Knowing Your Child's Mind and its Relationship with Theory of Mind Acquisition

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Abstract

Research suggests that parental reflective functioning (PRF)—that is, the parent's capacity to envision the mind of the child—is a key factor in understanding the child's reflective capacities. Yet, most existing measures of PRF assume that it is a broad trait-like feature. This study investigated cross-sectional relationships between domain-specific PRF, operationalized as mothers' estimates of the Theory of Mind (ToM) capacities of their children (mother's ToM estimates; MTE), and ToM acquisition in 83 preschool children, using a multidimensional approach. Results showed that the accuracy of MTE was positively related to the children's capacity for ToM, while the degree of certainty of inaccurate MTE was negatively related to ToM acquisition. The implications of these findings for the conceptualization of PRF and its relationship to ToM and other features of social cognition in children are discussed.

Keywords: Parental reflective functioning, Theory of Mind, social cognition, emotion understanding, mental state estimation

Highlights:

- Theory of Mind (ToM) and parental reflective functioning (PRF) are multidimensional constructs
- Associations among PRF and ToM acquisition are domain-specific
- Inaccuracy of mother's ToM estimates (MTE) hampers ToM development in their children
- Higher certainty with regard to inaccurate MTE is associated with lower child ToM performance

Over the past decades, there has been much research aimed at gaining a better understanding of mentalizing, which refers to someone's ability to understand and reflect upon their own and other's expressions and behaviours in terms of thoughts, wishes, intentions, feelings, and desires (Fonagy et al., 2002). This capacity to attribute mental states to self and others is considered to be the hallmark of understanding the nature and depth of social interactions, and provides humans with resilience while navigating a complex social world (Ensink & Mayes, 2010). A well-known operationalization of mentalizing in developing children is Theory of Mind (ToM), a multidimensional construct that refers to the understanding that people's actions and interactions are driven by underlying internal beliefs, emotions, desires, and intentions (Premack & Woodruff, 1978). General ToM understanding is thought to consist of three components, namely, cognitive, affective, and belief-desire ToM, which include the understanding of beliefs and knowledge (e.g., false-belief reasoning and perspective taking), affects (e.g., emotion recognition and attribution), and desires (e.g., belief-desire reasoning), respectively (Blijd-Hoogewys & van Geert, 2016; Ensink & Mayes, 2010; Hughes & Leekam, 2004; Wellman, 2018; Wellman & Liu, 2004).

Although mentalizing and ToM are conceptually related, the notion of mentalizing is used as an umbrella term to refer to the capacity to reflect on oneself and others and all the components of this capacity, involving both cognitive processes (e.g., perspective taking) as well as affective processes (e.g., emotional attunement and self-regulation) and the capacity to reflect on the mental states of both oneself and others (Luyten et al., 2020). ToM, at least in its original meaning, is a theoretical concept that specifically refers to other-oriented, and typically more cognitive, processes involved in recognizing and understanding mental states (Jańczak, 2021). Hence, ToM mainly focuses on the capacity to reflect on the mind of others, in particular the cognitive processes associated with this capacity.

Young children are considered to be predisposed to develop mentalizing skills (Fonagy et al., 2002). As part of a cognitive and biological maturation process, children gradually master more sophisticated ToM understanding throughout the preschool years, with a substantial increase between 42 and 56 months of age (Blijd-Hoogewys & van Geert, 2016; Wellman et al., 2001). However, this maturation process needs to be rooted in an adequate social learning environment for ToM understanding to develop fully (Ensink & Mayes, 2010; Kim, 2015). Moreover, environmental factors are thought to contribute to the intraindividual variation among children in ToM acquisition, in the sense that they seem to accelerate or delay children's ToM development (Devine & Hughes, 2018; Wellman, 2012). In this context, a growing body of research has focused on the role of parental mentalizing, or parental reflective functioning (PRF), in the developmental trajectory of ToM acquisition (Ensink & Mayes, 2010). PRF refers to a specific expression of the more general capacity to mentalize in which the parent reflects upon their own and their child's internal mental experience, and understands the child's behaviour as being driven by underlying mental states, such as thoughts, feelings, desires, and intentions (Slade, 2005). PRF therefore encompasses a parental stance involving an awareness of and interest in the internal psychological world of the child (Zeegers et al., 2017). Parents with high levels of PRF typically focus on what their child is thinking and feeling, and model this focus on reasoning about mental states, for example, through pretend play in early development or long discussions with their adolescent son or daughter about their interests or fears later on in development, all of which involve experiences of joint perspective taking and affect regulation. These interactions are thought to foster and scaffold the child's development of mentalizing and ToM understanding (Luyten, Nijssens, et al., 2017; Midgley et al., 2017).

