Parental reflective functioning and Theory of Mind acquisition:

A developmental perspective

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Many studies have been conducted to better understand the development of Theory of Mind (ToM)—that is, the capacity to attribute mental states to self and others, and to understand people's actions and interactions as being driven by underlying internal beliefs, emotions, desires, and intentions—in children (Premack & Woodruff, 1978). ToM is considered an essential and perhaps even central capacity for children to navigate their increasingly complex social world. Consistent with this assumption, several studies have shown important associations between ToM and social and psychological functioning (e.g., Astington, 2003; Slaughter, Dennis, & Pritchard, 2002). In addition, impairments in ToM have been associated with several psychological disorders (Baron-Cohen, 2000; Bora, Bartholomeusz, & Pantelis, 2016; Bora & Berk, 2016; Brüne, 2005; Hezel & McNally, 2014; Sharp et al., 2011; Uekermann et al., 2010). ToM is considered a multidimensional construct that includes cognitive features, affective capacities, and belief-desire understanding (Blijd-Hoogewys & van Geert, 2016; Ensink & Mayes, 2010; Hughes & Leekam, 2004; Wellman, 2018; Wellman & Liu, 2004). Cognitive ToM is typically studied by the assessment of false-belief reasoning, that is, the realization that internal beliefs can differ from the real, external world, and that individuals' actions depend on their beliefs rather than on the real situation (Flavell, 1993; Wellman, Cross, & Watson, 2001). False-belief understanding thus specifically refers to representational mental states of belief and knowledge (Hughes & Leekam, 2004). Affective ToM is typically studied using emotion-understanding paradigms (i.e., the ability to recognize facial expressions and/or to attribute emotional states to self and others). Belief-desire reasoning, finally, involves more complex capacities related to emotion attribution, such as the recognition that someone's behavior is affected by that person's beliefs and desires, as well as an awareness of the affective outcomes of someone's actions (e.g., understanding that someone will feel good if they get what they desired, and feel bad if they do not) (Bartsch & Wellman, 1995).

Overall, studies of the development of ToM converge to suggest that there is an important transition within the pre-school years, wherein children gradually master more sophisticated emotion understanding, as well as false-belief and belief-desire reasoning (e.g., Bartsch & Wellman, 1995; de Rosnay, Pons, Harris, & Morrell, 2004; Harris, Johnson, Hutton, Andrews, & Cooke, 1989; Pons, Harris, & de Rosnay, 2004; Wellman, 2012). Although there is a great deal of intraindividual variation and much overlap over time in the development of these capacities, it seems that affective ToM emerges first in development followed by belief-desire reasoning based on true beliefs (i.e., between 3 and 4 years of age). Subsequently, between the ages of 4 and 5, the child develops false-belief understanding (Kim, 2015; Pons et al., 2004; Wellman, 2012). From 6 years of age onward, the child is able to jointly consider the role of false beliefs and desires in attributing emotions (Bartsch & Wellman, 1995; Bradmetz & Schneider, 1999, 2004; de Rosnay et al., 2004; Harris et al., 1989; Kim, 2015; Ruffman & Keenan, 1996).

There is still considerable debate concerning the factors that influence the onset and development of ToM. Several (often complementary) theories have been proposed to better understand the acquisition of ToM, ranging from biological and maturational (Scholl & Leslie, 2001) to experience-based theories (Ensink & Mayes, 2010; Hughes & Devine, 2015a, 2015b). Hence, it is likely that both genetics and environment play an important role in the acquisition of ToM (Ensink & Mayes, 2010). Indeed, it has been shown that all normally developing children—independent of individual and cultural differences—eventually master ToM in the pre-school years (Wellman, 2012). Moreover, a critical stage in ToM development seems to be between 3.5 and 4.5 years of age, during which ToM increases substantially, probably reflecting a largely biologically determined maturation effect (Blijd-Hoogewys & van Geert, 2016; Wellman et al., 2001). Environmental factors are thought to contribute to the variability among children in ToM acquisition (Wellman, 2012), in the sense that they seem to “push” the child toward earlier or later ToM development.

A growing body of research has focused on the role of parental mentalizing or parental reflective functioning (PRF) in the development of ToM (Ensink & Mayes, 2010). PRF refers to parents’ ability to reflect upon their own and their child’s internal mental experience, and to understand the child’s behavior as being driven by underlying mental states, such as thoughts, feelings, desires, and intentions (Slade, 2005).

