groups were combined into two higher categories, *optimal parenting* and *non-optimal parenting* (including the three categories other than optimal). The term "non-optimal" was chosen according to previous research that used this approach (Kooiman et al., 2004). This term further implies that it includes categories that are merely not the "optimal" category. The high stability of the PBI has been shown in previous research (Mackinnon et al., 1989). The internal consistency in the current study was excellent (Cronbach's α = 0.91 and 0.90 for care and overprotection, respectively).

Emotion dysregulation was assessed at T1 using the subscale *Lack of emotional awareness* of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). This subscale was chosen based on its close connection to PRF capacity on the conceptual level (i.e., emotional awareness as the first step of mental reflection). The subscale consists of 6 items measuring the tendency to be attentive to and acknowledge one's own emotions (e.g., "I pay attention to how I feel." or "When I'm upset, I believe my emotions are valid and important."). The rating scale ranges from 1 to 5 and is reversed to calculate the sum score. Higher scores indicate higher levels of lack of emotional awareness. The internal consistency in the current study was good (α = 0.84).

Parenting efficacy was assessed at T2 using the same-named subscale of the Parental Sense of Competence (PSOC; Johnston & Mash, 1989). The subscale consists of 7 items (e.g.,

"If anyone can find the answer to what is troubling my child, I am the one.") to measure a parent's perceived competence in their parenting role. The 6-point rating scale ranges from 1 to 6. Higher scores indicate higher levels of parenting efficacy. The internal consistency in the current study was acceptable ($\alpha = 0.73$).

Depression was assessed at T2 using the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987). It consists of 10 items to measure depressive symptoms in women in the perinatal period. The 4-point rating scale ranges from 0 to 3. Higher scores indicate higher levels of depression. A cut-off value of 11 was identified in a recent meta-analytic study with maximised sensitivity and specificity, indicating an elevated risk for a mild depressive disorder (Levis et al., 2020). The internal consistency in the current study was good ($\alpha = 0.84$).

State anxiety was assessed at T2 using the same-named scale of the State-Trait Anxiety Inventory (STAI-S; Spielberger et al., 1970). State anxiety is a transient emotional state characterised by feelings of tension, apprehension, and nervousness. The scale consists of 20 items rated on a 4-point scale ranging from 1 to 4. Higher scores indicate higher levels of state anxiety. A cut-off value of 40 is established to detect an elevated risk for anxiety disorders. The internal consistency in the current study was excellent ($\alpha = 0.92$).

3.1.4 Statistical analysis

To examine correlations between all included study variables and to examine the relation between PRF and MM, Pearson's *r* was applied for continuous variables, Spearman's ρ for skewed and ordinal variables, and point-biserial correlations for dichotomous categorical variables. Hierarchical multiple regression analyses with block-wise entry were applied to examine the associations between mothers' parental mentalization, psychosocial functioning, and recalled parenting by their own mother. In step 1, emotion dysregulation (for PRF) or parenting efficacy (for MM indicators) was tested. In step 2, maternal depression and state anxiety were added. Finally, in step 3, recalled parenting by own mother was added. Regression diagnostics using residual statistics and scatterplots showed satisfying results regarding the assumptions of normality, linearity, and homoscedasticity. Values of the standardised DFBeta indicated no potential multivariate outliers. Unstandardised *b* coefficients were reported. R^2 was reported for the single regression steps, while adjusted R^2 was reported for the regression models. Associations were considered significant at $p < .05$ (two-tailed). Effect sizes for significant predictor variables and variables with a not negligible effect size were reported with η^2_p, with values of .01 indicating a small-sized, .06 a medium-sized, and .14 a large-sized effect.

Regarding statistical power for the regression analyses, at least $n = 85$ mother-infant dyads were needed to identify an expected minimum overall effect of medium size with a power

of 80% (calculated using G*Power 3.1.9.6; Faul et al., 2009). Therefore, the findings of the regression analyses were slightly underpowered (75%).

Missing data analysis showed that the sample size would reduce by 33% with listwise deletion. Because complete case analysis could result in statistical bias and substantial data were available for all participants, the missing data were handled according to standard practice and recommendations (Graham, 2009). First, single missing values in the self-report data were imputed on the item-level using the Expectation-Maximisation algorithm. Second, patterns of missing values were analysed on the scale-level, showing 1–17% of missing data, mainly in the variables PRF and MM. Comparisons regarding sociodemographic and obstetric variables (maternal age, education, relationship status, household income, planned pregnancy, parity, and infant gender) between incomplete and complete cases using t and χ^2 tests showed no statistically significant differences. Finally, the dataset was completed using the multiple imputation method on the scale-level with $m = 35$ imputations (fully conditional specification), including all variables analysed in this study (Graham, 2009; White et al., 2011). Pooled statistics following Rubin's rule were reported (Rubin, 1987). For explained variance and significance level of the overall models and effect sizes in multiple regression analyses, median values across all imputations were reported. All statistical analyses were conducted using IBM SPSS Statistics for Macintosh (Version 26).

3.2 Results Study II

3.2.1 Descriptive statistics and preliminary analyses

Table 7 shows the descriptive data for all study variables of the original dataset. The scores of the variables PRF, representational MM, appropriate MM, and emotion dysregulation were normally distributed. The scores of non-attuned MM, depression, state anxiety, and recalled overprotection by own mother were positively skewed (mainly from low to moderate), whereas the scores of parenting efficacy and recalled care by own mother were negatively skewed (mainly from moderate to high). Approximately 9% ($n = 7$) of the participants reported a depression score, and 21% ($n = 16$) reported a state anxiety score above the respective cut-off values. Using the combination of cut-off values for recalled care and overprotection by own mother, the recalled parenting by own mother was reported to be optimal among 60% ($n = 45$) of the participants and non-optimal among 40% ($n = 30$) of the participants. Specifically, the 40% in the non-optimal group consisted of 21% ($n = 16$) of the participants recalling parenting by own mother as neglectful, 15% ($n = 11$) as affectionless control, 4% ($n = 3$) as affectionate constraint.

Table 7 *Descriptive statistics of the study variables*

Variable	n	M	SD	Range	Skewness	Kurtosis
PRF T2	63	4.10	0.98	3–7	0.55	–0.19
Representational MM T2	63	49.97	16.61	16.67–87.50	0.25	–0.62
Appropriate MM T2	64	3.32	2.06	0–8.57	0.44	–0.86
Non-attuned MM T2	64	1.60	1.56	0–7.24	1.62	3.38
Emotion dysregulation T1	71	15.31	4.88	6–25	0.17	–0.78
Depression T2	76	4.95	4.36	0–25	1.65	4.84
State anxiety T2	73	34.12	9.04	22–73	1.98	5.72
Parenting efficacy T2	73	31.63	4.48	16–40	–0.86	1.39
Recalled care by own mother T1	75	28.64	6.09	1–36	–1.58	4.48
Recalled overprotection by own mother T1	75	8.59	6.98	0–36	1.48	2.70

Note. T1 = 3 weeks postpartum; T2 = 7 months postpartum; PRF = parental reflective functioning; MM = mind-mindedness.

Further, preliminary analyses indicated that sociodemographic and obstetric variables including maternal age, education, parity, planned pregnancy, and infant gender showed no significant associations with PRF nor MM indicators.

3.2.2 Relations between PRF and MM indicators

To address the first aim of the study, Table 8 shows the correlations between PRF and MM indicators. Contrary to the hypothesis, no statistically significant correlations between PRF and MM indicators were found. However, the small-sized nonsignificant correlation between PRF and representational MM was very close to the significance level ($p = .052$). Notably, the nonsignificant correlations between PRF and observed MM indicators were negative.

Furthermore, representational and observed MM indicators did not correlate significantly with each other, although the effect sizes and significance levels indicated different levels of potential association for appropriate ($p = .107$) and non-attuned MM ($p = .657$). Additionally, appropriate and non-attuned MM correlated significantly and positively with each other, with a small-sized effect.

Table 8 *Correlations between PRF and MM indicators*

	Variable	1	2	3
1	PRF	–		
2	representational MM	.25[†]	–	
3	appropriate MM	–.13	.21	–
4	non-attuned MM[a]	–.14	.06	.26[*]

Notes. PRF = parental reflective functioning; MM = mind-mindedness.
[a] Spearman's ρ reported.
[†] $p < .10$. [*] $p < .05$.

3.2.3 Parental mentalization in association with maternal psychosocial functioning, and recalled parenting by own mother

To address the second aim of the study, bivariate correlations between PRF, MM indicators, maternal psychosocial variables and recalled parenting by own mother were explored. Next, multivariate associations were investigated separately for PRF and MM indicators to identify their respective correlates.

Bivariate correlations between all relevant study variables

Table 9 shows the bivariate correlations between parental mentalization, maternal psychosocial functioning and recalled parenting by own mother. PRF was significantly and negatively correlated with emotion dysregulation, with a medium-sized effect. Representational MM was correlated with parenting efficacy at the significance level ($p = .05$) with a small-sized effect, whereas no significant correlations between appropriate MM and parenting efficacy were found. In terms of maternal depression and state anxiety, no significant correlations with PRF nor MM indicators were found. Further, recalled parenting by own mother as optimal showed a medium-sized significant and negative correlation with representational MM and a small-sized nonsignificant correlation with appropriate MM very close to the significance level ($p = .053$).

Table 9 *Bivariate correlations between parental mentalization, maternal psychosocial variables, and recalled parenting by own mother*

Variable	PRF	representational MM	appropriate MM
Emotion dysregulation	−.34**	−.12	.13
Parenting efficacy[a]	.11	.25‡	.10
Depression[a]	−.09	.08	−.15
State anxiety[a]	−.24†	−.09	−.10
Recalled parenting by own mother[b]	.08	−.30*	−.24†

Notes. PRF = parental reflective functioning; MM = mind-mindedness.
[a] Spearman's ρ reported. [b] Recalled parenting by own mother: 0 = non-optimal, 1 = optimal.
† $p < .10$. ‡ $p = .05$. * $p < .05$. ** $p < .01$.

Multivariate associations with PRF

Results of the hierarchical multiple regression analysis predicting PRF are shown in Table 10. In the first step, emotion dysregulation (lack of emotional awareness) significantly predicted PRF ($R^2 = .12$, $p = .003$), showing a negative effect. In the second step, adding maternal depression and state anxiety significantly contributed to the prediction of PRF

($\Delta R^2 = .08$, $p = .033$), with state anxiety showing a significant negative effect in addition to emotion dysregulation. In the third step, adding recalled parenting by own mother did not significantly contribute to the prediction of PRF ($\Delta R^2 = .004$, $p = .550$). In the third and final model, emotion dysregulation and state anxiety were significant predictors with medium-sized effects ($\eta^2_p = .12$ and $.09$, respectively). Maternal depression and recalled parenting by own mother did not contribute to the prediction significantly. The model explained a total of 16% of the variance in PRF. Overall, mothers who reported less emotional awareness and mothers with higher levels of state anxiety showed lower PRF, partially supporting the hypotheses.

Table 10 *Hierarchical multiple regression analysis predicting PRF*

	Steps	b	$SE\ b$	p	95% CI	
					LL	UL
1	Constant	5.15	0.40	.000	4.37	5.93
	Emotion dysregulation	−0.07	0.03	.006	−0.12	−0.02
		$R^2_{adj} = .11$, $p = .003$				
2	Constant	6.31	0.69	.000	4.96	7.66
	Emotion dysregulation	−0.06	0.02	.008	−0.11	−0.02
	Depression	0.06	0.04	.148	−0.02	0.13
	State anxiety	−0.05	0.02	.029	−0.09	0.00
		$R^2_{adj} = .16$, $p = .001$				
3	Constant	6.52	0.75	.000	5.05	8.00
	Emotion dysregulation	−0.07	0.02	.006	−0.11	−0.02
	Depression	0.05	0.04	.176	−0.02	0.13
	State anxiety	−0.05	0.02	.024	−0.09	−0.01
	Recalled parenting by own mother[a]	−0.14	0.26	.577	−0.64	0.36
		$R^2_{adj} = .16$, $p = .003$				

Notes. $N = 76$. PRF = parental reflective functioning; CI = confidence interval; LL = lower limit; UL = upper limit.
[a] Recalled parenting by own mother: 0 = non-optimal, 1 = optimal.

Multivariate associations with MM indicators

Table 11 shows the results of the hierarchical multiple regression analyses predicting representational and appropriate MM.