Over the past decades, several operationalizations of PRF have been developed, ranging from more global to specific measures (for a review, see Schiborr et al., 2013), each tapping into different features of PRF. Some of these operationalizations have been used in studies investigating the potential role of PRF in promoting ToM development. For example, research shows that parental mental-state talk (i.e., the parent explicitly referring to internal mental states when speaking to the child) is related to affective ToM (Doan & Wang, 2010; Dunn, Brown, & Beardsall, 1991; Dunn, Brown, Slomkowski, et al., 1991; Taumoepeau & Ruffman, 2006, 2008) and cognitive ToM (Adrián et al., 2007; Dunn, Brown, Slomkowski, et al., 1991; Ensor et al., 2014; Peterson & Slaughter, 2003; Symons et al., 2006), as well as ToM understanding more generally (Ruffman et al., 2002). Maternal mind-mindedness (MMM; Meins & Fernyhough, 2010), which refers to parents' tendency to verbalize emotional states in interactions with their children, has been shown to be related to affective, cognitive, and belief-desire ToM (de Rosnay et al., 2004; Hughes et al., 2018; Laranjo et al., 2014; Lundy, 2013; Meins et al., 2013; Meins et al., 1998; Meins et al., 2003; Meins et al., 2002). However, the above-mentioned relationships were not replicated in two studies that failed to find direct associations between MMM and subsequent emotion understanding or false-belief understanding (Ereky-Stevens, 2008; Licata et al., 2016). Further, the affective ToM capacities of the parent have been associated with child general ToM understanding (Sabbagh & Seamans, 2008), and representational measures of PRF have been associated with affective (Steele et al., 1999) and cognitive ToM (Ensink et al., 2015; Rosso & Airaldi, 2016; Rosso et al., 2015; Scopesi et al., 2015). Similarly, the key dimensions of the Parental Reflective

Functioning Questionnaire (PRFQ; Luyten et al., 2009; Luyten, Mayes, et al., 2017) have been associated with affective, belief-desire, and cognitive ToM (Nijssens et al., 2021). Finally, Sharp and colleagues (Sharp et al., 2006) found that parental hypermentalizing (excessive mentalizing, characterized by undue certainty about the child's mind, but in a way that is often distorted or intrusive) negatively influences ToM development in the child. For instance, poor maternal accuracy regarding the responses of their children on a socio-cognitive reasoning task, which can be seen as a functional measure of PRF, was negatively associated with child ineffective social-cognitive reasoning.

Taken together, the above-mentioned results emphasize the specificity of PRF, as different operationalizations and features of PRF have been differentially related to different components of ToM. However, the majority of existing studies of ToM typically focus on only one component of ToM, such as affective (e.g., emotion understanding) or cognitive (e.g., false-belief reasoning) ToM. Hence, in line with the multidimensional nature of both PRF and ToM, there is a need for more research investigating associations between different operationalizations of PRF and the different ToM components to identify those specific associations.

The Present Study

The present paper presents a cross-sectional study among biological mothers and their offspring aged 3–5 years (n = 83), investigating associations among PRF and child ToM using a multidimensional approach (i.e., including different ToM dimensions). As mentioned in the Introduction, parental mentalizing is considered an umbrella concept for several operationalizations of PRF, each tapping into different features of PRF. Unlike existing studies that examine the associations between parent and child mentalizing capacities by using representational (e.g., the Adult Attachment Interview or Parent Development Interview), interactional (e.g., MMM), or questionnaire-based (e.g., PRFQ) measures of PRF, the current study uses a functional, domain-specific measure of PRF, namely, PRF with regard to specific features of ToM in their children. More specifically, mothers were asked to estimate the performance of their children on ToM tasks. The accuracy and degree of certainty of the mothers' estimations of their children's ToM performance (i.e., the mothers' ToM estimates; MTE) were used as a proxy of PRF. Hence, MTE incorporates two core features of PRF. First, an important hallmark of PRF is having the child's mind in mind, which may be reflected by enhanced knowledge about the child's mental states (i.e., making accurate estimations about the child's mind). Second, the parent must maintain a not-knowing stance (i.e., recognizing the opacity of mental states), as being too certain about the child's mental states is characteristic of distorted mentalizing, especially when the parent is highly certain while making inaccurate estimations of the child's mind. Therefore, certainty of MTE is divided in terms of the degree of certainty related to the accuracy of the estimation (i.e., degree of certainty of accurate versus inaccurate estimations).

Both MTE and ToM are considered to be offline, trait-like measures of mentalizing. Similar to ToM, MTE taps into explicit, cognitive-oriented mentalizing in a specific context. In addition, ToM and MTE both share a focus on other-focused mentalizing, although research on ToM has mostly focused on mentalizing about an abstract character, whereas MTE focuses on mentalizing about one's own child. Additionally, MTE includes features of self-oriented mentalizing (i.e., self-reported scores of the degree of certainty while making estimations about their child's ToM performance).

Based on the literature reviewed above, we expected high levels of domain-specific PRF (i.e., accuracy of affective, cognitive, and belief-desire MTE) to be positively associated with ToM dimensions, and low levels of domain-specific PRF (as expressed by high or low levels of certainty of affective, cognitive, and belief-desire MTE) to be negatively associated with ToM dimensions. In addition, given the domain-specific nature of each of the MTE measures, we expected associations to be particularly strong for congruent measures of MTE and ToM. Finally, we examined interaction effects with age, as age-related differences in the associations among MTE and ToM may exist. Consistent with the suggestion that PRF may accelerate or delay ToM acquisition (Devine & Hughes, 2018; Nijssens et al., 2021; Wellman, 2012), we expected associations among MTE and ToM to be particularly pronounced in younger and older children.