One research tradition in this context has focused on the role of parental mental-state talk (i.e., explicitly referring to internal mental states when speaking to their child), which has been shown to be positively related to aspects of the child’s ToM understanding, such as emotion recognition and false-belief understanding (Devine & Hughes, 2018; Tompkins, Benigno, Kiger Lee, & Wright, 2018). Maternal mind-mindedness (i.e., the parents’ tendency to verbalize emotional states in interactions with their children), in turn, has been shown to be related to subsequent ToM capacities, such as emotion understanding, perspective taking, false-belief understanding, and belief-desire reasoning (Devine & Hughes, 2018; Kirk et al., 2015; Laranjo, Bernier, Meins, & Carlson, 2014; Meins, Fernyhough, Arnott, Leekam, & de Rosnay, 2013; Meins et al., 2002). Further, studies have shown that the affective ToM capacities of the parent prospectively predicted child ToM (Sabbagh & Seamans, 2008), and representational measures of PRF have been shown to be prospectively related to emotion understanding (Steele, Steele, Croft, & Fonagy, 1999) and mentalizing capacities in childhood (Ensink et al., 2015; Rosso, Viterbori, & Scopesi, 2015; Scopesi, Rosso, Viterbori, & Panchieri, 2015) and in adolescence (Benbassat & Priel, 2012).

However, the majority of studies in this area focused solely on emotion understanding or false-belief understanding, and were conducted within the broader range of pre-school years (3–6-year-olds) or in children of a specific age group (e.g., 5-year-olds). Therefore, there is a need for research investigating associations between PRF and the development of the different dimensions of ToM (i.e., emotion, false-belief, and belief-desire understanding) including age-specific relations.

In addition, recent developments have suggested that PRF is multidimensional (Luyten, Mayes, Nijssens, & Fonagy, 2017; Luyten, Nijssens, Fonagy, & Mayes, 2017; Smaling, Huijbregts, van der Heijden, van Goozen, & Swaab, 2016). The Parental Reflective Functioning Questionnaire (PRFQ; Luyten et al., 2009; Luyten, Mayes, et al., 2017), for instance, distinguishes between three key dimensions of PRF (Luyten, Mayes, et al., 2017; Luyten, Nijssens, et al., 2017). The first dimension, *prementalizing modes* (PM), refers to a nonmentalizing stance that is often characteristic of parents with (severe) impairments in PRF. PM is characterized by the tendency of parents to make maladaptive and malevolent attributions about their child (e.g., “My child cries around strangers to embarrass me”) and an inability to enter into the child’s internal subjective world (e.g., “Often, my child’s behavior is too confusing to bother figuring out”). The second dimension, *certainty of mental states* (CMS), refers to the parent’s (in)ability to recognize that mental states are inherently opaque. There is considerable variability in how certain parents are when attributing mental states to their child, ranging from being overly certain (i.e., no recognition of the opacity of mental states, characterized by intrusive mentalizing or hypermentalizing) to being overly uncertain (i.e., an almost complete lack of certainty about the child's mind, characterized by hypomentalizing), or even a combination of both hypermentalizing and hypomentalizing. Recognizing the opacity of mental states (e.g., "I can sometimes misunderstand the reactions of my child") is considered adaptive PRF, while being overly certain or uncertain is thought to be characteristic of distorted PRF. The third dimension refers to parental *interest and curiosity in the child's mental states* (IC), that is, the willingness of the parent to understand the child "from the inside out" (e.g., "I am often curious to find out how my child feels"). A lack of genuine interest and curiosity in the child's mind can also be associated with both hypomentalizing and hypermentalizing. High levels of IC, for example, may reflect intrusive hypermentalizing (i.e., excessive mentalizing that goes far beyond what is probable), whereas very low levels of IC may reflect an absence of interest in the child's mental states (e.g., "I believe there is no point in trying to guess what my child feels").

Although it is likely that different dimensions of PRF (e.g., PM, CMS, and IC) are associated with ToM, no study to date has directly investigated these associations. This will be the focus of the present study.

The Present Study

This study focused on the role of PRF before, during and after the average threshold for ToM acquisition, which is typically situated around age 4 (Blijd-Hoogewys & van Geert, 2016; Kim, 2015; Pons et al., 2004; Wellman, 2012; Wellman et al., 2001).

The first objective of this study was to investigate the different ToM dimensions (affective, belief-desire, and cognitive ToM understanding) within and across the different age groups (children aged 3, 4, and 5 years). Based on the literature reviewed above, we expected to observe an increase in affective and belief-desire ToM from the age of 3 years onward, followed by the development of cognitive ToM in 4-year-olds.

The second aim was to investigate the relationship between the different dimensions of PRF and the ToM dimensions across these age ranges. We expected high levels of PRF (i.e., medium to high IC and CMS) to be positively associated with ToM dimensions, and low levels of PRF (i.e., high PM) to be negatively associated with ToM. In addition, we hypothesized that associations between PRF and ToM development would be most pronounced in the younger and older age group. Indeed, parents with high levels of PRF may “push” their children across the threshold earlier, particularly with regard to more basic ToM (i.e., emotion recognition and belief-desire reasoning). By contrast, the absence of PRF and distorted mentalizing in particular, as indicated by PM, may hamper the acquisition of ToM capacities in younger and older children (i.e., before and after the average threshold for ToM development).