Table 11 *Hierarchical multiple regression analyses predicting representational and appropriate MM*

	Steps	Representational mind-mindedness					Appropriate mind-mindedness				
		b	*SE b*	*p*	95% CI		*b*	*SE b*	*p*	95% CI	
					LL	UL				LL	UL
1	Constant	14.87	14.27	.298	−13.12	42.86	0.87	1.87	.641	−2.79	4.53
	Parenting efficacy	1.12	0.45	.013	0.24	2.00	0.08	0.06	.195	−0.04	0.19
		$R^2_{adj} = .08, p = .008$					$R^2_{adj} = .02, p = .136$				
2	Constant	37.77	23.66	.111	−8.77	84.32	1.26	2.63	.632	−3.89	6.41
	Parenting efficacy	0.90	0.51	.078	−0.10	1.90	0.06	0.06	.307	−0.06	0.18
	Depression	1.20	0.68	.076	−0.13	2.53	−0.13	0.09	.165	−0.30	0.05
	State anxiety	−0.64	0.39	.095	−1.40	0.11	0.02	0.05	.690	−0.08	0.12
		$R^2_{adj} = .11, p = .010$					$R^2_{adj} = .04, p = .127$				
3	Constant	59.96	24.36	.015	11.95	107.97	3.78	2.58	.143	−1.28	8.85
	Parenting efficacy	0.77	0.49	.121	−0.20	1.74	0.05	0.06	.418	−0.07	0.16
	Depression	0.97	0.63	.127	−0.28	2.21	−0.15	0.09	.075	−0.32	0.02
	State anxiety	−0.89	0.38	.019	−1.64	−0.15	−0.01	0.05	.855	−0.10	0.09
	Recalled parenting by own mother[a]	−13.93	4.32	.001	−22.41	−5.45	−1.58	0.53	.003	−2.61	−0.55
		$R^2_{adj} = .25, p < .001$					$R^2_{adj} = .15, p = .004$				

Note. N = 76. MM = mind-mindedness; CI = confidence interval; LL = lower limit; UL = upper limit.
[a] Recalled parenting by own mother: 0 = non-optimal, 1 = optimal.

For the prediction of representational MM, parenting efficacy showed a significant positive effect in the first step ($R^2 = .09$, $p = .008$). In the second step, adding maternal depression and state anxiety did not significantly contribute to the prediction of representational MM ($\Delta R^2 = .06$, $p = .106$). Also, the effect of parenting efficacy was no longer significant. In the third step, adding recalled parenting by own mother significantly contributed to the prediction of representational MM ($\Delta R^2 = .15$, $p < .001$). In the final model, state anxiety and recalled parenting by own mother were significant predictors with medium- to large-sized effects ($\eta^2_p = .11$ and $.17$, respectively). Parenting efficacy and maternal depression did not contribute to the prediction significantly, although the nonsignificant effect of parenting efficacy was not negligible ($\eta^2_p = .05$). The model explained a total of 25% of the variance in representational MM. Overall, mothers who reported higher state anxiety and mothers who recalled parenting by their own mother as optimal showed lower levels of representational MM, contrary to the hypotheses.

For the prediction of appropriate MM, parenting efficacy showed no significant effect in the first step ($R^2 = .03$, $p = .136$). In the second step, adding maternal depression and state anxiety did not significantly contribute to the prediction ($\Delta R^2 = .05$, $p = .158$). In the third step, adding recalled parenting by own mother significantly contributed to the prediction of appropriate MM ($\Delta R^2 = .12$, $p = .002$). In the final model, recalled parenting by own mother was the only significant predictor with a medium-sized effect ($\eta^2_p = .13$). Parenting efficacy, maternal depression and state anxiety did not contribute to the prediction significantly, although the nonsignificant effect of maternal depression was not negligible ($\eta^2_p = .05$). The model explained a total of 15% of the variance in appropriate MM. Overall, mothers who recalled parenting by their own mother as optimal showed lower levels of appropriate MM, contrary to the hypotheses.

Sensitivity analyses

In order to investigate the stability of the multivariate results, the multiple regression analyses were repeated using the continuous variables of recalled care by own mother and recalled overprotection by own mother separately. The results were confirmed for recalled care by own mother, whereas recalled overprotection by own mother showed no significant effect on PRF or MM indicators.

3.3 Discussion Study II

This study aimed to investigate the relation between two forms of parental mentalization, namely PRF and MM, and their respective associations with maternal

psychosocial functioning and recalled parenting by own mother. The findings revealed no direct link between PRF and MM and indicated their psychosocial correlates. Specifically, maternal emotion dysregulation and state anxiety were associated with PRF, and maternal state anxiety was also associated with representational MM. Interestingly, maternal recalled parenting by own mother as optimal showed a negative predictive effect on representational and appropriate MM.

3.3.1 Relation between PRF and MM

Since MM measures capture various aspects involving cognitive and affective capacities (Yatziv et al., 2018, 2020), differences in their associations with PRF were expectable. In the current study, PRF could not be significantly linked with MM indicators. However, the nonsignificant correlation between PRF and representational MM was fairly close to the significance level and should be further investigated. On this representational level, the two constructs partially share the same mentalizing process. Specifically, identifying mental states in children is at the core of MM and also represents the essential step of the reflection process involved in PRF (Bérubé-Beaulieu et al., 2016). Although contrary to the hypothesis, the absent association between PRF and observed MM is in line with findings from two very recent studies, adding to the evidence that PRF and MM are two distinct constructs assessing diverse aspects of parental mentalization (Dollberg, 2021; Krink & Ramsauer, 2021). Bérubé-Beaulieu et al. (2016) argued that a mother's PRF level does not necessarily link with the amount of her verbalisation about mental states. This lack of direct link could be related to the competence-performance gap (see Chapter 1.1.3), also indicated by the absent association between PRF and observed MM in the current study. Moreover, the nonsignificant correlations between PRF and observed MM indicators were negative in the current study, further indicating that other influencing factors are potentially involved.

Another reason for the absent direct association between PRF and observed MM could lie in their assessment methods. The activation of PRF is related to a certain level of emotional arousal as provided by the demand questions in the PDI-R, while observed MM is usually assessed in free-play interactions with low distress, in which the mother's PRF was presumably less activated. Hence, assessing MM in a more structured interaction situation such as the SFP could help connect PRF with observed MM since mothers' PRF would be more activated in the SFP than in a free-play situation (as described and discussed in Study I; see Chapter 2.2 and 2.3). Under elevated emotional distress, mothers with higher PRF could still manage to better tune in (i.e., be mind-minded) to their infant compared to mothers with lower PRF. For instance, in the current sample, the mother with the second-highest appropriate MM score had a PRF

score of 3, which is below the threshold to moderate or ordinary mentalizing and describes that the mother was mostly naming mental states without reflecting on them during the interview. This mother might not be able to maintain the same level of appropriate MM under elevated emotional distress. Moreover, non-attuned MM could also be better explored under a certain level of distress, especially since non-attuned MM occurs very infrequent (McMahon & Newey, 2018). For instance, McMahon and Newey (2018) investigated observed MM using the SFP and found a higher proportion of mothers making at least one non-attuned mind-related comment than previous studies using non-distress interaction situations.

Furthermore, representational and observed MM indicators were not significantly associated with each other in the current study. In fact, there is scarce evidence on whether both methods measure the same construct (Illingworth et al., 2016; McMahon & Bernier, 2017). Previous studies found small- to medium-sized correlations between mothers' observed MM in infancy and later representational MM in toddlerhood (Fishburn et al., 2021; Meins et al., 2003). However, to the best of the author's knowledge, both measures have not been used concurrently in previous studies during infancy. The current result indicates fundamental differences between the two methods. Representational MM could indicate parents' ability to perceive their children as having their own minds, while observed MM indicates parents' behaviour to use this ability. Accordingly, their absent association could also be understood using the competence-performance gap. Further, Illingworth et al. (2016) found that observed maternal MM was trait-like and stable across interactions with different children of the same mother, while representational maternal MM differed between different children of the same mother, indicating a higher relational component of representational MM.

Additionally, contrary to previous findings (Meins et al., 2012), appropriate and non-attuned MM were positively related to each other. This finding raises some questions about the relation between the two dimensions. Meins et al. (2012) described different patterns of combination for the level of maternal appropriate and non-attuned MM depending on the categorisation of their children's attachment (e.g., mothers of children with a resistant attachment pattern showed high levels of both appropriate and non-attuned MM). Accordingly, it could be assumed that the association between appropriate and non-attuned MM are not merely non-existent but instead linked with other maternal or child characteristics. When both observed MM indicators combined, maternal co-regulation capacity could be better illustrated. For instance, the mother with the highest appropriate MM score in the current sample also had a higher non-attuned MM score (over the 90th percentile), while her PRF score of 4 indicated a limited mentalizing capacity.

3.3.2 Psychosocial correlates for mothers' parental mentalization

The potential relation between PRF and MM indicators could be better understood in the context of other maternal correlates. The multivariate associations mainly aligned with the bivariate correlations between the two forms of parental mentalization and maternal psychosocial factors. In line with the theoretical background and as hypothesised, PRF was related to maternal emotion dysregulation. Specifically, mothers who were generally less attentive to their own emotions also showed a lower capacity to reflect on their relationship with the infant. It should be noted that emotion dysregulation was measured at 3 weeks postpartum in the current study. During this physically and emotionally vulnerable period, a lower level of emotion dysregulation could particularly indicate good regulatory capacity of the mother (Rutherford et al., 2015), which is similar to the effect of PRF under moderate emotional distress.

The hypothesised association between MM indicators and parenting efficacy was not found, although the positive effect of parenting efficacy on representational MM was significant in the first step of the hierarchical regression analysis. Thus, mothers who felt more confident in their parenting ability could potentially represent their infant in a more mind-minded manner, but not when other maternal variables were considered. An essential aspect of parenting efficacy is the parent's belief about the effect their actions have on the child (Vance & Brandon, 2017), which seems to be potentially linked with maternal mental representation of the child but does not reflect actual maternal behaviour in interaction with the child. To further explore parenting-related correlates for MM, it could be helpful to include maternal psychological maturity or a broader parenting cognition such as maternal locus of control, which has been linked with observed MM previously (Camberis et al., 2016).

Regarding maternal current mood, maternal state anxiety was negatively associated with PRF and representational MM, whereas no significant associations were found for appropriate MM. The findings indicate that the emotionally arousing effect of anxiety could potentially impair mothers' mentalizing capacity on the level of mental representation but not on mothers' mentalizing capacity observed through behaviour. Previous research has linked maternal anxiety with lower quality of maternal-foetal bonding in the prenatal period (Göbel et al., 2018). Thus, the current findings add to the evidence that maternal anxiety symptoms could particularly impair the quality of the mother's mental representation of her relationship with the child. In terms of appropriate MM, the nonsignificant effect of maternal depression was not negligible, at least in the current sample. A potential negative effect of maternal depression on observed MM would be in line with previous research showing that maternal depression

generally disrupts mother-infant interaction, whereas the effect of maternal anxiety is relatively mixed (Feldman et al., 2009). A recent study indicated that maternal depression in the early postpartum period could impact observed MM more than concurrent maternal depression (Bigelow et al., 2018). Notably, only when taking recalled parenting by own mother into account, the effect of state anxiety on representational MM was significant, and the nonsignificant effect of maternal depression on appropriate MM showed a non-negligible size. Thus, maternal current mood appears to (potentially) affect MM only in combination with other parenting-related factors. Since the current sample had few women with higher levels of anxiety or depression, these associations should be investigated in more diverse samples.

3.3.3 Mothers' parental mentalization and recalled parenting by own mother

Contrary to expectation, maternal recalled parenting by own mother as optimal had a negative predictive effect on representational and appropriate MM, while no significant effect on PRF was found. Specifically, mothers who experienced the parenting behaviours of their own mother to have been optimal (characterised as a high level of care and a low level of overprotection) used proportionally fewer mental attributes to describe their infant and made proportionally less appropriate mind-related comments during the interaction with their infant. Recollection of parenting by own caregivers has previously been linked to adult mental health outcomes, showing suboptimal parenting (especially lack of care) as a risk factor for mental health issues (Enns et al., 2002). This effect was also reflected in the negative correlations between recalled parenting as optimal and maternal depression ($r = -.37$, $p < .01$) and state anxiety ($r = -.40$, $p < .001$) in the current study. However, when focusing on attachment relationships, recalled care and overprotection by own caregivers were previously associated only with limited aspects of adult attachment style (Hexel, 2004). Further, adult secure attachment style could buffer some of the negative effects of non-optimal parenting by own caregivers (Gittleman et al., 1998). Hence, it does not seem essential for adult attachment, whether the experience with own mother to have been optimal or not, but rather the reflective processing of this recalled experience (i.e., a parent could have recalled difficulties with their own mother but still manage to reflect upon this experience in a coherent and organised manner). Accordingly, parental mentalization could represent a separate process that is only loosely connected with recalled parenting by own caregivers.