Method

Participants and Procedures

This study was part of a broader research project on PRF and ToM development and was approved by the Ethics Committee of the university of (institution blinded). Undergraduate students collected data as part of their master thesis. More specifically, they asked Dutch-speaking mothers of a biological child aged 3–5 years to participate in a study on child social-emotional development. Eligible mothers were recruited through the student's social network and nursery schools. Participation was voluntary and full anonymity was guaranteed. Mothers who agreed to participate provided written informed consent. In the first part of the study, mothers were asked to complete a booklet of questionnaires. Approximately 570 mothers were contacted. In total, 385 of these completed the questionnaires, of whom 23 did not meet the inclusion criteria because their children were outside the age range 3–5 years. From the remaining sample of 362 mothers and children, 83 mother–child pairs (22.9%) were randomly selected and invited to participate in the second part of the study together with their children. All contacted mothers agreed to participate in the second part of the study (which took place a maximum of 3 months after the first part through house visits). During this part of the study, the children participated in a standardized ToM experiment while the mothers filled in a second questionnaire about their estimations of the child's performance on the ToM tasks. This questionnaire included a detailed description of the ToM tasks and test questions that were presented to the child. For each test question, the mothers were asked to indicate whether they thought their child would be able to provide the correct answer, and to indicate how certain they were of their estimation. At the end of the ToM assessment, children received an age-appropriate children's book as a gift for their participation.

The children were a mean 54.5 months old (*SD* = 9.04; range 36.0–71.0) and comprised 42 girls (50.6%) and 41 boys (49.4%). The mean age of the mothers was 35.6 years (*SD* = 3.95; range 28.0–45.5). The majority of mothers (82%) had attained higher education. Full demographic information is provided in Table 1.

Mothers of boys and girls did not differ significantly in terms of their age, educational level, or working status. In addition, there were no significant differences in the mean age of the boys and girls. Finally, no significant differences were found with regard to maternal age or educational level, or child gender or age, between mothers and children who participated in the ToM experiment and those who did not.

Measures

ToM development was measured by using a series of ToM tasks that assess different domains of ToM understanding, such as affective (i.e., emotion recognition and attribution), belief-desire (based on true beliefs), and cognitive (i.e., perspective taking and false-belief reasoning) ToM. Following an extensive review of the existing literature on ToM, we selected a set of nine different ToM tasks (22 items in total) designed for children aged 3–6 years, to measure general ToM development, as well as affective (8 items), belief-desire (8 items), and cognitive (6 items) ToM (Denham, 1986; Flavell et al., 1968; Harris et al., 1989; Hogrefe et al., 1986; Wellman & Woolley, 1990; Wimmer & Perner, 1983). Each item was scored as correct (1 point) or incorrect (0 points), with a maximum score of 22 (sum of items). A total ToM score (i.e., general ToM) was computed as the mean of all items. ToM dimensions (i.e., affective, belief-desire, and cognitive) were computed by calculating mean item scores based on the items that were categorized in these dimensions. A detailed description of the ToM tasks is described elsewhere (blinded reference). The selected tasks have been shown to have good test–retest reliability and internal consistency (Hughes et al., 2000), and have been used in various studies (Meins et al., 2002). In the present study, Cronbach's alphas for general, affective, belief-desire, and cognitive ToM were .80, .58, .84, and .65, respectively.

Maternal PRF was measured by the mother's ability to predict the ToM performance of her child, as well as her degree of certainty in making these estimations. More specifically, the mother was asked whether she thought her child would be able to provide the correct answer on a specific ToM item, and to indicate on a scale from 0 to 100% how certain she was of her estimation. The accuracy and degree of certainty of this estimation was named the mother's ToM estimates (MTE). MTE comprises three subscales, namely accuracy, certainty of accurate estimations, and certainty of inaccurate estimations. These subscales were further divided into the different ToM classifications, which enabled us to measure MTE in general, as well as MTE with regard to affective, belief-desire, and cognitive ToM tasks. In the present study, Cronbach's alphas for accuracy and degree of certainty of MTE were .67 and .96, respectively.

Statistical Analyses

A power analysis was conducted based on other studies typically reporting medium effect sizes concerning the association between PRF and child ToM (Devine & Hughes, 2018; Tompkins et al., 2018). For medium effect sizes, the required sample size is $n = 85$ ($p < .05$, power = .80) for testing Pearson's correlations, and $n = 76$ ($p < .05$, power = .80) for testing multiple regression with three independent variables (Cohen, 1992).

First, Pearson's correlations were computed to investigate associations among demographic features, MTE, and ToM. Comparison of maternal levels of education and working status and their associations with ToM performance and MTE were analysed with an independent-samples *t*-test and a one-way analysis of variance, respectively.

Next, we conducted hierarchical multiple regression analyses (HMRAs) to determine the unique proportion of variance explained by each set of predictors (i.e., child age and MTE subscales) in predicting child ToM (i.e., general, affective, belief-desire, and cognitive), including potential interaction effects. For these analyses, all variables were mean-centred and entered sequentially as follows: (1) child age; (2) MTE subscales; (3) the interaction term between child age and MTE subscales. In these analyses, significant moderation effects were indicated by significant standardized regression coefficients and significant changes in R^2 for the interaction terms (Aiken & West, 1991). For each regression model, we calculated Cohen's f^2 as a measure of the effect size (Cohen, 1992). We plotted simple slopes for the association between low and high (one standard deviation below and above the mean, respectively) levels of the independent variable (i.e., MTE accuracy or the degree of certainty of inaccurate MTE) and dependent variable (i.e., general ToM) for low and high (one standard deviation below and above the mean, respectively) levels of the moderator (i.e., child age) (see www.jeremydawson.co.uk/slopes.htm). SPSS version 27.0 was used for all statistical analyses.