Method

Participants and Procedures

Dutch-speaking mothers of a biological child aged 3 to 5 years were contacted via several daycare centers across Belgium and requested to participate in a study on child social-emotional development. Participation was entirely voluntary and confidentiality was guaranteed. Mothers who agreed to participate provided written informed consent, and were then asked to complete a booklet of questionnaires. Next, a random subgroup of mothers was invited to participate in the second part of the study together with their child. During this part of the study (which took place a maximum of 3 months after the first part of the study), the children participated in a 45-minute standardized ToM experiment in a quiet room in their home situation. During the experiment, the child was alone with the experimenter who presented the tasks. The tasks were not counterbalanced, meaning that the ToM task battery was administered in a fixed order for each child. The study was approved by the Ethics Committee of the University of Leuven, Belgium.

In total, approximately 570 mothers were contacted, of whom 385 completed the questionnaires. Twenty-three questionnaires were removed because the children fell outside the age range specified in the inclusion criteria (i.e., 3–5 years), leaving a sample of 362 mothers and children, from which 83 mother–child pairs (22.9%) were randomly selected to complete the battery of ToM measures.

Overall, 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%). There were no significant differences between boys and girls in terms of mean age. The mean age of the mothers was 35.6 years (*SD* = 3.95; range 28.0–45.5) and the majority of mothers (82%) had attained higher education. No significant differences were found for maternal age, educational level, or working status between mothers of boys versus girls, or between mothers whose children participated in the ToM experiment and those who did not. Finally, there were no significant differences between children who participated in the ToM experiment and those who did not with regard to child sex or age.

Measures

Parental reflective functioning was assessed with the Parental Reflective Functioning Questionnaire (PRFQ; Luyten et al., 2009; Luyten, Mayes, et al., 2017), an 18-item self-report questionnaire scored on a 7-point Likert scale. The PRFQ includes three subscales: *prementalizing modes* (PM), with six items that assess modes of thinking that reflect the repudiation of or defense against mentalizing; *certainty about mental states* (CMS), with six items reflecting being either overly certain (hypermentalizing) or overly uncertain (hypomentalizing) of the mental states of the child; and *interest and curiosity in mental states* (IC), with six items reflecting curiosity about the mental states of the child. Adequate PRF is reflected by low PM and medium to high CMS and IC. Distorted PRF, on the other hand, is reflected by high PM and extremely low (i.e., scores 1 and 2) or extremely high (i.e., scores 6 and 7) CMS and IC. In the current sample, mothers on average reported moderate to high scores on IC (M = 5.72; SD = 0.82; range 3.33–7.00) and CMS (M = 4.35; SD = 1.10; range 2.00–7.00), with some mothers reporting very high scores (i.e., 7). None of the mothers reported very low scores on IC or CMS (i.e., an indicator of hypomentalizing), which is more likely to occur in at-risk samples. Recent studies have supported the reliability and validity of the PRFQ (Luyten, Mayes, et al., 2017). In the present study, Cronbach's alphas for PM, CMS, and IC were .60, .79, and .69, respectively.

ToM development was measured by using a series of nine different ToM tasks (22 items) that assess different domains of ToM understanding, such as affective, belief-desire, and cognitive ToM. *Affective ToM* (8 items) was assessed by two emotion-recognition tasks, measuring the child's ability to recognize four basic emotions (i.e., happy, sad, angry, or scared) (a) by describing how a person (same gender as the child) is feeling in a series of four pictures, and (b) by pointing towards a particular facial expression on a matrix with four gender-matched pictures (Denham, 1986). *Belief-desire ToM* (8 items) was measured by presenting the child with a series of stories and assessing the child's ability to understand the protagonist's feelings when a belief and a desire for a particular object was met or not met (Harris et al., 1989; Wellman & Woolley, 1990). *Cognitive ToM* (6 items) was measured by (a) two perspective-taking tasks, assessing the child's ability to take the visual perspective of the experimenter: the 'Mouse task' and the 'Cat and ice-cream task' (Flavell, Botkin, Fry, Wright, & Jarvis, 1968); (b) two unexpected content false-belief tasks, assessing the child's capacity for false-belief reasoning based on the understanding of deceptive contents: the 'Smarties task' (Hogrefe, Wimmer, & Perner, 1986) and the 'Coke and milk task' (Harris et al., 1989); and (c) two change-of-location false-belief tasks, assessing the child's capacity for false-belief understanding based on predicting the protagonist's search behavior after an unexpected transfer of an hidden object: the 'Sally-Anne task' and the 'Frog-chocolate task' (Wimmer & Perner, 1983).