Previous studies have also shown complex influence from mothers' recalled parenting by their own mothers on their own motherhood (Göbel et al., 2020; Handelzalts et al., 2018). It is noteworthy that the non-optimal group in the current population-based sample mainly did not indicate highly adverse experiences frequently seen in clinical settings. Especially considering

the second-largest group (21%) of participants recalling parenting by own mother as neglectful (characterised as low care and low overprotection) still reported relatively high recalled care on average ($M = 24.69$, $SD = 2.60$, while the possible score ranges between 0–36 with the cut-off value 27). Mothers who recalled their own mother's parenting as non-optimal could have been more sensitive or differentiated about their own early experience and, consequently, more effortful in being mind-minded for their infant. On the contrary, the recollection of highly optimal parenting by own mother could indicate underlying defence mechanisms (Hesse, 2016), especially considering that the recalled parenting measures not merely past parenting behaviour but, more importantly, the mothers' emotional experience of their mothers' parenting. The optimal group reported high emotional warmth and understanding and almost no conflicts regarding their own independence, which could indicate an idealisation of their own bonding experience with their mother and potentially also a higher level of identification with their mother leading to a lower tendency to see or treat their own infant as an individual with a separate mind. Especially during the early postpartum period (when recalled parenting by own mother was assessed in the current study), reflection on mothers' relationship with their own mother as a role model could be activated (Stern, 1995), and mothers with less optimal experience with their own mother could see their infant in a more mind-related manner due to the access to their own internal conflicts. Since defence mechanisms could be identified during the PDI-RF coding and were taken into account to estimate the overall PRF level (Slade, Bernbach, et al., 2004), this could be why maternal recalled parenting by own mother was not associated with PRF.

Another reason for this counterintuitive finding for MM but not PRF could be that the questionnaire used in the current study focuses on behaviours of parents' own caregivers, which is more closely related to the MM concept. In contrast, PRF is more closely related to the emotional processing of parents' own experiences. For PRF, specific dimensions of recalled parenting combined with other psychosocial factors could reveal potential associations in clinical groups. For example, maternal recollection of autonomy support by own mother was related to maternal adult RF in a recent study with mothers and their school-aged boys with externalising problems (Dejko–Wańczyk et al., 2020).

Overall, findings in the current study confirm that PRF is a mental regulatory capacity related to maternal emotion regulation. In contrast, MM is more relational and appears to be more related to maternal behavioural attunement than expected, directly connected with mothers' recalled experiences with their own mother. It can be assumed that PRF and MM would be only related in combination with other maternal or child characteristics, such as

maternal executive function, adult attachment, or child temperament (Barreto et al., 2016; Dollberg, 2021; Riva Crugnola et al., 2018; Sharp & Fonagy, 2008; Yatziv et al., 2018, 2020). Since the two constructs are placed at different theoretical levels between parental attachment-related representations and behaviour (Meins, 1999), their associations should be investigated using a longitudinal design in future studies.

3.3.4 Strengths and limitations

The current study has several strengths and limitations. It is one of the first studies aiming directly at the relation between PRF and MM by combining measures from different research traditions to embed them into the maternal psychosocial context. Two measures were applied concurrently for MM to explore the construct on different levels, which has not been done in previous studies. The longitudinal design allowed to investigate the predictive effect of maternal recalled parenting by own mother and emotion dysregulation assessed earlier, which was, however, not the case for parenting efficacy. A major limitation is the assessment of representational MM using a PDI-R permit question, which contributes to the shared method variance between PRF and representational MM. The coding procedure for representational MM was adapted and therefore deviated from the standard coding method. Mental attributes assessed in the current study refer to the frequency of the attributes used to describe not only the child but also examples for specification. This approach partially includes richness as another aspect of maternal representation. Also, the interview method was not developed to assess parental MM in infancy. Further, the multiple regression analyses were slightly underpowered, which could have caused some effects not to be identified. Thus, the multivariate findings should be interpreted with due caution. Given the moderate sample size, the two dimensions of recalled parenting were combined into a dichotomous categorisation to limit the number of predictors. Future studies with larger sample sizes should investigate all four categories of recalled parenting or examine the two dimensions separately, especially considering the nonsignificant effects of recalled overprotection by own mother in the sensitivity analyses of the current study. Finally, the homogeneity of maternal characteristics in the current sample could help avoid the effects of other confounders but can also be seen as a limitation.

4. Study III: Parental mentalization and infant temperament development – Concurrent associations and predictive effects[11]

As described in Chapter 1.3, studies on the association between parental mentalization and infant temperament are scarce. Hence, Study III aimed to investigate this association in mother-infant dyads during the first year of life. For this purpose, both PRF and MM were examined as two aspects of parental mentalization. Since the relation between PRF and MM is not yet well understood, they were examined separately in this study. Further, based on previous research, the temperament construct of infant negative emotionality has been commonly linked with parenting and was thus the main outcome of interest. Another temperament trait related to negative emotionality, namely infant soothability, was also explored.

The first aim was to examine whether PRF and MM are associated with infant temperament (negative emotionality and soothability) assessed concurrently at 7 months postpartum. Although previous findings are mixed or scarce, it was hypothesised that PRF and MM would be negatively related to infant negative emotionality and positively related to infant soothability measured concurrently and thus indicating an interplay between parental mentalization and infant temperament.

The second aim was to investigate whether PRF or MM at 7 months postpartum can predict infant temperament (negative emotionality and soothability) at 12 months postpartum. Due to the developmental continuity of infant temperament and the potential influence of current mood on maternal report of the outcome measure, infant temperament at 7 months and maternal depression at 12 months were controlled for the second aim. It was hypothesised that higher levels of parental mentalization (i.e., higher PRF, or higher appropriate MM and lower non-attuned MM) in mothers would be associated with more regulated infant behaviour (i.e., lower negative emotionality or higher soothability).

Frequency scores (instead of proportion scores) for MM indicators were mainly used to investigate the second aim. This approach was chosen because, independent of how much a parent verbalises in total, the infant was still exposed to the comments made, as stressed by McMahon et al. (2016). Previous studies have also indicated frequency scores to be a valid measure of MM (McMahon & Bernier, 2017). The proportion scores were additionally explored.

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[11] Preliminary findings for Study III were part of a conference poster: Stuhrmann, L. Y., Göbel, A., & Mudra, S. (2020, July 6–9). *Does it matter how parents reflect? Associations between parental reflective functioning and infant temperament*. [Poster presentation]. International Congress of Infant Studies Virtual Congress.

4.1 Methods Study III

4.1.1 Study design and participants

This study utilised a longitudinal, mixed-method design with two assessment points from the PAULINE study: 7 months (T2) and 12 months (T3) postpartum, using self-report questionnaires, an interview, and a behavioural observation.

The participants were $N = 76$ healthy mother-infant dyads, the subsample for this dissertation project. Seven mother-infant dyads did not provide data at T3, but sufficient data were available for them in total. The infants were on average 7.03 months old ($SD = 0.68$, range: 6–10) at T2 and 11.89 months old ($SD = 1.62$, range: 11–14) at T3. There were no substantial changes in the sample characteristics described in detail in Study II (see Chapter 3.1.1).

4.1.2 Procedure

The mothers filled out a set of questionnaires that were sent by post at both T2 and T3. The behavioural observation with the mother-infant dyads and the interview with the mothers at T2 were described in Study II (see Chapter 3.1.2). The participants were not compensated financially. As a token of gratitude, the participants were given a small bag of mother-infant products at T2 and screenshots of the infant from earlier behavioural observations at T3.

4.1.3 Measures

Primary measures

Mothers' PRF and MM were assessed at T2 via interview and behavioural observation, respectively. PRF was assessed using the PDI-R and coded using the PDI-RF coding procedure (Slade, Bernbach, et al., 2004). MM was assessed using the observation of a 15-minute free-play situation and coded using the manual by Meins and Fernyhough (2015). The procedures were described in detail in Study II (see Chapter 3.1.3). Frequency scores were mainly used for the second aim of the current study due to the direct connection to the infants' exposure to maternal mind-related comments (McMahon et al., 2016). The proportion scores of MM indicators recommended in the official manual were also used for exploration.

Infant temperament was assessed at T2 and T3 using the German adaptation of the Infant Behaviour Questionnaire (IBQ; Pauli-Pott et al., 2003; Rothbart, 1981). The IBQ is widely used and consistently shown to be a reliable and valid instrument for assessing infant temperament (Gartstein & Marmion, 2008; Goldsmith et al., 1991; Pauli-Pott et al., 1999). In the current study, three subscales were used: *Distress to limitations* (e.g., "If your baby had to wait for his/her food or drink, did he/she seem to care little?"), *Distress to novelty* (e.g., "When

your baby was given a new toy, how often did he/she hesitate when he/she first saw it?"), and *Soothability* (in situations of fussing or crying, e.g., "How often did your baby quickly settle down through rocking and swinging?"). Mothers were asked to rate the frequencies of their infant's behaviour in various daily situations such as feeding, sleeping, or playing during the previous week on a scale ranging from 1 (*never*) to 7 (*always*). There was also a rating of 0 if the situation "did not occur". Based on previous studies (Mertesacker et al., 2004; Rothbart, 1986; Worobey & Blajda, 1989), the subscales Distress to limitations and Distress to novelty were aggregated into one composite score to measure *negative emotionality*. Higher scores indicate higher levels of negative emotionality. In terms of the subscale Soothability, higher scores indicate higher levels of infant soothability. The internal consistency was questionable (but nearly acceptable) to good in the current sample ($\alpha = 0.83$ and 0.75 for negative emotionality at T2 and T3, respectively, and $\alpha = 0.73$ and 0.67 for soothability at T2 and T3, respectively).

Secondary measures

Sociodemographic information was assessed using a self-report questionnaire at each assessment point, including socioeconomic status, relationship status, and obstetric history, as reported in Chapter 3.1.1.

Maternal depression was assessed at T3 using the German version of the Centre for Epidemiologic Studies Depression (CES-D; Hautzinger & Bailer, 1993; Radloff, 1977). The short version applied in this study consists of 15 items that ask about depressive symptoms experienced by the respondent during the past week. The rating 4-point scale ranges from 0 (*rarely or none of the time*) to 3 (*most or almost all the time*). Higher scores indicate higher levels of maternal depression. A cut-off value of 17 is established to detect an elevated risk for depressive disorders. The internal consistency in the current sample was excellent ($\alpha = 0.92$).

4.1.4 Statistical analysis

To examine correlations between all included study variables and to examine the relation between parental mentalization and infant temperament, Pearson's *r* was applied for continuous variables, Spearman's ρ for skewed and ordinal variables, and point-biserial correlations for dichotomous categorical variables. Multiple linear regression analyses were used to examine the predictive effects of mothers' PRF or MM at 7 months on infant temperament at 12 months while controlling for infant temperament at 7 months and maternal current depression at 12 months. Regression diagnostics using residual statistics and scatterplots showed satisfying results regarding the assumptions of normality, linearity, and

homoscedasticity. Values of the standardised DFBeta indicated no potential multivariate outliers. Unstandardised *b* coefficients and adjusted R^2 were reported. Associations were considered significant at *p* < .05 (two-tailed). Effect sizes for predictor variables were reported with η^2_p, with values of .01 indicating a small-sized, .06 a medium-sized, and .14 a large-sized effect.

Regarding statistical power for the regression analyses, at least *n* = 77 mother-infant dyads in the model with PRF (3 predictors in total) and 85 mother-infant dyads in the models with MM indicators (4 predictors in total) were needed to identify an expected minimum overall effect of medium size with a power of 80% (calculated using G*Power 3.1.9.6; Faul et al., 2009). Therefore, the findings of the regression analyses with MM indicators were slightly underpowered (75%).

Missing data analysis showed that the sample size would reduce by 34% with listwise deletion, although substantial data was available for all participants. Hence, the missing data were handled according to standard practice and recommendations (Graham, 2009). Single missing values in the self-report data on the item-level were imputed using the Expectation-Maximisation algorithm. Subsequently, patterns of missing values on the scale-level were analysed. Here, missing data varied between 1–17%, mainly in the variables PRF, MM, and infant temperament at T3. Comparisons regarding sociodemographic and obstetric variables (maternal age, education, relationship status, household income, planned pregnancy, parity, and infant gender) between incomplete and complete cases using *t*, χ^2, and Fisher's exact tests showed no statistically significant differences. Finally, the dataset was completed using the multiple imputation method on the scale-level with *m* = 35 imputations (fully conditional specification), including all variables analysed in this study (Graham, 2009; White et al., 2011). Pooled statistics following Rubin's rule were reported (Rubin, 1987). For explained variance and significance level of the overall models and effect sizes in multiple linear regression analyses, median values across all imputations were reported. All statistical analyses were conducted using IBM SPSS Statistics for Macintosh (Version 26).

4.2 Results Study III

4.2.1 Descriptive statistics and preliminary analyses

Table 12 shows the descriptive data for all study variables of the original dataset. The scores of the variables PRF, appropriate MM proportion, infant negative emotionality at 7 months, and infant soothability at 7 and 12 months were normally distributed. The scores of appropriate MM frequency, non-attuned MM frequency and proportion, maternal depression,

infant negative emotionality at 12 months were positively skewed (mainly from low to moderate). Especially non-attuned MM frequency was considerably skewed. Approximately 10% ($n = 8$) of the participants reported a depression score above the cut-off value.