Results

Descriptive Statistics

Associations among demographic features of the mother (age, working hours, working days, and durations of relationship, living together, and marriage) and the child (age) on the one hand, and MTE and ToM acquisition (general, affective, belief-desire, cognitive) on the other, were non-significant, except for age. As expected, there was a significant relationship between child age and ToM performance ($r = .49$, $p < .001$; $r = .40$, $p < .001$; $r = .33$, $p < .01$; and $r = .40$, $p < .001$ for general, affective, belief-desire, and cognitive ToM, respectively). Furthermore, child age (but not maternal age) was significantly positively associated with the accuracy of general, affective, and belief-desire MTE ($r = .44$, $p < .001$; $r = .37$, $p < .001$; $r = .34$, $p < .01$, respectively). Finally, maternal age (but not child age) was significantly positively associated with certainty of correct MTE ($r = .34$, $p < .01$), as well as with certainty of incorrect MTE ($r = .32$, $p < .01$). There were no significant differences in the child's ToM performance or MTE between mothers with lower (primary and secondary education) and higher (graduate school and university) levels of education. In addition, maternal working status (classified as unemployed, labourer, white-collar worker, self-employed, or other) showed no significant associations with either ToM performance of the child or MTE.

On average, mothers accurately estimated 73.23% (*SD* = 14.56%) of their child's general ToM performance. For cognitive, affective, and belief-desire ToM, accuracy was 60.24% (*SD* = 24.67%), 81.63% (*SD* = 17.93%), and 77.26% (*SD* = 23.68%), respectively. The degree of certainty of accurate MTE was on average 74.97% (*SD* = 12.98%), 67.00% (*SD* = 15.94%), 80.07% (*SD* = 14.62%), and 75.07% (*SD* = 13.93%) for general, cognitive, affective, and belief-desire ToM, respectively. The degree of certainty of inaccurate estimations of general, cognitive, affective, and belief-desire ToM was on average 66.65% (*SD* = 15.10%), 64.41% (*SD* = 16.31%), 73.50% (*SD* = 18.93%), and 67.77% (*SD* = 17.25%), respectively.

Given the significant correlations of child and maternal age with ToM and MTE, correlational analyses were controlled for age of the mother and of the child.

Zero-Order Correlations Among MTE and ToM Dimensions

Zero-order correlations among MTE and ToM (see Table 2) showed that general accuracy of MTE was significantly positively associated with general, belief-desire, and cognitive ToM. Accuracy of affective MTE, in turn, was significantly positively associated with general and affective ToM. Accuracy of belief-desire MTE was significantly positively associated with general, belief-desire, and cognitive ToM. Accuracy of cognitive MTE was significantly positively associated with cognitive ToM.

No significant associations were found for the degree of certainty of accurate MTE and ToM performance. The degree of certainty of inaccurate MTE, on the other hand, was significantly negatively associated with ToM. More specifically, certainty of inaccurate general MTE was negatively associated with general, affective, and belief-desire ToM. Certainty of inaccurate affective MTE was negatively associated with affective and belief-desire ToM. Certainty of inaccurate belief-desire MTE was negatively associated with general, affective, and belief-desire ToM. Finally, certainty of inaccurate cognitive MTE was negatively associated with general, affective, and belief-desire ToM.

Main and interaction effects of MTE and Child Age in predicting ToM

HMRAs showed that general ToM was best predicted by a combination of child age ($\beta = .27$, $p < .01$), accuracy of MTE ($\beta = .49$, $p < .001$), certainty of inaccurate MTE ($\beta = –.17$, $p = .06$), the interaction between child age and accuracy of MTE ($\beta = .22$, $p < .05$), and the interaction of child age and certainty of inaccurate MTE ($\beta = .17$, $p < .05$), explaining 52% of the variance, representing a large effect (Model 3: $R^2 = .52$, $F(5) = 16.22$, $p < .001$, Cohen's $f^2 = 1.08$; see Table 3). The significant two-way interaction between accuracy of MTE and child age as plotted in Figure 1, shows that child age moderated the relationship between maternal accuracy and general ToM. In older children (i.e., high levels of child age), maternal accuracy was significantly associated with general ToM acquisition. More specifically, general ToM was significantly higher in children of mothers who were highly accurate in their estimations compared with children of mothers who showed low MTE accuracy. For younger children (i.e., low levels of child age), there was no significant difference in general ToM development between children of mothers who scored low versus high on MTE accuracy. Figure 2 shows that the simple slopes for certainty of inaccurate MTE were nonsignificant in both younger and older children.

Affective ToM was best predicted by a combination of accuracy of MTE (β = .40, p < .01) and certainty of inaccurate MTE (β = –.23, p = .07), explaining 30% of the variance and representing a large effect (Model 2: R^2 = .30, F(3) = 6.97, p < .01, Cohen's f^2 = .43; see Table 4). Belief-desire ToM was best predicted by a combination of accuracy of MTE (β = .71, p < .001) and certainty of inaccurate MTE (β = –.25, p < .01), explaining 67% of the variance and representing a large effect (Model 2: R^2 = .67, F(3) = 38.32, p < .001, Cohen's f^2 = 2.03; see Table 5). Cognitive ToM was best predicted by a combination of child age (β = .35, p < .01), accuracy of MTE (β = .37, p < .001), and certainty of inaccurate MTE (β = –.20, p < .05), explaining 35% of the variance and representing a large effect (Model 2: R^2 = .35, F(3) = 12.68, p < .001, Cohen's f^2 = .54; see Table 6).