The answers to each of the questions in the abovementioned tasks were 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 provided in the Appendix (see Supplementary Materials). The selected tasks are designed for children aged 3–5 years and have shown good test–retest reliability and internal consistency (Hughes et al., 2000). In the present study, Cronbach's alphas for affective, belief-desire, and cognitive ToM were .58, .84, and .65, respectively.

Data 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, descriptive statistics (i.e., Pearson's correlations, independent-samples *t*-tests, and one-way ANOVAs) were calculated to describe the sample. Second, we computed zero-order correlations among PRF dimensions and ToM dimensions. Third, a one-way MANCOVA was used to examine whether ToM dimensions differed based on age groups. Hence, the children were divided into three subgroups according to their age, namely 3-year-olds ($N = 22$), 4-year-olds ($N = 32$) and 5-year-olds ($N = 29$). Post-hoc pairwise comparisons were conducted to determine whether the different age groups differed in terms of ToM development. Finally, we conducted hierarchical multiple regression analyses (HMRAs) to determine the unique proportion of variance explained by each set of predictors (i.e., PRF dimensions and child age), including potential interaction effects. More specifically, we first conducted sequential polynomial regression analyses to investigate the nature of the relation between the independent (i.e., child age and PRF dimensions) and dependent (i.e., ToM dimensions) variables (i.e., linear or quadratic). Next, we tested main effects of the predictor variables (i.e., child age and PRF dimensions) and whether the relation between child age and ToM dimensions was moderated by PRF dimensions. For each PRF dimension, a separate regression model was analyzed. For these analyses, all variables were mean-centered and entered sequentially as follows: (1) child age; (2) PRF dimension; (3) the interaction term between child age and PRF dimension. 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). We plotted simple slopes for the association between low and high (one standard deviation below and above the mean, respectively) levels of the predictor variable (i.e., child age) and ToM dimensions for low and high (one standard deviation below and above the mean, respectively) levels of the moderator (PRF dimensions) (see www.jeremydawson.co.uk/slopes.htm). For each regression model, we calculated Cohen's f^2 as a measure of the effect size (Cohen, 1992).

Results

Descriptive Statistics

There were no significant associations between the mothers' demographic features on the one hand, and PRF dimensions and ToM acquisition on the other. Further, comparison of mothers with lower (primary and secondary education) and higher (graduate school and university) educational levels did not reveal any significant differences in maternal PRF dimensions or the child's ToM performance. In addition, no significant effects of maternal working status on maternal PRF or child ToM performance were showed. Next, we compared boys and girls in terms of their ToM understanding, as some previous studies have found sex differences in favor of girls (e.g., Blijd-Hoogewys & van Geert, 2016; Charman, Ruffman, & Clements, 2002). However, no sex differences were found in our sample. In addition, no significant differences were found between boys and girls with regard to their mother's PRF capacities. Finally, there was a significant relationship between child age and ToM performance ($r = .49$, $p < .001$; $r = .40$, $p < .001$; $r = .33$, $p = .002$; and $r = .40$, $p < .001$ for general, affective, belief-desire, and cognitive ToM, respectively), but not between maternal age and ToM performance. Yet, no significant associations were found between child or maternal age and PRF. Given the significant correlations between child age and ToM development, all further correlational analyses were controlled for child age.

Zero-order Correlations Among Study Variables

The different ToM dimensions were positively correlated with general ToM ($p < .001$). Further, belief-desire ToM was positively associated with affective ($r = .35$, $p = .001$) and with cognitive ($r = .23$, $p = .04$) ToM. Correlations among PRF dimensions showed only a negative trend toward significance between PM and CMS ($r = –.21$, $p = .06$). Finally, zero-order correlations among PRF and ToM showed that PM was negatively associated with affective ToM ($r = –.24$, $p = .03$), whereas IC was significantly positively associated with affective ToM ($r = .23$, $p = .04$). None of the other correlations were significant (see Table 1).

Age Differences in ToM

There was a statistically significant difference between the age groups (i.e., children aged 3, 4, and 5 years) on the combined ToM dimensions, $F(8, 152) = 3.65$, $p = .001$, Wilks' $\lambda = .70$, partial $\eta^2 = .16$. Post-hoc univariate tests showed that there was a statistically significant difference between age groups in general ToM development ($F(2, 79) = 11.20$, $p < .001$, partial $\eta^2 = .22$), as well as in the affective ($F(2, 79) = 6.15$, $p = .003$, partial $\eta^2 = .14$), belief-desire ($F(2, 79) = 5.76$, $p = .005$, partial $\eta^2 = .13$), and cognitive ($F(2, 79) = 7.47$, $p = .001$, partial $\eta^2 = .16$) ToM dimensions. The mean scores for general, affective, belief-desire, and cognitive ToM development within each age group, as well as significant mean-level differences over time, are shown in Figure 1. Post-hoc pairwise comparisons showed, as expected, that general ToM significantly increased between age 3 and 4 years ($p = .020$), age 4 and 5 years ($p = .011$), and age 3 and 5 years ($p < .001$). Affective ToM significantly increased between age 4 and 5 years ($p = .005$) and age 3 and 5 years ($p = .003$). Belief-desire ToM significantly increased between age 3 and 4 years ($p = .036$) and age 3 and 5 years ($p = .001$). Cognitive ToM significantly increased between age 3 and 4 years (p = .029), age 4 and 5 years (p = .073), and age 3 and 5 years (p < .001).