Table 12 *Descriptive statistics of the study variables*

Variable	n	M	SD	Range	Skewness	Kurtosis
PRF T2	63	4.10	0.98	3–7	0.55	–0.19
Appropriate MM (%) T2	64	3.32	2.06	0–8.57	0.44	–0.86
Appropriate MM (F) T2	64	5.06	3.65	0–20	1.40	3.35
Non-attuned MM (%) T2	64	1.60	1.56	0–7.24	1.62	3.38
Non-attuned MM (F) T2	64	2.55	3.27	0–22	3.77	19.83
Maternal depression T3	68	8.53	7.66	0–41	1.98	4.96
Infant negative emotionality T2	73	79.74	17.05	31–121	0.08	0.24
Infant soothability T2	73	33.40	4.70	20–42	–0.14	0.25
Infant negative emotionality T3	61	85.01	13.35	62–120	0.65	0.06
Infant soothability T3	65	38.51	6.46	20–53	–0.11	–0.02

Note. T2 = 7 months postpartum; T3 = 12 months postpartum; PRF = parental reflective functioning; MM = mind-mindedness; % = proportion score; F = frequency score.

Further, preliminary analyses indicated that sociodemographic and obstetric variables including maternal age, education, parity, planned pregnancy, and infant gender showed no significant associations with infant negative emotionality or soothability.

4.2.2 Parental mentalization and concurrent infant temperament

To address the first aim of the study, Table 13 shows the correlations between the study variables. Contrary to the hypothesis, PRF and MM indicators were not significantly correlated with either infant negative emotionality or soothability measured concurrently at 7 months, with small-sized effects. These results indicate no concurrent association between maternal PRF or MM and infant temperament.

Although not significant, PRF and appropriate MM (proportion and frequency) showed higher correlations with infant temperament measured at 12 months than 7 months postpartum. Only non-attuned MM proportion showed higher correlations with infant soothability at 7 months than 12 months. This nonsignificant correlation between non-attuned MM proportion and concurrent infant soothability at 7 months was also the highest correlation among all concurrent correlations between parental mentalization and infant temperament ($r = .23$, $p = .065$, 95% CI [.00, .44]).

Table 13 *Correlations between the study variables*

	Variable	1	2	3	4	5	6	7	8	9
1	PRF T2	–								
2	Appropriate MM (%) T2	−.12	–							
3	Appropriate MM (F)[a] T2	.09	.77**	–						
4	Non-attuned MM (%)[a] T2	−.09	.29*	.22†	–					
5	Non-attuned MM (F)[a] T2	−.01	.17	.36**	.88**	–				
6	Negative emotionality T2	.07	−.08	.02	−.13	−.01	–			
7	Soothability T2	−.10	.09	.02	.23†	.20	−.36**	–		
8	Negative emotionality T3	−.18	−.21	−.24†	.05	.03	.41**	−.17	–	
9	Soothability T3	.15	.17	.20	−.05	−.04	−.31*	.37**	−.37**	–
10	Depression[a] T3	−.07	.09	.01	−.03	.01	.18	−.20	.27*	−.30*

Notes. $N = 76$. T2 = 7 months postpartum; T3 = 12 months postpartum; PRF = parental reflective functioning; MM = mind-mindedness; % = proportion score; F = frequency score.
[a] Spearman's ρ reported.
$^\dagger p < .10.$ * $p < .05.$ ** $p < .01.$ *** $p < .001.$

4.2.3 Prediction of infant temperament by parental mentalization

To address the second aim of the study, the predictive effects of PRF and MM indicators were tested in separate models for infant negative emotionality and soothability, respectively.

Prediction of infant negative emotionality

Two models were tested separately to investigate the prediction of infant negative emotionality at 12 months by PRF or MM indicators at 7 months. Infant negative emotionality at 7 months and maternal current depression at 12 months were controlled. Table 14 shows the results of the multiple linear regression analyses.

Contrary to the hypothesis, mothers' PRF showed no significant effect on later infant negative emotionality. However, the size of this nonsignificant negative association was not negligible, at least in the current sample ($\eta^2_p = .05$). Further, infant negative emotionality at 7 months and maternal current depression at 12 months were significant predictors, showing positive associations with large- and medium-sized effects ($\eta^2_p = .19$ and .07), respectively. The model explained a total of 25% of the variance in infant negative emotionality at 12 months.

Partially consistent with the hypothesis, the frequency of maternal appropriate MM showed a significant medium-sized effect on later infant negative emotionality ($\eta^2_p = .11$), while the effect of non-attuned MM frequency was not significant. Thus, mothers who made

more appropriate mind-related comments during the interaction at 7 months also reported a lower level of infant negative emotionality at 12 months. Further, infant negative emotionality at 7 months and maternal current depression at 12 months were again significant predictors, showing positive associations with large- and medium-sized effects ($\eta^2_p = .19$ and .07), respectively. The model explained a total of 29% of the variance in infant negative emotionality at 12 months.

Table 14 *Multiple linear regression analyses predicting infant negative emotionality at T3*

Variables	b	$SE\ b$	p	95% CI		η^2_p
				LL	UL	
Constant	66.16	9.32	.000	47.88	84.43	
Negative emotionality T2	0.32	0.09	.000	0.15	0.50	.19
Maternal depression T3	0.42	0.20	.037	0.03	0.81	.07
PRF T2	–2.63	1.69	.120	–5.95	0.69	.05
$R^2_{adj} = 0.25$, $p < .001$						
Constant	60.04	7.52	.000	45.28	74.79	
Negative emotionality T2	0.32	0.09	.000	0.15	0.49	.19
Maternal depression T3	0.43	0.20	.029	0.04	0.82	.07
Appropriate MM (F) T2	–1.16	0.49	.018	–2.13	–0.20	.11
Non-attuned MM (F) T2	0.62	0.49	.209	–0.35	1.58	.02
$R^2_{adj} = 0.29$, $p < .001$						

Note. $N = 76$. T2 = 7 months postpartum; T3 = 12 months postpartum; PRF = parental reflective functioning; MM = mind-mindedness; F = frequency score; CI = confidence interval; LL = lower limit; UL = upper limit.

Additionally, the analysis was repeated using the proportion scores of MM indicators for exploration. Here, the effects of appropriate ($b = -1.30$, $SE\ b = 0.85$, $p = .127$, $\eta^2_p = .04$) and non-attuned MM ($b = 0.99$, $SE\ b = 1.03$, $p = .338$, $\eta^2_p = .02$) were both nonsignificant, whereas the effects of infant negative emotionality at 7 months ($b = 0.31$, $SE\ b = 0.09$, $p = .001$, $\eta^2_p = .17$) and maternal depression at 12 months ($b = 0.46$, $SE\ b = 0.20$, $p = .023$, $\eta^2_p = .08$) were still significant. This model explained a total of 23% of the variance in infant negative emotionality at 12 months ($p < .001$).

Although not all statistically significant, the predictive effects of PRF and MM indicators on later infant negative emotionality in the current study showed the theoretically expected direction.

Prediction of infant soothability

Two models were again tested separately to examine the prediction of infant soothability at 12 months by PRF or MM indicators at 7 months. Infant soothability at 7 months and

maternal current depression at 12 months were controlled. Table 15 shows the results of the two multiple linear regression analyses.

Contrary to the hypothesis, in both models, PRF and the frequency of MM indicators showed no significant predictive effects on later infant soothability. The effect of maternal depression was also nonsignificant, although not negligible in the model with MM indicators, at least in the current sample ($\eta^2_p = .05$). Infant soothability at 7 months consistently and positively predicted infant soothability at 12 months, showing a significant medium-sized effect ($\eta^2_p = .13$). Nevertheless, both models explained a total of 18% of the variance in infant soothability at 12 months.

Table 15 *Multiple linear regression analyses predicting infant soothability at T3*

	b	$SE\ b$	p	95% CI		η^2_p
				LL	UL	
Constant	20.42	7.78	.009	5.11	35.74	
Soothability T2	0.47	0.18	.011	0.11	0.82	.13
Maternal depression T3	–0.17	0.10	.084	–0.37	0.02	.04
PRF T2	1.07	0.86	.215	–0.63	2.77	.03
	$R^2_{adj} = 0.18, p < .001$					
Constant	23.29	6.25	.000	11.00	35.58	
Soothability T2	0.49	0.18	.006	0.14	0.83	.13
Maternal depression T3	–0.18	0.10	.072	–0.38	0.02	.05
Appropriate MM (F) T2	0.31	0.24	.194	–0.16	0.79	.04
Non-attuned MM (F) T2	–0.26	0.24	.284	–0.73	0.22	.02
	$R^2_{adj} = 0.18, p < .001$					

Note. $N = 76$. T2 = 7 months postpartum; T3 = 12 months postpartum; PRF = parental reflective functioning; MM = mind-mindedness; F = frequency score; CI = confidence interval; LL = lower limit; UL = upper limit.

Additionally, the analysis was repeated using the proportion scores of MM indicators for exploration. Here, the effects of appropriate ($b = 0.55$, $SE\ b = 0.38$, $p = .148$, $\eta^2_p = .04$) and non-attuned MM proportions ($b = –0.79$, $SE\ b = 0.51$, $p = .121$, $\eta^2_p = .05$) were also nonsignificant. The effect of infant negative emotionality at 7 months was still significant ($b = 0.49$, $SE\ b = 0.18$, $p = .006$), with a large-sized effect ($\eta^2_p = .14$). Further, the effect of maternal depression at 12 months was very close to the significance level ($b = –0.19$, $SE\ b = 0.10$, $p = .053$, 95% CI [–0.39; 0.00]), with a medium-sized effect ($\eta^2_p = .06$). This model explained a total of 19% of the variance in infant negative emotionality at 12 months ($p < .001$).

Although not statistically significant, the predictive effects of PRF and MM indicators showed again the theoretically expected direction.

Sensitivity analyses

In order to investigate the stability of the multivariate results with the frequency scores of MM indicators, the multiple regression analyses were repeated to consider a potential effect of maternal verbosity. Here, the total number of maternal comments during the behavioural interaction was additionally controlled. The results from the models with frequency scores were confirmed.

4.3 Discussion Study III

This study aimed to investigate the association between parental mentalization and infant temperament both concurrently and longitudinally. The findings revealed no concurrent correlations between parental mentalization (PRF and MM) and infant temperament (negative emotionality and soothability). Higher appropriate MM frequency significantly predicted lower infant negative emotionality, while other parental mentalization variables did not show statistically significant effects. Moreover, infant negative emotionality and soothability showed a moderate continuity from 7 to 12 months postpartum. Higher maternal current depression was also significantly associated with higher infant negative emotionality at 12 months postpartum.

4.3.1 Concurrent associations

The findings regarding parental mentalization and concurrent infant temperament indicate no direct interacting effects between the constructs. Interestingly, PRF and most MM indicators showed larger-sized correlations with infant temperament measured at 12 months compared to 7 months postpartum. This descriptive pattern indicates less influence from infant temperament on maternal mentalizing capacity but potentially an influencing effect of maternal mentalization on the development of perceived infant temperament. Although contrary to the hypothesis, these results align with some previous findings on MM, indicating PRF and MM represent maternal cognitive-behavioural capacities that are relatively independent of the influence of infant temperament (Meins et al., 2011).

Nonetheless, the influence of infant temperament on PRF or MM should be further investigated. Especially for infants with a particularly "difficult" temperament, their parents could generally experience more distress in the co-regulation, which in turn could be linked to mentalizing capacity (Sharp & Fonagy, 2008). Similarly, mothers of infants with early regulatory problems have previously shown higher levels of pre-mentalizing modes (i.e., lower PRF) than mothers of a healthy control group (Georg et al., 2018). Moreover, rudimental cognitive functions linked with parental mentalizing capacity could be relevant in this context. Child characteristics, including temperament, have previously shown moderating effect on the

link between maternal executive functions and mentalization. More specifically, maternal executive functions were linked with PRF when mothers perceived their children as more difficult, whereas the zero-order correlation between executive functions and PRF was statistically nonsignificant (Yatziv et al., 2020). The association between maternal executive functions and MM was also stronger when mothers reported more difficult temperament of their infant (Yatziv et al., 2018). Therefore, although the current finding indicates no direct interaction between infant temperament and parental mentalization measured concurrently, this interaction could occur with rudimental cognitive functions involved in the mentalizing process or only be detectable in a clinical sample with higher general parental distress. Further, assessing MM under elevated emotional arousal could also reveal its association with infant temperament. For example, using the SFP, maternal non-attuned MM was linked with more extreme behavioural responses of the infant, while infant negative affect also showed an effect on later appropriate MM (McMahon & Newey, 2018).

Although statistically nonsignificant, maternal non-attuned MM scores showed a unique pattern of higher correlations with concurrent than later infant soothability, particularly the proportion score. This pattern is especially interesting and should be followed up in future studies since non-attuned MM is very infrequent, and the role of non-attuned MM has been rarely discussed apart from the context of child attachment security (McMahon & Bernier, 2017). As mentioned earlier, previous studies using behavioural observation found associations between infant negative affect and non-attuned MM under emotional distress, indicating potential interaction between infant temperament and maternal non-attuned MM (McMahon & Newey, 2018; Planalp et al., 2019). For example, one participant from the current sample made particularly frequent non-attuned mind-related comments, most of them referring to the infant's potential preference or desire, such as "Do you want something else?", "Do you want a cup?", or "Where do you want to go?". This mother also reported a relatively high score on infant soothability at 7 months (i.e., over the 80th percentile in the current sample). A mother who keeps guessing what the infant might want and also articulate these guesses (although the comments did not match the infant's signs) is potentially not able to read the infant's signs sensitively but, instead, keeps trying new things for soothing when the infant is fussy. This behaviour would eventually lead to calming of the infant despite the lack of maternal attunement. Alternatively, a mother who perceives her infant as easier to soothe could be potentially less sensitive to the infant's signs and articulate more mind-related assumptions regardless of the infant's internal states.