Discussion

PRF has been hypothesized to be an important factor contributing to intraindividual variation in ToM development. In this study, we examined a domain-specific measure of PRF, which we referred to as MTE (i.e., the accuracy and degree of certainty of the mother's estimations of her child's ToM performances), and its associations with preschool children's abilities to pass affective, belief-desire, and cognitive ToM tasks. Results showed that the general accuracy of MTE in mothers of preschool children was strongly related to ToM in their children. This finding is congruent with earlier research showing that poor maternal accuracy regarding the responses of their children on a socio-cognitive reasoning task is associated with child ineffective social-cognitive reasoning (Sharp et al., 2006). In addition, we found that relationships were especially strong between dimension-specific accuracy (i.e., accuracy in estimating affective, belief-desire, or cognitive ToM performance) and ToM performance on these respective (but not other) dimensions. For example, the mother's ability to make more accurate estimations of her child's capacity to recognize and attribute emotions (i.e., affective ToM) was related to better affective ToM performance of the child, but not to higher performance on cognitive features of ToM such as the ability to reason about beliefs. These task-specific associations provide further evidence for the specificity of both PRF and ToM, and emphasize the importance of PRF in the development of ToM understanding in their children. From this perspective, one could indeed expect that the mother's ability to accurately hold her child's mind in mind would help the child to better understand their own mind as well as the mind of others, which should be reflected in better ToM performance. On the other hand, as the child's ToM understanding becomes more developed, this might also help the mother to better understand the child's mind, leading to more accurate estimations thereof. Hence, longitudinal research is needed to investigate and clarify the nature and reciprocity of these relationships. In this regard, meta-analyses have reported only small effects of PRF on the development of ToM (Devine & Hughes, 2018). Yet, in this study, we found medium to large effects of domain-specific PRF on ToM development. More research, using different measures of PRF and ToM, is therefore needed to further investigate the precise role of general and domain-specific PRF on ToM development.

While accuracy of MTE was considered a proxy of adequate PRF, high levels of certainty—especially with regard to inaccurate estimations—were considered a proxy of distorted PRF. As expected, higher degrees of certainty while making incorrect estimations about the child's mind were associated with lower child ToM performance. Interestingly, high certainty of inaccurate MTE was associated with impairments in affective and belief-desire ToM, but not with cognitive ToM. This is consistent with theoretical assumptions that distorted PRF may lead to problems in affective ToM (e.g., accurate emotion understanding and attribution) (e.g., Ensink & Mayes, 2010; Fonagy et al., 2002; Fonagy & Target, 2005; Sharp & Fonagy, 2008; Slade, 2005) but does not necessarily impede the development of cognitive components of ToM, such as visual perspective taking and false-belief understanding (Luyten, Nijssens, et al., 2017). A possible explanation for these differential results may be that the development of cognitive ToM capacities is mainly part of a biological maturation process, whereas affective ToM capacities are primarily developed within a mentalizing environment, in which the child learns to understand and attribute emotional mental states through interactions with their parents that are characterized by marked affect mirroring, joint perspective taking, and affect regulation. Yet, the parent's tendency to misread the child's mind and to make inaccurate assumptions about the child's behavior may interfere with experiences of co-regulation, which in turn increases the risk for emotional problems in the child (Luyten et al., 2020). This is in line with recent studies showing associations among low levels of PRF and child emotional problems (Burkhart et al., 2017; Krink et al., 2018; Luyten, Mayes, et al., 2017; Nijssens et al., 2020; Pazzagli et al., 2018; Rostad & Whitaker, 2016; Rutherford et al., 2015). Yet, again one should be careful in drawing causal conclusions from these findings, as bidirectional relationships between PRF and ToM may exist. It may well be that distorted PRF, for example, is driven by child factors (e.g., behavioural difficulties or emotion-regulation problems).

The degree of certainty of accurate MTE was relatively unrelated to ToM development, and might thus be considered to be less maladaptive and therefore not to impede ToM acquisition. Although recognizing the opacity of mental states is one of the hallmarks of adaptive PRF, it seems that the parent's tendency to be overly certain about the child's mind does not necessarily hamper ToM in the case of accurate attributions, that is, when mothers seem to know the mind of their child relatively well.

Taken together, these findings suggest that the children of mothers who are highly certain while making inaccurate assumptions about their child's inner world have lower ToM capacities, especially with regard to emotion understanding. These findings are further supported by the regression analyses that showed large effects of MTE in predicting affective, belief-desire, and cognitive ToM. Interestingly however, cognitive ToM was best predicted by the combination of accuracy of MTE, certainty of inaccurate MTE, and child age, while affective and belief-desire ToM were best predicted by the combination of accuracy of MTE and certainty of inaccurate MTE only (and not child age). One possible explanation may be that cognitive ToM development reflects a biologically determined maturation effect (i.e., main effect of child age), which requires an adequate social learning environment (i.e., adequate PRF operationalized as MTE) to fully develop (Blijd-Hoogewys & van Geert, 2016; Devine & Hughes, 2018; Ensink & Mayes, 2010; Kim, 2015; Wellman, 2012; Wellman et al., 2001). ToM development with regard to emotion understanding (i.e., affective and belief-desire ToM), on the other hand, seems to be driven less by biological maturation and more by environmental factors, in the sense that inadequate PRF delays these ToM capacities, independent of child age. An alternative, but related, explanation may be that PRF particularly influences ToM development after the average threshold for ToM acquisition. Indeed, affective and belief-desire ToM understanding typically emerge first in development, between the ages of 3 and 4 years, followed by cognitive ToM, when the child is 5 years old (Kim, 2015; Wellman, 2012). Therefore, in this sample of preschoolers, the role of MTE may be more pronounced with regard to basic ToM capacities (i.e., understanding and attributing emotions) that are expected to be fully acquired in the majority of the children, and less pronounced with regard to more advanced ToM capacities (i.e., false-belief reasoning) that are still developing. Hence, it may well be that negative associations among MTE and cognitive ToM arise when children are older (5 years old and above).