PRF and ToM Dimensions

Sequential polynomial regression analyses showed that general ToM was best predicted by a linear model of child age and a quadratic model of maternal PM (see Table 1 in Supplementary Materials). Affective ToM was best predicted by a linear model of child age, maternal IC, and maternal CMS, and a quadratic model of maternal PM (see Table 2 in Supplementary Materials). A linear model of child age and maternal IC and a quadratic model of maternal PM best predicted belief-desire ToM (see Table 3 in Supplementary Materials). Finally, cognitive ToM was best predicted by a linear model of child age and a quadratic model of maternal CMS (see Table 4 in Supplementary Materials).

HMRAs showed that general ToM was best predicted by (1) a combination of child age (β = .42, p < .001) and maternal PM^2 (β = –.48, p < .001), explaining 38% of the variance and representing a large effect (Model 2: R^2 = .38, F(3) = 16.00, p < .001, Cohen's f^2 = .61; see Table 5 in Supplementary Materials); and (2) a combination of child age (β = .56, p < .001) and the interaction between child age and maternal IC (β = –.31, p = .002), explaining 34% of the variance and representing a large effect (Model 2: R^2 = .34, F(3) = 13.39, p < .001, Cohen's f^2 = .52; see Table 6 in Supplementary Materials). The significant two-way interaction between child age and maternal IC is plotted in Figure 2, showing that maternal IC moderated the relation between child age and general ToM. Low levels of IC were associated with lower levels of general ToM at younger child age, whereas low IC at older child age was associated with higher levels of general ToM. High IC, on the other hand, was associated with higher levels of general

ToM at younger child age. However, general ToM did not further increase with age in children of mothers with high IC, leading to lower levels of general ToM at older child age (compared to children of mothers with low IC). Finally, maternal CMS did not significantly predict general ToM, leading to a model with only child age (β = .49, p < .001) as a significant predictor of general ToM (Model 1: R^2 = .24, F(1) = 25.52, p < .001, Cohen's f^2 = .32; see Table 7 in Supplementary Materials).

Affective ToM was best predicted by (1) a combination of child age (β = .32, p = .001) and maternal PM^2 (β = –.53, p < .001), explaining 35% of the variance and representing a large effect (Model 2: R^2 = .35, F(3) = 14.25, p < .001, Cohen's f^2 = .54; see Table 8 in Supplementary Materials); (2) a combination of child age (β = .43, p < .001), IC (β = .20, p = .046), and the interaction between child age and maternal IC (β = –.20, p = .053), explaining 24% of the variance and representing a medium to large effect (Model 3: R^2 = .24, F(3) = 8.41, p < .001, Cohen's f^2 = .32; see Table 9 in Supplementary Materials); and (3) a combination of child age (β = .36, p = .001) and the interaction between child age and maternal CMS (β = .17, p = .099), explaining 21% of the variance and representing a medium to large effect (Model 3: R^2 = .21, F(3) = 7.07, p < .001, Cohen's f^2 = .27; see Table 10 in Supplementary Materials). The significant two-way interaction between child age and maternal IC is plotted in Figure 3, showing that maternal IC moderated the relation between child age and affective ToM. At younger child age, lower levels of IC were associated with lower levels of affective ToM, whereas higher levels of IC were associated with higher levels of affective ToM. At older child age, there was no significant difference in affective ToM acquisition between children of mothers with high versus low IC. Figure 4 shows the significant two-way interaction between child age and maternal CMS, indicating that higher levels of CMS were associated with higher levels of affective ToM, but only at older child age.

Belief-desire ToM was best predicted by (1) a combination of child age (β = .27, p = .009) and maternal PM^2 (β = –.42, p = .004), explaining 22% of the variance and representing a medium to large effect (Model 2: R^2 = .22, F(3) = 7.28, p < .001, Cohen's f^2 = .28; see Table 11 in Supplementary Materials); and (2) a combination of child age (β = .40, p < .001) and the interaction between child age and maternal IC (β = –.29, p = .006), explaining 21% of the variance and representing a medium to large effect (Model 3: R^2 = .21, F(3) = 7.00, p < .001, Cohen's f^2 = .27; see Table 12 in Supplementary Materials). Figure 5 shows that maternal IC moderated the relation between child age and belief-desire ToM. At younger child age, lower levels of IC were associated with lower levels of belief-desire ToM, whereas higher levels of IC were associated with higher levels of belief-desire ToM. The reversed pattern was visible at older child age, showing that lower and higher IC were associated with higher and lower belief-desire ToM, respectively. Finally, maternal CMS did not significantly predict belief-desire ToM, leading to a model with only child age (β = .33, p = .002) as a significant predictor of belief-desire ToM (Model 1: R^2 = .11, F(1) = 10.06, p = .002, Cohen's f^2 = .12; see Table 13 in Supplementary Materials).