4.3.2 Predictive associations

The findings regarding the predictive effects of PRF or MM on later infant temperament were limited in the current study. Only the frequency of appropriate MM showed a significant effect on infant negative emotionality, indicating that mothers who frequently read and react to their infant's mental states appropriately could help shape the infant's expression of negative emotionality later on. Specifically, when the mother could correctly read signs of frustration and fear and respond accordingly, the infant could better "cope" with frustration and fear in the future. Although the proportion scores are recommended in the original manual, frequency scores still directly indicate the amount of mind-related comments the child receives (McMahon & Bernier, 2017). Further, Hughes et al. (2018) stressed that the proportion scores could inflate the level of maternal MM. Thus, when two appropriate mind-related comments were made, the proportion score would vary considerably between a mother who made ten comments in total (20%) and a mother who made three comments in total (67%). The fact that the proportion score of appropriate MM showed no significant association with later infant negative emotionality potentially support this inflation argument and indicate the relevance of the actual exposure of the infant to the maternal comments made.

The underlying mechanisms of the associations between parental MM and child development are yet not fully understood. Parental MM was developed in the context of infancy and focused on parental language, although infants cannot understand what is being said literally (McMahon & Bernier, 2017). However, appropriate MM is not only relevant because of what was said but also whether it matched the infant's behavioural signs in the interaction. As established in the psychodynamic literature and developmental science, infants actively participate in social interactions and can understand the affective messages conveyed in the interpersonal interaction, including vocal tones and non-verbal signs, while the repeated experience of being understood can be internalised and lead to better self-regulation (Fonagy et al., 2007; Paquette-Smith & Johnson, 2016; Stern, 1998). Further, there is evidence that parental depression or anxiety are linked with infant interactive behaviours, showing that parental depression was linked with more neutral affect in infants. In contrast, parental anxiety was linked with more attention to the parent and less neutral affect in infants (Aktar et al., 2017). Thus, infants can pick up their parents' affective availability or distress in daily interactions and adapt their own behaviour accordingly. To better understand the connection between parental MM and infant temperament development, it would be helpful to consider additional aspects of parent-infant interactions, such as parental mirroring behaviour, which could be predicted by maternal MM previously (Bigelow et al., 2015).

Contrary to expectation, mothers' PRF showed no essential impact on later infant negative emotionality in the current study, although the nonsignificant effect was not negligible and should be followed up in future studies. According to mentalization theory, parental co-regulation in a reflective manner could support the development of infants' intrapsychic structures and self-regulation (Fonagy et al., 2002). The manifestation of this early development is indeed challenging for its empirical assessment. Since the activation of PRF is connected to emotional arousal, it might be helpful to assess infant behaviour in structured interaction tasks with the parent or directly target infant self-regulatory behaviours. For instance, Heron-Delaney et al. (2016) linked mothers' PRF with infant negative affect and self-regulating behaviour using the SFP, indicating a regulatory effect of PRF. Thus, although infant negative emotionality might not be associated with PRF as in the current study, infant self-regulatory strategy might be modulated by the affective experience with a reflective parent. In line with this assumption, Borelli, Lai, et al. (2020) differentiated child emotion regulation into two components: emotional distress and coping strategies. They found no direct connection between mothers' PRF and their toddlers' distress but demonstrated that mothers' PRF moderated the link between toddlers' distress and coping behaviour. Additionally, it might be helpful to consider PRF sub-dimensions. For instance, Smaling, Huijbregts, van der Heijden, et al. (2016) reported that infant negative emotionality was not significantly correlated with overall PRF but with self-focused PRF.

Combined with findings from Study II, PRF is more closely linked with maternal emotion regulation and might less directly influence child self-regulation at this early stage, while MM is more interactional and potentially influences infant behaviour more directly. However, previous studies demonstrated a significant effect of maternal characteristics (e.g., depression, anxiety, and social support) on infant temperament independent of parenting behaviour (Pauli-Pott et al., 2004), as shown in the current study with the significant effect of maternal depression on infant negative emotionality. The absent association between PRF and infant temperament may also be due to the fact that PRF represents a more fundamental regulatory capacity. Thus, it might be essential to take maternal behaviour into account. For example, Smaling et al. (2017) found a significant difference in reported infant physical aggression between low versus high prenatal PRF only if no maternal intrusiveness was present.

Temperament has a fundamental connection with genetic factors, but the rearing environment also shapes its development (Shiner et al., 2012). Accordingly, the large-sized effects of infant temperament at 7 months on 12 months and their medium-sized correlations confirm a moderate continuity in the development of negative emotionality and soothability

(Braungart-Rieker et al., 2010; Pauli-Pott et al., 2003). This fact further highlights the relevance of the additional predictive effect of appropriate MM frequency on infant negative emotionality despite the steady developmental continuity.

Furthermore, in line with previous research, predicting different infant temperament traits involved different maternal factors (Liu et al., 2020; Pauli-Pott et al., 2004). Infant soothability could not be significantly predicted by any maternal mentalization variables but only earlier infant soothability. As mentioned earlier, different from other parental mentalization variables, non-attuned MM scores indicated a potential interaction with infant soothability, at least in the current sample. This indication should be followed up in future studies since soothing a fussy infant can heighten parental emotional arousal, which is in turn linked with the activation of parental mentalization (Rutherford et al., 2015).

Lastly, it should be noted again that maternal and infant characteristics influence each other reciprocally. The prediction of infant temperament development by maternal characteristics does not preclude the impact of infant temperament on, for example, later parenting behaviour (Bates et al., 2012). To further investigate the maternal influence on the development of infant temperament and later self-regulation, it would provide more insights to additionally consider maternal characteristics during pregnancy since infant emotional development can be shaped by prenatal exposure (Gartstein & Skinner, 2018).

4.3.3 Strengths and limitations

The current study has several strengths and limitations. This is the first study on parental mentalization and infant temperament that investigated both PRF and MM as different aspects of parental mentalization. The longitudinal study design allowed to investigate potential predictive effects and consider infant temperament at an earlier time to account for developmental continuity. Measures used in the current study are widely viewed as gold-standard for the assessed constructs. Nonetheless, the internal consistency for infant soothability at 12 months postpartum was relatively low. Further, infant temperament assessed using maternal report cannot be separated from bias in maternal perception, although maternal depression was controlled. Behavioural observation of infant temperament could provide additional insights. Moreover, only selected infant temperament traits were examined, although infant negative emotionality conceptually includes other traits such as sadness. It could be helpful to examine a broader range of infant temperament traits for exploration. Although the current sample size is not uncommon for this research area, partially due to the time-consuming and labour-intensive assessment and coding of qualitative data, the modest sample size did not allow more complex statistical analyses. The regression analyses were slightly underpowered,

so that the multivariate findings should be interpreted with due caution. Lastly, the homogeneity regarding sociodemographic characteristics and low psychosocial risks in the current sample limits the generalisability of the findings. Studies with more diverse samples could include higher levels of infant negative emotionality or difficult temperament, which could be more relevant in the context of parental mentalization or co-regulation in general.

5. General discussion

This dissertation investigated mothers' parental mentalization during infancy and early childhood by focussing on essential elements of early attachment relationships, namely PRF, MM, parenting behaviour, and early developmental outcome. To this end, three separate studies were carried out. Study I was a systematic review that provided a critical overview of current research on the association between PRF and early parenting behaviours. This review also addressed contextual factors that influence the examined association and considered methodological issues related to the assessment of PRF and parenting behaviours. Subsequently, the two empirical studies were conducted as part of the PAULINE study, both using longitudinal designs with different assessment points from 3 weeks to 12 months postpartum. Study II investigated the relation between PRF and two types of MM and explored their psychosocial correlates as well as associations with maternal bonding experience with own mother. Study III investigated bidirectional relations between PRF or MM and infant temperament. In this chapter, the findings of the three studies will be summarised and then discussed together based on three extracted aspects for theoretical and practical implications.

5.1 Summary of main findings

The findings of Study I demonstrate that although PRF is generally positively associated with positive parenting and negatively associated with negative parenting, this is not evident for all PRF sub-dimensions depending on sample types (e.g., high-risk versus community, mothers versus fathers). Over half of the studies did not compare multiple parenting behaviours concurrently. Especially negative parenting constructs were scarcely examined. The indication of stronger associations in emotionally more challenging interaction situations demonstrates the regulatory effect of PRF on parenting quality under moderate distress. The considerable differences between bivariate and multivariate associations suggest crucial influences from further personal and environmental factors such as socioeconomic status. This finding draws attention to consider the family system and the cultural and socioeconomic environment in which parents and their children are situated. In particular, for high-risk samples, an

investigation of the PRF sub-dimensions is essential. Mixed findings on the role of maternal depression and BPD features highlight the complex interaction between PRF and parental psychopathology. Future research should investigate the factorial models of PRF using various observation settings in diverse sample types (i.e., regarding sociodemographic characteristics, psychosocial risk factors, cultural context) with larger sample sizes using multivariate statistics to generate more insights for embedding PRF into a complex and comprehensive parenting context.

The findings of Study II indicate no direct connection between mothers' PRF and representational or observed MM at 7 months postpartum. Although sharing similar processes of the awareness and interpretation of mental states, the constructs of PRF and MM capture rather distinct aspects of parental mentalization. In terms of associations with maternal psychosocial functioning and recalled parenting by own mother, the findings revealed further differences between PRF and MM. In particular, the link between PRF and maternal emotion regulation was confirmed, indicating emotional awareness as an essential part of PRF. On the other hand, the link between MM and parenting efficacy was not found. The associations with state anxiety suggest that higher levels of emotional arousal (as indicated by anxiety symptoms) could impair PRF and representational MM, both closely connected to parental mental representation. The paradoxical negative effect of recalled parenting by own mother as optimal on representational and appropriate MM reveals possible internal conflicts regarding mothers' bonding experience with their own mother. This finding also indicates a close connection between MM and the parenting context.

The findings of Study III indicate no direct interplay between parental mentalization (i.e., PRF and MM) and infant temperament (i.e., negative emotionality and soothability) at 7 months postpartum. However, the unique descriptive pattern of correlations suggests a potential association between non-attuned MM and concurrent infant soothability, which should be followed up in future studies. Although both infant negative emotionality and soothability showed moderate stability from 7 to 12 months postpartum, results demonstrated a predictive effect of appropriate MM on later infant negative emotionality. Thus, infants who were exposed to more appropriate mind-related comments during an interaction with their mothers at 7 months were reported to show lower levels of negative emotionality at 12 months. On the other hand, such predictive effect was not found for PRF on infant negative emotionality, although the effect size was not negligible in the current sample. In terms of infant soothability, no predictive effect from any parental mentalization variables was found.

5.2 Conceptualisation of parental mentalization with PRF and MM

After decades of research, parental mentalization is shown to be highly relevant in the context of early relationships, and evidence on its effect on subsequent child development is accumulating. However, empirical indications on what aspects of a mother's mind help what parts of the co-regulating processes are still limited. To contribute to the theory building and keep the research focus more targeted in future studies, it is essential to delineate the related concepts such as PRF and MM (Luyten, Nijssens, et al., 2017). Particularly in the context of attachment research, a variety of theoretical and methodological approaches are brought together to describe fine-grained mechanisms involved in early relationships (Duschinsky, 2020). Especially qualitative assessment procedures such as interviews or behavioural observations often contain fundamental differences that capture critical details along the spectrum of mental and behavioural processes.

As indicated by the findings of this dissertation, both PRF and MM appear to be maternal characteristics that are not directly influenced by perceived infant temperament, at least in the current population-based community sample. Further, PRF is more closely related to maternal emotion self-regulation, while MM seems to be more related to behavioural components of parenting and therefore shows a direct effect on later infant negative emotionality accordingly. Tracing back to the theoretical origins, PRF is closely connected to intrapsychic mechanisms related to emotion regulation (Fonagy et al., 2002). Although this concept contains crucial elements of object relationships, it is less interactional than MM. In line with the theoretical background, the moderate negative effect from state anxiety on PRF in Study II indicates the inhibitory effect of heightened emotional arousal on the mother's reflective capacity. On the other hand, mothers with higher PRF could better handle emotional arousal or distress and thus experience lower levels of state anxiety. This link between PRF and emotional arousal is also consistent with the finding from Study I that PRF activation was related to emotional distress during behavioural observation. Accordingly, the regulatory quality of PRF can be best assessed under increased emotional arousal, such as using the interview method (Luyten et al., 2019).