In line with this hypothesis, interaction effects between MTE and child age were found in predicting general ToM capacities (i.e., affective, belief-desire, and cognitive ToM combined), showing that general ToM development is hampered by maternal inaccuracy. At younger child age, when ToM acquisition is still in progress, levels of general ToM were similar in children of mothers who were highly accurate versus those of mothers who were less accurate. When children grow older, particularly when children grow beyond the threshold for average ToM development, levels of general ToM were higher in children whose mothers were highly accurate compared with those whose mothers were highly inaccurate. With regard to certainty of inaccurate MTE, slopes in both younger and older children were nonsignificant. These interaction effects were not found for the ToM dimensions separately.

These findings may have important clinical implications with regard to parent–child intervention programmes. Overall, the results of this study suggest that child mentalizing capacities may be fostered by promoting parents' PRF. More specifically, it seems important to promote parents' interest and curiosity in their child's mind and to help parents read the mind of their child accurately. Yet, at the same time, clinicians must be alert to a lack of flexibility and consideration of alternative perspectives in parents while reasoning about their child's mind, as high levels of certainty with regard to inaccurate assumptions are considered maladaptive and hamper the child in developing a ToM of their own. Hence, if this is the case, interventions must focus on the opacity of mental states, and parents must be helped to realize that they actually do not know the mind of their child as well as they think they do. To date, several interventions that may foster PRF have been developed (for an overview, see Barlow et al., 2021; Camoirano, 2017; Luyten, Nijssens, et al., 2017). Core ingredients that have been identified in those intervention programmes are psychoeducation, role plays, and group discussions with other parents (Lo & Wong, 2022). In addition, the use of video feedback is thought to be particularly effective in promoting PRF, as it allows the parent to take a meta-perspective and to focus on the internal mental states of themselves and their child from a third-person perspective (Nijssens et al., 2012). All the above-mentioned ingredients have in common that they promote the parent's capacity for perspective taking and joint attention, and help the parent to maintain a more mentalizing stance of curiosity and inquiry while envisioning the child's mind. In turn, the child has repeated experiences of being mentalized, which is of key importance in social learning and the development of mentalizing (Luyten et al., 2022). Finally, interventions should be tailored to the child's age and developmental phase. More specifically, children's ToM might be fostered by focusing on emotion recognition and attribution in younger children, while from age 5 onward the focus should shift to self–other differentiation, perspective taking, and cognitive reasoning about beliefs.

Finally, limitations of this study should be acknowledged. First, we focused only on MTE as a proxy of PRF in relation to ToM development. As noted, different operationalizations of PRF may show differential relationships with ToM understanding. Therefore, future research should investigate relationships between broad measures of PRF (i.e., representational PRF or MMM) and more domain-specific measures of PRF (i.e., PRFQ dimensions or MTE) and ToM development. Second, the nature of this sample was limited to a homogeneous group of mainly well-educated and well-functioning mothers. Therefore, these findings cannot be generalized to higher-risk samples (i.e., clinical populations). In addition, the sample size was relatively small, which may have resulted in limited statistical power for some of the associations that were investigated. Also, internal consistency values of some of the subscales were somewhat lower than the general threshold for acceptability. Further, the cross-sectional design of this study precluded drawing conclusions about the nature of the relationships found. Therefore, results should be interpreted with caution and further longitudinal research in larger samples in both normally developing and in at-risk children is needed to specify potential evocative person–environment interactions and to identify the unique contribution of (different operationalizations of) PRF with regard to the development of child ToM understanding, and vice versa.

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Tables

Table 1.

Demographic Data of Mothers and Children

	Mothers (*n* = 83)	Children (*n* = 83)
Age (years)[a]	35.61 (3.95)	4.54 (0.75)
Work (hours per week)[a]	25.98 (12.66)	
Work (days per week)[a]	3.84 (1.67)	
Relationship status (years)[a]		
Duration of relationship	11.78 (4.56)	
Living together	9.60 (3.54)	
Marriage	7.10 (3.52)	
Educational level (%)		
Primary education	2.40	
Secondary education	15.70	
Higher education (graduate school)	38.60	
Higher education (university)	43.40	
Working status (%)		
Unemployed	3.60	
Labourer	9.60	
White-collar worker	60.20	
Self-employed	10.80	
Other	15.80	

Note: [a] Mean (*SD*).

Table 2.

Zero-Order Correlations Among Maternal Theory of Mind Estimates and Theory of Mind

	General ToM	Affective ToM	Belief-desire ToM	Cognitive ToM
General Accuracy	.51***	.18	.43***	.39***
Accuracy Affective ToM	.25*	.42***	.06	.10
Accuracy Belief-desire ToM	.53***	.05	.69***	.22*
Accuracy Cognitive ToM	.13	–.07	–.03	.42***
Certainty accurate General MTE	–.03	–.07	–.10	.13
Certainty accurate Affective MTE	–.04	–.04	–.06	.05
Certainty accurate Belief-desire MTE	–.07	–.10	–.15	.13
Certainty accurate Cognitive MTE	–.07	–.11	–.15	.13
Certainty inaccurate General MTE	–.46**	–.49**	–.51**	.10
Certainty inaccurate Affective MTE	–.27	–.41*	–.33*	.24
Certainty inaccurate Belief-desire MTE	–.40*	–.36*	–.51**	.16
Certainty inaccurate Cognitive MTE	–.43**	–.44**	–.41*	–.04

Note: ToM = Theory of Mind. MTE = maternal ToM estimates.