Cognitive ToM was best predicted by child age (β = .40, p < .001), explaining 16% of the variance and representing a medium effect (Model 1: R^2 = .16, F(1) = 15.05, p > .001, Cohen's f^2 = .19). Adding maternal PM (see Table 14 in Supplementary Materials), IC (see Table 15 in Supplementary Materials), or CMS (see Table 16 in Supplementary Materials) to the model did not provide an improvement in fit, although these models were also significant.

Discussion

This study investigated the development of ToM acquisition and associations among PRF and ToM from a multidimensional and developmental perspective, in a sample of 83 mothers and their pre-school children. As expected, results showed that general ToM significantly increases with child age. This was also true for the individual ToM dimensions (i.e., affective, belief-desire, and cognitive ToM). In line with our hypotheses, pre-school children performed better on affective and belief-desire ToM understanding than on cognitive ToM. It thus seems that children learn to recognize and attribute emotional mental states before they acquire the capacity for cognitive perspective taking and reasoning about (false) beliefs. Second, results shed further light on the role of PRF in ToM development, and were largely consistent with the hypothesis that separate PRF dimensions may have differential associations with ToM dimensions, thus supporting a multidimensional perspective on PRF (Luyten, Mayes, et al., 2017; Luyten, Nijssens, et al., 2017; Smaling et al., 2016) and ToM acquisition (Blijd-Hoogewys & van Geert, 2016; Wellman, 2018).

Distorted PRF—operationalized as the tendency of mothers to make malevolent attributions about their child's behavior (i.e., PM)—impeded the development of children's general, affective, and belief-desire ToM throughout the pre-school years. More specifically, there was a quadratic association between PM and these ToM dimensions, consistent with the notion that higher levels of maternal PM may hamper ToM acquisition, particularly with regard to emotion understanding (i.e., recognizing and attributing emotions). These results are congruent with theoretical assumptions that maladaptive PRF negatively influences child social-emotional development (e.g., Ensink & Mayes, 2010; Fonagy & Target, 2005; Sharp & Fonagy, 2008; Slade, 2005) and previous research indicating the role of PM in understanding the development of emotional problems (Burkhart, Borelli, Rasmussen, Brody, & Sbarra, 2017; Krink, Muehlhan, Luyten, Romer, & Ramsauer, 2018; Luyten, Mayes, et al., 2017; Nijssens, Vliegen, & Luyten, 2020; Pazzagli, Delvecchio, Raspa, Mazzeschi, & Luyten, 2018; Rostad & Whitaker, 2016; Rutherford, Booth, Luyten, Bridgett, & Mayes, 2015). Indeed, PM is characterized by misreading the child's mind and making inaccurate assumptions about the child's behavior, often leading to an incongruent response to the child's mental state. This may impede children's capacity to accurately recognize and attribute affective mental states in themselves and others (Fonagy, Gergely, Jurist, & Target, 2002). The quadratic effect of maternal PM further suggested that low levels of PM may not impede ToM development, which is consistent with Winnicott's idea of the 'good-enough' parent (Winnicott, 1971). Parents are never 'perfect', and a tendency to make maladaptive attributions with regard to the child's inner world may not hamper ToM development if such attributions are not frequently made by parents.

Interestingly, an effect of maternal PM was not found for cognitive ToM development. This is consistent with the notion that PM may lead to problems in affective ToM, but does not seem to impact cognitive features implicated in ToM (Luyten, Nijssens, et al., 2017). Finally, these results support the hypothesis that individual differences in children's ToM may exhibit nonlinear relations with environmental factors, such as PRF (Blijd-Hoogewys & van Geert, 2016; Devine & Hughes, 2018). One should be careful in drawing causal conclusions from these findings, as relationships between PRF and ToM may be bidirectional. For example, it may well be that child factors (e.g., problems with affect regulation) may lead to increased levels of PM in parents.

The second dimension of PRF—interest and curiosity in mental states (i.e., IC)—showed age-related effects with regard to the development of general, affective, and belief-desire ToM.