PDI-RF describes not only whether parents can explicitly connect mental states with behaviours but also allows implicit aspects such as the affective tone or coherence of the narrative and potential psychological defence to be considered. For example, when asked, "How do you think your relationship with your child is affecting his development or personality?" one participant Daniela (with an overall level of ordinary PRF, score of 5) from the current project responded as follows:

Yes, quite extremely. Well, that is also crucial that he can develop at all. That he approaches things without fear and simply feels the sense of security. So, like "everything is good here, I can also take care of my things and experience and explore something". And I see that almost more with our older child. That when our atmosphere here at home is not so good, or we argue or something is in the air, or we are just nervous or annoyed, he immediately jumps at it. So, I see that much more clearly, and he often asks, "what happened" and "why was daddy loud" or "what is going on". So, he doesn't let himself get so irritated, but he also gets unsettled. And I think with [infant's name] it's also like that, that his character just shows a bit. (Daniela, mother of a 7-month-old boy and a 42-month-old boy)

While this mother showed a general awareness and a certain level of sensitivity for interactions between mental states, her example did not support her beginning statement of providing the child with a sense of security. Using direct discourse to describe her children's mental states further indicated uncertainty or inability of further reflection. Most importantly, her response did not give a clear picture of the mental states of the index child (i.e., the infant). These considerations are accounted for in the PDI-RF coding, resulting in a rating of rudimentary or inexplicit mentalization (score of 4) for this question. At the same time, this single rating was only part of the overall reflective process observed during the interview. Nonetheless, the single overall score is also limited in indicating the complex processes and dimensions involved (Luyten, Nijssens, et al., 2017). For example, the PRFQ subscales would provide single indicators for some key aspects of Daniela's PRF (i.e., the level of her non-mentalizing stance, how curious and certain she is about her infant's mental states).

In comparison, MM is conceptualised and measured mainly based on maternal verbal comments in parent-child interactions. Closely related to maternal sensitivity, observed MM captures maternal psychological attunement to the infant in behavioural interactions (Meins et al., 2001). Thus, it is not merely about what a mother said but more about how her verbal comments matched her infant's behaviour. In the case of appropriate MM, the mother demonstrates awareness of and attunement to the child's mental states (e.g., "Do you want to touch the cat?" while the child is gazing at the cat toy), often accompanied by behavioural responses to the child's cues (e.g., giving the cat toy to the child). In the case of non-attuned MM, the mother misreads the child's mind or follows her own agenda (e.g., "Do you want to have something else, or do you want to keep playing that ball?" when the child was very engaged in playing with the ball and showed no sign of wanting to do something else). Although implicated in the concept, the mother's mental reflection about the child's mental state is not

measured directly. However, empirical evidence on the relational nature of MM suggests that mothers' focus on the internal states of their children is relationship-specific (Larkin, Schacht, et al., 2020), thus, indicating a particular mental reflection of their children's minds.

Further, representational MM captures another aspect of MM, using parents' mental representation of their children based on mental attributes. This measure does not allow the appraisal of the appropriateness of parental representation that lies at the core of the MM concept. Accordingly, representational and observed MM were not significantly correlated in Study II, indicating an essential difference between the two measures and ultimately between the measured aspects of the construct. Compared to observed MM, representational MM was influenced more strongly by maternal recalled parenting by own mother and additionally associated with maternal state anxiety. These associations with negative effects indicate representational MM to show less buffering effect in the presence of psychosocial risks and therefore less regulatory than observed MM.

Nonetheless, representational MM directly captures a relevant aspect of parental mentalization, thus seeing children as having their own minds. The findings suggest that representational MM could be a mental image about the child that offers the basis for mental reflection but does not necessarily guide parental mind-minded behaviour. Without the direct experience of being understood as a mental agent in daily interactions for the child, the link between representational MM and child emotional or cognitive development might differ considerably from observed MM, as stressed by previous research (Illingworth et al., 2016), and should be distinguished in future studies. Furthermore, a newly developed observational assessment of parental MM during toddlerhood includes yet distinct dimensions of observed MM (Fishburn et al., 2021) and offers opportunities to deepen the understanding of parental MM.

Further differences in PRF and MM were indicated by their associations with mothers' experienced parenting by their own mother in Study II. The association was absent for PRF, indicating PRF to be a reflective process relatively independent of previous bonding experience. In contrast, the association was significant for representational and appropriate MM, which aligns with the close theoretical connection between the MM concept and parenting behaviour. Especially thought-provoking was the fact that mothers who experienced parenting by their own mother as non-optimal showed more effort in mind-minded interaction with their child. For example, Bianca, a participant from the current project, described the relationship with her mother as "not loving" and only "[…] everything functional was taken care of, food and such" during the PDI-R assessment, which was reflected in her recalled parenting by own mother as

non-optimal (neglectful parenting characterised by low care and low overprotection). Although she struggled to mentalize in the interview (overall score of 3), she was very effortful in parenting by wanting to do things differently than her mother: "I just try to somehow give my child quite a lot of love" (from PDI-R transcript). Interestingly, Bianca also achieved a relatively high score in appropriate MM (proportion score around 70th percentile and frequency score above 90th percentile in the current sample) despite her limited PRF capacity in reflecting on her 7-month-old child's mental states underlying behaviour. Although PRF seems to be an independent process, a deeper understanding of the potential connections between parents' own early experience and subsequent mind-minded behaviour can still be understood more in-depth by combining PRF and MM measures. In Bianca's case, her PDI-R transcript provided many indications of what she struggled with in parenting (e.g., wanting to provide a loving environment but lacking understanding of an affectionate parent-child relationship) and potential reasons why she struggled (e.g., early experience and unresolved internal conflicts with her own parents). At the same time, the behavioural interaction with her infant also offered insights on how she could nevertheless appropriately read her child's behavioural cues. In fact, mentalization-based interventions aimed to improve PRF often include the element of video feedback that provides parents with the opportunity to observe their own interaction with the infant (Barlow et al., 2020; Sadler et al., 2006).

The absence of significant correlations between PRF and observed MM as well as between representational and observed MM adds to the evidence on the underlying competence-performance gap between maternal mental and behavioural capacity (Barreto et al., 2016; Meins et al., 2014; Meins et al., 2006). It remains to be investigated what lies between the two aspects of parental mentalization. Maternal characteristics potentially related to individual differences in PRF or MM such as personality traits, parenting-related factors (e.g., parenting stress, style, or beliefs) or rudimentary cognitive capacities such as executive functions could help shed light on this question (Ahrnberg et al., 2020; Lee, 2021; McMahon & Bernier, 2017; Rutherford et al., 2018; Yatziv et al., 2020). More relationship-specific factors previously investigated with PRF or MM are also relevant, such as adult attachment (Dollberg, 2021) or maternal-foetal bonding (McMahon et al., 2016; Røhder et al., 2020). Considering PRF sub-dimensions or the content of mind-related comments (e.g., emotion or cognition, infant-centred or self-centred; McMahon & Newey, 2018; Milligan et al., 2015) and mental attributes might also reveal additional insights. Further, the understanding of the self and others is rooted in all constructs of parental mentalization. This connection between self and others is natural due to the relational nature of psychological processes on the one hand and the shared

neuro network related to self-other reflection on the other hand (Luyten, Nijssens, et al., 2017). Thus, neurobiological studies might help understand individual differences regarding various aspects of mentalization.

5.3 Contextual factors in the research of parental mentalization

Parental mentalization involves a range of intra- and interpersonal processes regarding cognition and affect, self and other (Luyten, Nijssens, et al., 2017). Consequently, its manifestation varies depending on the context. As highlighted by the findings from Study I, associations between PRF and parenting behaviours varied considerably depending on contextual factors such as sample types, interaction situations, or socioeconomic environment. Complemented by the psychosocial correlates of parental mentalization from Study II, these findings draw attention to the fact that context matters, at least to a certain degree. Contextual factors influence parental mentalization and early relationships on various levels: personal, situational, socioeconomic, and cultural.

Considering personal factors, understanding psychosocial correlates of parental mentalization may help expand our understanding of the concept and identify possibilities to promote parenting quality. Maternal characteristics such as psychosocial functioning, including parenting stress, anxiety or depression symptoms, are common factors considered in the early parenting context (Riva Crugnola et al., 2016). In line with the close theoretical link between parental mentalization and affective states, PRF and representational MM were negatively influenced by maternal state anxiety. In contrast, appropriate MM appears to be a behavioural capacity relatively independent of the negative impact of maternal anxiety or depression symptoms, at least in the current population-based community sample. Therefore, mind-minded interaction could represent a valuable parental resource and a starting point to promote parental mentalization and parent-child interaction, as illustrated earlier with the case example of Bianca. Despite the negative effect of maternal state anxiety, PRF can also be "resilience-promoting" (Fonagy & Bateman, 2016, p. 61) and therefore interact with parental psychopathology in a complex manner. In the current project, several mothers with mental health issues demonstrated ordinary PRF (score of 5), while many mothers reporting no current mental health issues only showed questionable PRF (score of 3). The interview data indicate that a mother's intensive mental reflections on her own emotions are related to sensitivity to mental states, which is, in turn, helpful in understanding the child. Qualitative studies on PDI-R could help further understand how mental reflection in the parenting context can succeed despite psychopathology. However, in the case of severe psychopathology, parental mentalization is often impaired (Krink & Ramsauer, 2021; Pawlby et al., 2010; Schacht et al.,

2013) and shown as an imbalance of different mentalizing capacities (Luyten, Nijssens, et al., 2017). The impact of parental psychopathology on parenting quality could be better investigated when multiple aspects of parental mentalization are measured to capture what parts of the mentalizing process could be relevant in mothers with different levels of psychopathology and related psychosocial functioning.

Regarding situational factors, interaction situations are highly relevant when investigating parental mentalization, as discussed earlier in the three current studies. With very low levels of emotional arousal, parents' mentalizing capacities are potentially not activated. Besides the stronger association between PRF and parenting behaviours described in Study I, studies using attachment-activating interaction situations such as the SFP also revealed possibilities to explore the meaning and effect of non-attuned MM as well as the influence of infant affect on maternal MM (McMahon & Newey, 2018; Planalp et al., 2019). Observation of caretaking in the home environment has also been discussed (McMahon & Bernier, 2017) and could reveal daily challenges mothers experience with the infant.

Zooming out to the bigger picture, families are situated in socioeconomic environments that allow differential access to social and financial recourses (Bradley & Corwyn, 2002). When external resources are limited, the internal parental capacities could make a more considerable difference for children's development. For example, the positive effect of early maternal appropriate MM on later child cognitive development is shown to be especially relevant in socioeconomically disadvantaged families (Meins et al., 2013; Meins et al., 2019). Families with low-income or long-term unemployment are exposed to chronic stress that could considerably inhibit parental mentalization and impact parenting quality (Sleed et al., 2020), while higher PRF could also protect against this negative impact (Buttitta et al., 2019). Especially at-risk or high-risk families in clinical settings are often affected by long-term adversity that impairs parental emotion regulation and mentalizing capacity (Slade et al., 2019). Accordingly, one of the first steps to promote reflective parenting is to recognise and manage parental stress related to adversity (Slade, 2021).

The cultural background is also highly relevant for parental mentalization. In accordance with its origin, attachment theory and research are predominantly informed by Western cultural values (Quinn & Mageo, 2013). Attachment is a relational construct that considers the dynamics between self and others. However, questions regarding the relation between the self and others (Markus & Kitayama, 1991), the ideal of good parenting (Keller et al., 2018), or the focus on mind or behaviour (Doan & Wang, 2010) are related to the cultural background. Several cross-cultural comparisons on parental mentalization found lower levels

of MM or PRF in East Asian parents than their Western counterparts, demonstrating crucial cultural differences due to, for example, the East Asian cultural emphasis on interdependence or social norms about conformity and harmony (Dai et al., 2019; Fujita & Hughes, 2021; Hughes et al., 2018; Lee, 2021). Accordingly, the importance of individual independence and verbal expressions of mental states should be understood in the way how it helps the individual to develop in the cultural context. Moreover, to some extent, parenting is a cultural construct (Bornstein & Cheah, 2006) and is implicitly shaped by the cultural context (Dawson & Bain, 2021). Although one South African study (Dawson et al., 2018) in Study I discussed the eligibility of different observation methods for maternal sensitivity, potential particularities of the PDI-RF assessment in their non-Western sample was not addressed. Cross-cultural studies on parental mentalization should combine assessments of verbal expressions and embodied components, such as parental embodied mentalization (Shai & Belsky, 2011), to explore how parents with non-Western cultural backgrounds understand reflective parenting. Furthermore, even within the same cultural context, parenting beliefs related to the societal environment can have differential associations with parental mentalization. For example, in a community sample from the USA, mothers with higher PRF had more progressive than traditional parenting beliefs (Jessee, 2020).

Finally, it should be stressed that the contextual factors are interrelated. Socioeconomically disadvantaged families or parents with severe psychopathology are often exposed to multiple psychosocial risks such as trauma or poverty (Cyr et al., 2010). High-risk families with migrant backgrounds often represent ethnic minorities that partially do not share the same cultural background as the society they live in. Understanding the potential impact of these contextual factors is relevant for empirical research and parenting interventions.