N = 83; *p < .05, **p < .01, ***p < .001 (two-tailed test).

Table 3.

Hierarchical Multiple Regression Analysis for Predicting General ToM

	Model 1			Model 2			Model 3		
	b	SE_b	*β*	*b*	SE_b	*β*	*b*	SE_b	*β*
Child Age	.01	.00	.47***	.01	.00	.30**	.01	.00	.27**
MTE-A				.55	.12	.43***	.62	.12	.49***
MTE-CI				.00	.00	–.21*	.00	.00	–.17°
Child Age × MTE-A							.03	.01	.22*
Child Age × MTE-CI							.00	.00	.17*
F (*df*)	21.62***(1)			22.18***(3)			16.22***(5)		
Δ*F*	21.62***			17.80***			4.35*		
R^2	.22			.47			.52		
ΔR^2	.22			.25			.06		

Note. Independent variables were centred at their means. ToM = Theory of Mind. MTE-A = accuracy of maternal ToM estimates. MTE-CI = certainty of inaccurate maternal ToM estimates.

N = 83; °*p*< .10, * *p*< .05, ***p* < .01, *** *p* < .001.

Table 4.

Hierarchical Multiple Regression Analysis for Predicting Affective ToM

	Model 1			Model 2			Model 3		
	b	SE_b	*β*	*b*	SE_b	*β*	*b*	SE_b	*β*
Child Age	.01	.00	.28*	.00	.00	.18	.00	.00	.23
MTE-A				.46	.15	.40**	.55	.16	.48**
MTE-CI				.00	.00	–.23°	.00	.00	–.29*
Child Age × MTE-A							.02	.01	.16
Child Age × MTE-CI							.00	.00	–.10
F (*df*)	4.21*(1)			6.97**(3)			4.54**(5)		
Δ*F*	4.21*			7.79**			.93		
R^2	.08			.30			.33		
ΔR^2	.08			.22			.03		

Note. Independent variables were centred at their means. ToM = Theory of Mind. MTE-A = accuracy of maternal Theory of Mind estimates. MTE-CI = certainty of inaccurate maternal Theory of Mind estimates.

N = 83; °*p*< .10, * *p*< .05, ***p* < .01.

Table 5.

Hierarchical Multiple Regression Analysis for Predicting Belief-desire ToM

	Model 1			Model 2			Model 3		
	b	SE_b	*β*	*b*	SE_b	*β*	*b*	SE_b	*β*
Child Age	.01	.00	.20	.00	.00	.02	.00	.00	.03
MTE-A				.87	.10	.71***	.90	.11	.74***
MTE-CI				.00	.00	–.25**	.00	.00	–.26**
Child Age × MTE-A							.01	.01	.06
Child Age × MTE-CI							.00	.00	–.04
F (*df*)	2.44(1)			38.32***(3)			22.66***(5)		
Δ*F*	2.44			54.10***			.39		
R^2	.04			.67			.67		
ΔR^2	.04			.63			.01		

Note. Independent variables were centred at their means. ToM = Theory of Mind. MTE-A = accuracy of maternal ToM estimates. MTE-CI = certainty of inaccurate maternal ToM estimates.

N = 83; ***p* < .01, *** *p* < .001.

Table 6.

Hierarchical Multiple Regression Analysis for Predicting Cognitive ToM

	Model 1			Model 2			Model 3		
	b	SE_b	*β*	*b*	SE_b	*β*	*b*	SE_b	*β*
Child Age	.01	.00	.39***	.01	.00	.35**	.01	.00	.36***
MTE-A				.42	.11	.37***	.44	.12	.40***
MTE-CI				.00	.00	–.20*	.00	.00	–.18°
Child Age x MTE-A							.02	.01	.14
Child Age × MTE-CI							.00	.00	–.08
F (*df*)	13.36(1)			12.68***(3)			8.22***(5)		
Δ*F*	13.36***			10.61***			1.35		
R^2	.15			.35			.37		
ΔR^2	.15			.19			.02		

Note. Independent variables were centred at their means. ToM = Theory of Mind. MTE-A = accuracy of maternal ToM estimates. MTE-CI = certainty of inaccurate maternal ToM estimates.

N = 83; °$p < .10$, * $p < .05$, **$p < .01$, *** $p < .001$.