Results showed that mothers' interest and curiosity in the mental states of their children was associated with earlier acquisition of ToM, with higher levels of maternal IC being associated with higher levels of general, affective, and belief-desire ToM at younger child age. Little interest in the child's mental states (i.e., low IC) was, by contrast, associated with lower levels of these ToM dimensions in younger children. However, the difference between high and low maternal IC in relation to ToM acquisition disappeared as children grew older. At higher child age, results showed similar levels of affective ToM in children of mothers with high versus low IC, and even a slight disadvantage associated with high maternal IC (compared to low maternal IC) with regard to general and belief-desire ToM development. It thus seems that mothers with high IC may "push" their children across the threshold for ToM acquisition earlier, particularly with regard to more basic ToM (i.e., emotion recognition and belief-desire reasoning). However, later on in development, high maternal IC seemed to hamper further development of general, affective, and belief-desire ToM, which was reflected in only a slight increase of these ToM dimensions with child age. For children of mothers with low IC, the development of these ToM dimensions linearly increased with child age, even to a point where they overtook children of mothers with high IC. These findings may reflect the importance of separateness of minds, especially as children grow older and their strivings for autonomy increase (Luyten, Campbell, & Fonagy, 2019). Indeed, adequate PRF encompasses the parent's capacity to show interest in the child's mind and to sensitively attune to the child's mental states, while at the same time recognizing the child's mind as separate and agentive (Fonagy et al., 2002). The assumption that high levels of maternal IC may become intrusive and maladaptive is further strengthened by studies showing an association between IC and maternal intrusiveness (Luyten, Mayes, et al., 2017). Yet, again, an alternative explanation may be that when children show lower ToM capacities, it may increase parents' interest and curiosity in the child's internal world, especially when communication becomes more verbal and delays in ToM understanding become more explicit, as is the case in older children.

With regard to CMS, higher levels of CMS were associated with higher levels of affective ToM, but only at older child age. In younger children (i.e., before the average threshold ToM is reached), levels of affective ToM were similar in children of mothers with high or low CMS. It thus seems that the advantage of high maternal CMS appears especially after the age at which children typically develop affective ToM. Alternatively, better affective ToM capacities in the child may lead to more certainty in the parent about the child's mental states.

Taken together, the results of the study suggest a combined biological maturation and environmentally determined model of ToM development. Normally developing children seem to increasingly acquire ToM as they grow older, independent of their mothers' PRF, which supports the hypothesis that biological maturation progresses throughout the pre-school years (Scholl & Leslie, 2001). However, PRF does seem to have an important contribution in accelerating or inhibiting ToM development, especially in younger and older pre-school children, which supports the hypothesis that environmental factors may play an important role before and after the average threshold for ToM acquisition (Ensink & Mayes, 2010; Fonagy & Luyten, 2016; Hughes & Devine, 2015a, 2015b; Kim, 2015; Wellman, 2012). Alternatively, evocative or passive gene–environment correlations may play a role in this context (Devine & Hughes, 2018). For example, child factors might reduce or amplify the associations among PRF and ToM, leading to different results in different age groups. Further, it is important to be aware of the risk of child-to-parent effects, whereby the child elicits poor mentalizing (i.e., hypermentalizing, intrusive mentalizing, or prementalizing) in the parent. Better ToM capacities, by contrast, could lead to higher levels of PRF, in particular CMS. Further longitudinal research is needed to clarify the nature of the associations among PRF and ToM.

These findings may have important clinical implications with regard to parent–child intervention programs, and emphasize the importance of addressing PRF in prevention and intervention programs. To date, a number of mentalization-based interventions that may foster parents' mentalizing have been developed (for an overview, see Camoirano, 2017; Luyten, Nijssens, et al., 2017). The common aim of these interventions is to help parents to maintain a more mentalizing stance of curiosity and inquiry while envisioning the child's mind, rather than focusing solely on expressed behavior. The findings of this study suggest that promoting PRF may also foster the child's own capacity for mentalizing. In this regard, it seems particularly important to target the tendency of the parent to attribute hostile mental states to the child (i.e., PM), as the presence of prementalizing modes hampers the child's capacity for affect recognition and the understanding of emotions and desires in self and others. Further, with younger children (i.e., < 4 years), intervention programs should focus on increasing the parent's interest and curiosity in their own and their child's internal experiences (i.e., IC), and helping parents to recognize the opacity of mental states (i.e., CMS). When children are older (i.e., from age 5 onward), attention should shift to addressing inappropriate parental IC (i.e., hypermentalizing or intrusive mentalizing) and developing a more robust sense of knowledge about the child's mind (i.e., CMS). Yet, from a clinical perspective, it may be equally important to consider potential child-to-parent effects. For instance, cognitive capacities in children may lead parents to believe that their children have good ToM capacities, and that they as parents seem to know the mind of their children quite well, while in reality the children may not perform so well in the domains of affective and belief-desire reasoning. If this is the case, the therapeutic task with these parents may be to help them realize that they do not know the mind of their child as well as they think they do.