5.4 The extent of predictive effects on infant development

Parental mentalization has often been investigated with child attachment security or later social-emotional or cognitive development, while there is less known about its association with early emotional development. From the child's perspective, infant temperament is considered a salient characteristic that interacts with the rearing environment and relates to later social-emotional and personality development (Rothbart & Bates, 2006). Hence, Study III focused on whether and how parental mentalization can be linked with or potentially influence infant temperament.

Temperament and attachment are generally considered as related to each other (Mangelsdorf & Frosch, 1999; van IJzendoorn & Bakermans-Kranenburg, 2012). Temperament as a predominantly biologically-based construct nevertheless develops with the

child's affective experience in early relationships. Previous research has highlighted infant negative emotionality or "difficultness" in association with parenting characteristics (Bates et al., 2012). To better understand the findings from Study III, it should be stressed that mentalization is a relational concept and embedded in the parent-child attachment experience, while temperament is more related to the child's individual trait (van IJzendoorn & Bakermans-Kranenburg, 2012). However, both constructs comprise affective and behavioural components and may thus interact with each other. Accordingly, Study III demonstrated that maternal appropriate MM influences the development of infant negative emotionality, beyond the effects of earlier infant negative emotionality and maternal current mood. This finding adds to the evidence that parental mentalization (appropriate MM in specific) is associated with child emotional development early on during infancy and potentially supports the theory that infants internalise interpersonal experiences that help to form their intrapsychic structures and related self-regulation (Fonagy et al., 2002). On the other hand, it should be stressed that the predictive effect of appropriate MM on infant negative emotionality must be considered within the interactional context of the parent-child relationship. Infants with higher levels of negative emotionality could provoke less MM in their parents since it is harder for the parents to figure them out or more exasperating and stressful for the parents due to frequent fussiness, as previously shown in samples with clinically referred infants with early regulatory problems and their mothers (Georg et al., 2018).

In Study III, two mothers of the infants with the highest and the second-highest scores in negative emotionality at 7 months both described difficulties understanding their child's mental states and coping with child distress in the PDI-R assessment. Both showed low levels of appropriate MM, and one of them also showed a relatively high level of non-attuned MM. Their overall PRF levels were also questionable to rudimentary/inexplicit. In both cases, infant negative emotionality and maternal poor mentalizing capacities seem to interact with each other. Nevertheless, the low levels of PRF during the rest of the PDI-R assessment indicate poor maternal mentalizing that negatively impacts the handling of their infants.

A more recent model regarding interactions between parenting environment and child development is the genetic differential susceptibility model (Belsky & van IJzendoorn, 2017), highlighting the child's active role. This model describes that children characterised by heightened susceptibility are not merely more vulnerable but more sensitive to both negative and positive environmental conditions (van IJzendoorn & Bakermans-Kranenburg, 2019). Accordingly, heightened infant reactivity or negative emotionality can function as an essential moderator and interact with parental mentalization on its effect on, for example, the

development of child self-regulation. Using additional behavioural observation to assess infant temperament could be helpful in this context to identify infants with more intense reactions during tasks that induce negative affect and allow coding of child self-regulation at the time (Planalp et al., 2017).

The differential effect of PRF and MM indicators on infant negative emotionality again demonstrates the distinctness of the parental mentalization constructs. In Study III, PRF showed no significant predictive effect on infant temperament, whereas the significant predictive effect of MM was only observed using the frequency scores. If the repeated experience of being seen and understood is crucial for children, the frequency of this kind of experience would be meaningful independent of whether and what else was said. Nonetheless, the frequency scores of MM does not account for what occurred in the rest of the interaction. The connection between PRF and infant temperament is possibly indirect since higher PRF indicates better maternal self-regulation. Also, the predictive effect of PRF on infant negative emotionality was not negligible in the current sample and should be further investigated. As indicated by Study I, PRF is linked with parenting behaviour. Therefore, directly targeting infant self-regulatory behaviour and additional parental interactive behaviour might offer more insights into this potential connection.

Further, the assessment method for infant temperament is a relevant methodological issue. In temperament research, parental reports are a commonly used method since parents spend much more time with their children and can thus report on child behaviour patterns more reliably than single observations (Rothbart & Bates, 2006). At the same time, parental reports are also subject to bias. In comparison, laboratory observation methods could capture a more objective picture of child behaviour that is, on the other hand, only a snapshot (Rothbart & Bates, 2006). Infant negative emotionality was measured as frequencies of infant behaviours perceived by the mother in Study III, while the mother's perception of infant behaviour could also be part of observed MM. Therefore, additional behavioural observation might show differential results.

According to the theoretical background of mentalization described in the introduction, parental mentalizing capacity is crucial for marked affect-mirroring, which facilitates the development of the infant's mental representation of self-states. When considering to what extent parental mentalization influences infant development, it appears inevitable to focus more on possible manifestations of infants' mental representation and cognitive capacities using methods from developmental science (Cassidy et al., 2013). For example, Johnson et al. (2010) examined infants' expectations of maternal response to an infant's distress using a visual

habituation experiment with animated displays of abstract figures. More importantly, parental mentalization is thought to foster the development of social understanding. Measurements of infant cognitive capacities related to social understanding, such as implicit elements of theory of mind or preference for prosocial behaviours (Hamlin & Wynn, 2011; Slaughter, 2015), using experimental designs are no rarity in infancy research. Hence, incorporating research paradigms from developmental science can provide new insights and open up opportunities to deepen our understanding of the role of parental mentalization in early childhood.

5.5 Overall strengths and limitations

This dissertation has several methodological strengths and limitations. The systematic review offered an extensive overview of current research that helps understand how PRF could influence parenting practices. However, the identified contextual factors from the systematic review could not be considered in the two empirical studies. The instruments used to assess PRF and MM are considered gold standards with complex and time-consuming but reliable coding procedures, while an innovative coding procedure was applied to assess representational MM that allowed further exploration. The examples from interview and observation transcripts additionally shed light on the findings and illustrate the interpretations. However, due to limited resources, one PRF and MM coder (the doctoral candidate) conducted all the interviews and was not blind to the participants' information, thus prone to bias in the coding. The two empirical studies used longitudinal designs involving three assessment points to investigate the predictive effects of some variables. On the other hand, although common in the research field, the sample size was modest, and the two empirical studies shared the same study sample, limiting statistical conclusions. More complete cases with PRF or MM data would provide more reliable inference statistical results, albeit incomplete cases could be analysed using the multiple imputation method. Further, the homogeneity regarding sociodemographic characteristics of the sample reduces additional confounding effects in the statistical analyses but also limits the generalisability of the findings. Lastly, studies on PRF and MM using German-speaking samples are still scarce, and the current findings provide additional indications to this emerging body of research in Germany.

5.6 Conclusions and implications

This dissertation investigated parental mentalization operationalised as PRF and MM in the context of early parenting. Overall, the findings (a) confirmed the regulatory effect of PRF on early parenting and highlighted contextual factors that crucially influence the association between PRF and parenting behaviours, (b) explored the differences between PRF and MM

with psychosocial correlates and mothers' recalled parenting by own mother, while their potential overlaps were also discussed, and (c) demonstrated predictive effects of MM on the development of infant negative emotionality, while implications for their bidirectional relations were also discussed.

Parental mentalization is a broad concept. Without defining a specific construct under this concept, it is hard to understand what related mental or behavioural processes are involved in its effect on the infant-parent mutual regulation. Future studies on the relation between PRF and MM need to combine various assessments and psychological or neurobiological factors to reveal potential overlaps of the constructs. Longitudinal designs should also be used to investigate the development of PRF and MM and their bidirectional relations. While appropriate MM is shown to develop relatively stable (McMahon & Bernier, 2017), there is little known about non-attuned MM or PRF. Investigations beginning in the prenatal period could reveal developmental trajectories of PRF and MM from the prenatal to the postpartum period and help identify early indications for prevention or intervention, especially since parents' prenatal mental representations are also shown to be associated with the quality of postnatal parent-child interaction (Foley & Hughes, 2018).

In line with mentalization-based interventions (Barlow et al., 2020; Volkert et al., 2019), PRF is particularly important in clinical research considering its close relation with maternal emotion regulation and buffering effect against maternal negative bonding experience with own mother. For mothers struggling with their own emotional distress in the parenting context like Anja, Daniela, or Bianca from the current sample, highlighting and promoting their PRF capacity could help them manage their internal ambivalences and truly encounter their infants emotionally. PRF sub-dimensions could further reveal what key features or relational foci of the reflective process are relevant in association with parenting behaviours. Due to the complex interplay between parental mentalization and adult psychopathology, it might be helpful to conduct an in-depth qualitative analysis of PDI-R to understand the resilience-promoting elements of PRF. Such analysis could help explain how mothers with mental health issues could still manage to mentalize moderately, while a considerable proportion of "healthy" mothers could only show marginal mentalizing capacity, and how this could impact their children's development.

MM could be of particular interest for accessible prevention or intervention in the general or hard-to-reach populations due to its straightforward operationalisation and more direct link with parenting behaviour. In fact, a parenting intervention using a smartphone app aimed to promote maternal MM has already shown promising results in the UK (Larkin et al.,

2019). This kind of accessible support could offer a specific opportunity to promote parental interactional competence and serve as a starting point for perinatal mental health support by health professionals. Mothers' representational MM in infancy should yet be explored, possibly in combination with other maternal mental representation measurements (e.g., the WMCI), to help understand how this parental mental image of the infant could promote or impede early parent-child mutual regulation. Further, combining parental observed and representational MM in toddlerhood using the newly developed observational preschool assessment of parental MM could also help explain the relation between parental mental representation and interactive behaviour.

Due to the relevance of contextual factors, comparisons between community and at-risk samples with more diverse sociodemographic characteristics or ethnic backgrounds could reveal additional insights into the effects of PRF and MM on early parenting and infant development. Lastly, although the main focus of this dissertation was on the mother's mind, the indications on the differential effect of fathers' mentalizing capacities and potential interactions between both parents should be explored in-depth to learn more about the complex family system.

6. Abstracts in English and German

Background: Decades of research on early attachment relationships have identified parental mentalization as one of the central capacities for parental co-regulation, captured by parental reflective functioning (PRF) and mind-mindedness (MM). Despite intensive research, there was little conceptual differentiation between the constructs and their associated factors within the early relationship. Hence, this dissertation addressed the following research objectives: Study I – an extensive overview of current research on PRF and early parenting quality; Study II – the differentiation of PRF and MM with associated maternal factors; Study III – the bidirectional relations between PRF, MM, and infant temperament.

Methods: Study I was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines. Study II and III derived data from $N = 76$ mother-infant dyads as part of a prospective pregnancy cohort study in Hamburg, Germany. Both studies applied a longitudinal, mixed methods design with assessment points at 3 weeks and 7 months postpartum (Study II) and at 7 and 12 months postpartum (Study III). Measures included self-report questionnaires, the Parent Development Interview-Revised, and observation of mother-infant interaction.

Results: Study I confirmed the positive effect of PRF and its sub-dimensions on parenting behaviours and identified crucial influencing factors such as sample types, interaction situations, and socioeconomic factors. Study II found no direct link between PRF and MM. Maternal emotion dysregulation was negatively associated with PRF, while maternal state anxiety was negatively associated with PRF and one of the MM indicators. Unexpectedly, maternal recalled parenting by own mother as optimal showed a negative effect on MM. Study III revealed no direct interaction between PRF, MM, and infant temperament. A MM indicator significantly predicted later infant negative emotionality.

Conclusion: Overall, the current findings demonstrated PRF and MM as distinct aspects of parental mentalization. Contextual influencing factors on the personal, situational, socioeconomic, and cultural levels are also essential. PRF is closely related to maternal emotion regulation, whereas MM is closely related to the parenting context. Future studies should further explore factors contributing to the individual differences in PRF and MM. A combination of PRF and MM assessments would elucidate distinct effects of parental mental and behavioural capacities on the early relationship and prove valuable for clinical research and practice.

Hintergrund: Jahrzehntelange Forschung über frühe Bindungsbeziehungen identifizierte die elterliche Mentalisierung als eine der zentralen Fähigkeiten für die elterliche Ko-Regulation, die durch elterliche reflexive Kompetenz (PRF) und Mind-Mindedness (MM) erfasst wird. Trotz intensiver Forschung gab es nur wenig konzeptionelle Differenzierung zwischen den Konstrukten und ihren assoziierten Faktoren innerhalb der frühen Beziehung. Daher verfolgte diese Dissertation folgende Forschungsziele: Studie I – ein umfassender Überblick über die aktuelle Forschung zu PRF und elterlichem Interaktionsverhalten; Studie II – die Differenzierung von PRF und MM mit assoziierten mütterlichen Faktoren; Studie III – die wechselseitigen Zusammenhänge zwischen PRF, MM und dem kindlichen Temperament.