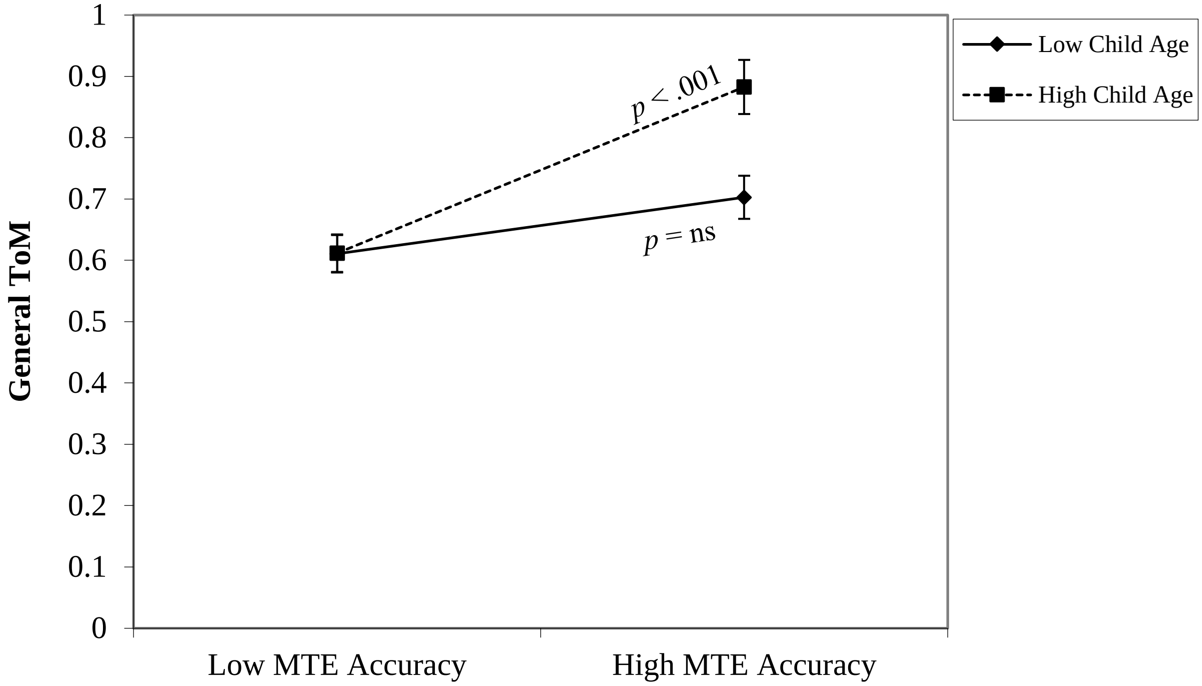

Figure 1. Moderation Effect of Child Age in the Relationship Between Accuracy of maternal Theory of Mind estimates (MTE) and General Theory of Mind (ToM) (bars indicate 95% confidence interval).

Note. The low and high values reflect 1 *SD* below and above the mean, respectively. ns = nonsignificant.

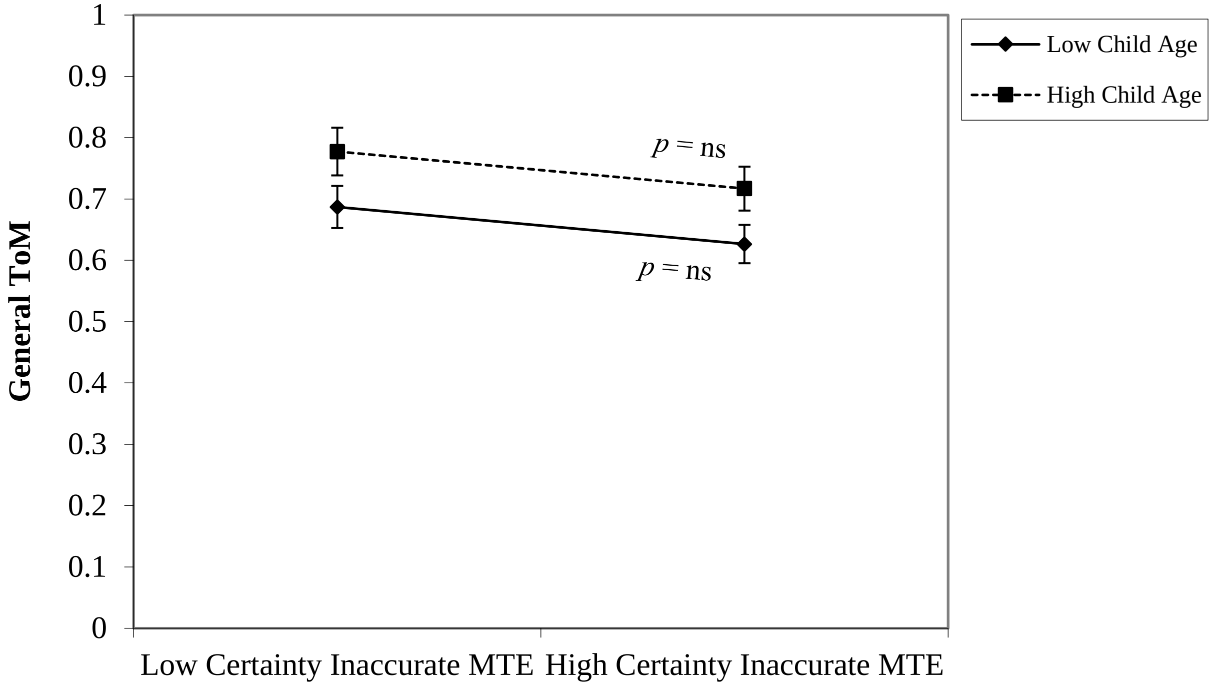

Figure 2. Moderation Effect of Child Age in the Relationship Between Certainty of Inaccurate maternal Theory of Mind estimates (MTE) and General Theory of Mind (ToM) (bars indicate 95% confidence interval).

Note. The low and high values reflect 1 *SD* below and above the mean, respectively. ns = nonsignificant.