Methoden: Studie I wurde gemäß den Preferred Reporting Items for Systematic Review and Meta-Analysis-Leitlinien durchgeführt. In den Studien II und III wurden Daten von $N = 76$ Mutter-Kind-Dyaden im Rahmen einer prospektiven Schwangerschaftskohortenstudie in Hamburg erhoben. Beide Studien verwendeten ein longitudinales, mixed-methods Design mit Erhebungszeitpunkten 3 Wochen und 7 Monate postpartal (Studie II) sowie 7 und 12 Monate postpartal (Studie III). Die Erfassungsmethoden umfassten Selbstauskunftsfragebögen, das Parent Development Interview-Revised und eine Beobachtung der Mutter-Kind-Interaktion.

 Ergebnisse: Studie I bestätigte die positive Wirkung der PRF sowie ihrer Subdimensionen auf das elterliche Interaktionsverhalten und identifizierte wesentliche Einflussfaktoren wie die Stichprobenart, Interaktionssituation und sozioökonomische Faktoren. In Studie II wurde kein direkter Zusammenhang zwischen PRF und MM gefunden. Mütterliche Emotionsdysregulation war negativ mit PRF assoziiert, während mütterliche Ängstlichkeit negativ mit PRF und einem der MM-Indikatoren assoziiert war. Unerwartet zeigte die mütterliche Erinnerung an eine optimale Erziehung durch die eigene Mutter einen negativen Effekt auf MM. In Studie III ergab sich keine direkte Interaktion zwischen PRF, MM und kindlichem Temperament. Ein MM-Indikator sagte die spätere negative Emotionalität des Säuglings signifikant voraus.

Schlussfolgerung: Insgesamt zeigen die vorliegenden Ergebnisse, dass PRF und MM distinkte Aspekte der elterlichen Mentalisierung darstellen. Wesentlich sind auch kontextuelle Einflussfaktoren auf der persönlichen, situativen, sozioökonomischen und kulturellen Ebene. PRF hängt eng mit der mütterlichen Emotionsregulation zusammen, während MM eng mit dem elterlichen Kontext zusammenhängt. Zukünftige Studien sollten weitere Faktoren untersuchen, die zu den individuellen Unterschieden in PRF und MM beitragen. Eine Kombination von PRF- und MM-Erhebungen würde die spezifischen Auswirkungen der mentalen und verhaltens-bezogenen Fähigkeiten der Eltern auf die frühe Beziehung verdeutlichen und sich als wertvoll für die klinische Forschung und Praxis erweisen.

7. List of abbreviations

AMBIANCE	Atypical Maternal Behavioural Instrument for Assessment and Classification
BPD	Borderline personality disorder
BZgA	Bundeszentrale für gesundheitliche Aufklärung
CARE-Index	Child-Adult Relationship Experimental Index
CES-D	Centre for Epidemiologic Studies Depression
CIB	Coding Interactive Behaviour
DERS	Difficulties in Emotion Regulation Scale
DIP	Disconnected and Extremely Insensitive Parenting
EA	Emotional availability
EPDS	Edinburgh Postnatal Depression Scale
EPHPP	Effective Public Health Practice Project
IBQ	Infant Behaviour Questionnaire
IPV-PTSD	Interpersonal violence-related posttraumatic stress disorder
MACY	Maternal Anxiety during the Childbearing Years
MBQS	Maternal Behaviour Q-sort
Mini-PRFI	Mini-Parent Reflective Functioning Interview
MIPCS	MACY Infant-Parent Coding System
MM	Mind-mindedness
NCAST	Nursing Child Assessment Satellite Training
NICE	National Institute for Health and Clinical Excellence
PAULINE	Prenatal Anxiety and Infant Early Emotional Development
PBI	Parental Bonding Instrument
PCIS	Parent/Caregiver Involvement Scale
PDI-R	Parent Development Interview-Revised
PDI-RF	Reflective functioning coding for Parent Development Interview-Revised
PRF	Parental reflective functioning
PRFQ	Parental Reflective Functioning Questionnaire
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
PROSPERO	International Prospective Register of Systematic Reviews
PSOC	Parental Sense of Competence
RF	Reflective functioning
SFP	Still-Face Paradigm
STAI-S	State-Trait Anxiety Inventory – State Anxiety
WMCI	Working Model of the Child Interview

8. List of tables

9. List of figures

10. References

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Appendix I

EPHPP QUALITY ASSESSMENT CHECKLIST adapted

A) SELECTION BIAS

A1 **Are the individuals selected to participate in the study likely to be representative of the target population?**

**Consider questions from the NICE guideline:
- Was the method of selection of participants from the eligible population well described?
- Were the inclusion or exclusion criteria explicit and appropriate?

**Criteria: description of sampling method, description of sampling setting, (e.g., in-/exclusion criteria, recruitment sites and procedure), sample size

  1   Very likely
  2   Somewhat likely
  3   Not likely
  4   Can't tell (selection not described)

A2 **What percentage of selected individuals agreed to participate?**

  1   80 – 100% agreement
  2   60 – 79% agreement
  3   less than 60% agreement
  4   Not applicable*
  5   Can't tell*

*Not applicable: Consider whether it was described in the paper, why it was not possible to report a response rate.
*Can't tell: if the response rate was not mentioned AND it's not possible to calculate the response rate based on reported statistics in the paper.

RATE SECTION A

1 Strong: The selected individuals are very likely to be representative of the target population (A1 is 1) and there is greater than 80% participation (A2 is 1) or the missing participation rate has been justified well (A2 is 4 with justification).

2 Moderate: The selected individuals are at least somewhat likely to be representative of the target population (A1 is 1 or 2) and there is 60 - 79% participation (A2 is 2). 'Moderate' may also be assigned if A1 is 1 or 2 and A2 is 4 (without justification).

3 Weak: The selected individuals are not likely to be representative of the target population (A1 is 3); or there is less than 60% participation (A2 is 3) or selection is not described (A1 is 4) and the level of participation is not described (A2 is 5).

SELECTION BIAS

Low   The sample is very likely to be representative of the target population or a specific subgroup. The participation rate is either greater than 80 % or well justified for not reporting (e.g., recruitment through flyers or posts on the internet).

Moderate   The sample is at least somewhat likely to be representative of the target population or a specific subgroup. The participation rate is either between 60–79 % or the recruitment procedure shows indications of justification for not reporting.

High   The sample is not likely to be representative of the target population or a specific subgroup. The participation rate is less than 60 %.

B) STUDY DESIGN

Indicate the study design

**Ratings adapted using the NICE guideline

Observational designs:
1) cohort study (prospective & retrospective)
2) Case–control studies
3) cross-sectional study
4) Correlation study

Experimental/intervention designs:
5) Randomised controlled trial (RCT)
6) Non-randomised controlled trial (NRCT)
7) Pre–post study aka. Before-and-after (BA) studies

Others:
8) 8 Other specify
9) 9 Can't tell

RATE SECTION B

1 Strong: will be assigned to those articles that described a cohort study, a case-control study <u>or</u> a RCT.

2 Moderate: will be assigned to those that described a cross-sectional study, a correlational study <u>or</u> a NRCT, a pre-post study.

3 Weak: will be assigned to those that used any other method or did not state the method used.

E) DATA COLLECTION METHODS

**Only consider the measurement tools on the outcome level (i.e., constructs examined by the review)

**Measurement tools must be described as reliable and valid. If 'face' validity or 'content' validity has been demonstrated, this is acceptable. Some sources from which data may be collected are described below:

- <u>Self-reported data</u> includes data that is collected from participants in the study (e.g., completing a questionnaire, survey, answering questions during an interview, etc.).
- <u>Assessment/Screening</u> includes objective data that is retrieved by the researchers. (e.g., observations by investigators).
- <u>Medical Records/Vital Statistics</u> refers to the types of formal records used for the extraction of the data. Reliability and validity can be reported in the study or in a separate study. For example, some standard assessment tools have known reliability and validity.

E1   Were data collection tools shown to be valid?

1   Yes
2   No
3   Can't tell

E2   Were data collection tools shown to be reliable?

1   Yes
2   No
3   Can't tell

RATE SECTION E

1 Strong: The data collection tools have been shown to be valid (E1 is 1); <u>and</u> the data collection tools have been shown to be reliable (E2 is 1).

2 Moderate: The data collection tools have been shown to be valid (E1 is 1); and the data collection tools have not been shown to be reliable (E2 is 2) or reliability is not described (E2 is 3).

3 Weak: The data collection tools have not been shown to be valid (E1 is 2) or validity is not described (E1 is 3) or both reliability and validity are not described (E1 is 3 and E2 is 3).

DETECTION BIAS

Low	Index variable was assessed through a validated and reliable instrument.
Moderate	Index variable was assessed through a validated instrument which has not been shown to be reliable or its reliability is not described.
High	The instrument used to assess index variable has not been shown to be valid. Or both reliability and validity are not described.

F) WITHDRAWALS AND DROP-OUTS

F1 **Were withdrawals and drop-outs (or missing data in cross-sectional studies) reported in terms of numbers and/or reasons per group?**

    1   Yes
    2   No

F2 **Indicate the percentage of participants completing the study (or missing data in cross-sectional studies). (If the percentage differs by groups, record the lowest).**

    1   80 -100%
    2   60 - 79%
    3   less than 60%
    4   Can't tell
    5   Not Applicable (i.e., Retrospective case-control)

**The percentage of participants completing study and the percentage of missing data could also be indicated as reported sample size in the result section.

** The combination of F1 = 2 und F2 = 1 was mostly rated in studies that did not report drop-outs or missing values but indicated in results that data from the whole sample has been used. In this case, it also qualifies for a moderate total rating.

RATE SECTION F

1 Strong: when the follow-up rate is 80% or greater (F1 is 1 and F2 is 1) or missing data was less than 20%.

2 Moderate: when the follow-up rate is 60 – 79% (F2 is 2) or missing data was 20–40% or F1 = 2 and F2 = 1 (see comment above).

3 Weak: when a follow-up rate is less than 60% (F2 is 3) or if the withdrawals and drop-outs were not described (F1 is 2 or F2 is 4) or missing data was more than 40% or missing data were not described.

ATTRITION BIAS

Low	The follow-up rate is high, or percentage of missing data was low.
Moderate	The follow-up rate is moderate, or percentage of missing data was tolerable.
High	The follow-up rate is low, or percentage of missing data was high.

H) ANALYSES

H1   Are the statistical methods appropriate for the study design?

**This refers to the whole statistical analysis of the study (rating on the study level, i.e., not only statistics that has been extracted for the review).

**Due to the complexity of statistical analyses and related statistical conditions, this section is only rated based on descriptions of the respective study and common statistical approaches in the relevant research area.

1   Yes
2   No
3   Can't tell

H2   Were important potential confounders controlled?

**e.g., sociodemographic data, obstetric history, psychosocial variables

1   Yes
2   No
3   Can't tell

RATE SECTION H

1 Strong: will be assigned when H1 is 1 <u>and</u> H2 is 1.

2 Moderate: will be assigned when H1 is 2 and H2 is 1 <u>OR</u> H1 is 2 and H2 is 2.

3 Weak: will be assigned when H1 is 3 <u>and</u> H2 is 2 or 3.

<u>GLOBAL RATING</u>
1 STRONG   (no WEAK ratings in the sections)
2 MODERATE (one WEAK rating in the sections)
3 WEAK   (two or more WEAK ratings in the sections)

Appendix II–IV

Appendix II–IV have been removed for data protection reasons.

[Appendix II–IV wurden aus datenschutzrechtlichen Gründen entfernt.]

Contributions to the publication

Study I:

Stuhrmann, L.Y., Göbel, A., Bindt, C., & Mudra, S. Parental Reflective Functioning and its Association with Parenting Behaviours in Infancy and Early Childhood: A Systematic Review. *Frontiers in Psychology*, 13:765312. doi: 10.3389/fpsyg.2022.765312

LYS developed the research question and study design, conducted the literature search and data extraction. LYS reviewed the studies for eligibility and quality rating, while AG reviewed and rated a portion of the studies. LYS drafted and revised the manuscript in close dialogue with SM and with comments from CB and AG. All authors have approved the final manuscript and agree to be accountable for all aspects of this work.

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Curriculum vitae

The CV has been removed for data protection reasons.

[Der Lebenslauf wurde aus datenschutzrechtlichen Gründen entfernt.]

Eidesstattliche Erklärung

Ich versichere ausdrücklich, dass ich die Arbeit selbständig und ohne fremde Hilfe verfasst, andere als die von mir angegebenen Quellen und Hilfsmittel nicht benutzt und die aus den benutzten Werken wörtlich oder inhaltlich entnommenen Stellen einzeln nach Ausgabe (Auflage und Jahr des Erscheinens), Band und Seite des benutzten Werkes kenntlich gemacht habe.

Ferner versichere ich, dass ich die Dissertation bisher nicht einem Fachvertreter an einer anderen Hochschule zur Überprüfung vorgelegt oder mich anderweitig um Zulassung zur Promotion beworben habe.

Ich erkläre mich einverstanden, dass meine Dissertation vom Dekanat der Medizinischen Fakultät mit einer gängigen Software zur Erkennung von Plagiaten überprüft werden kann.

Hamburg, den 04.11.2021

Unterschrift: ....