Finally, limitations of the study should be acknowledged. First, the sample was relatively small and homogeneous, and comprised mainly well-educated and well-functioning mothers. It might be that the contribution of PRF has a different pattern in fathers or at-risk samples. Second, the design of this study was cross-sectional and focused only on PRF as a possible mechanism explaining individual differences in ToM. However, it is important not to overestimate the role of PRF in ToM development. PRF is unlikely to be the single most important factor influencing ToM development and should be considered in the context of a variety of factors (e.g., parental psychopathology, family structure, life events, early adversities, and genetic predisposition). Hence, it is also important to be aware of bidirectional relations. Further research with multiwave studies in different samples (e.g., at-risk, adoptive, fathers) is needed to specify possible person–environment interactions and to identify the unique contributions of each of the parameters. In follow-up research with a cross-lagged longitudinal design, it would also be important to counterbalance the ToM tasks within and between subjects to control for potential confounds created by sequence, order, and learning effects.

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Tables

Table 1.

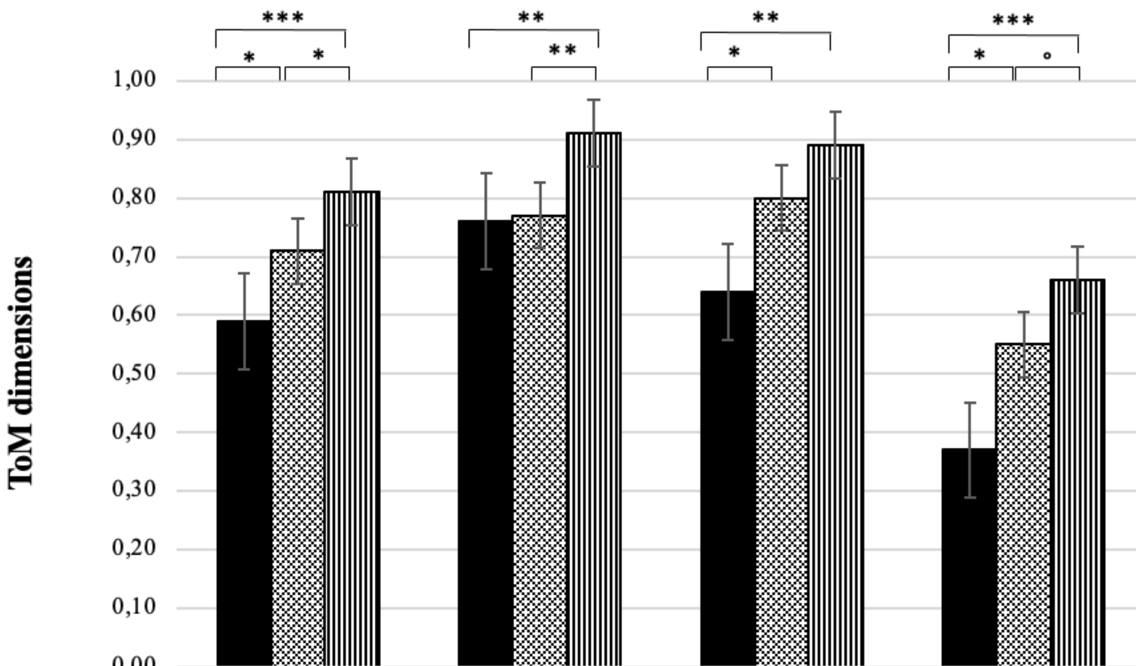
Zero-Order Correlations Among Dimensions of Parental Reflective Functioning and Theory of Mind (N = 83)

	1	2	3	4	5	6	7
1. PM	—						
2. CMS	–.21°	—					
3. IC	–.05	.00	—				
4. General ToM	–.16	.07	.12	—			
5. Affective ToM	–.24*	.17	.23*	.59***	—		
6. Belief-desire ToM	–.14	–.06	.16	.84***	.35**	—	
7. Cognitive ToM	.08	.05	–.11	.56***	–.02	.23*	—

Note: ToM = Theory of Mind. PM = prementalizing modes. CMS = certainty about mental states. IC = interest and curiosity about mental states. ToM = Theory of Mind.

°$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$ (two-tailed test).

Figures



	General ToM	Affective ToM	Belief-desire ToM	Cognitive ToM
3-year-olds	0,59	0,76	0,64	0,37
4-year-olds	0,71	0,77	0,80	0,55
5-year-olds	0,81	0,91	0,89	0,66

Note: ToM = Theory of Mind. *p < .05, **p < .01, ***p < .001, °p < .10.

Figure 1. Mean Scores for General, Affective, Belief-Desire, and Cognitive Theory of Mind in Different Age Groups of Pre-School Children.

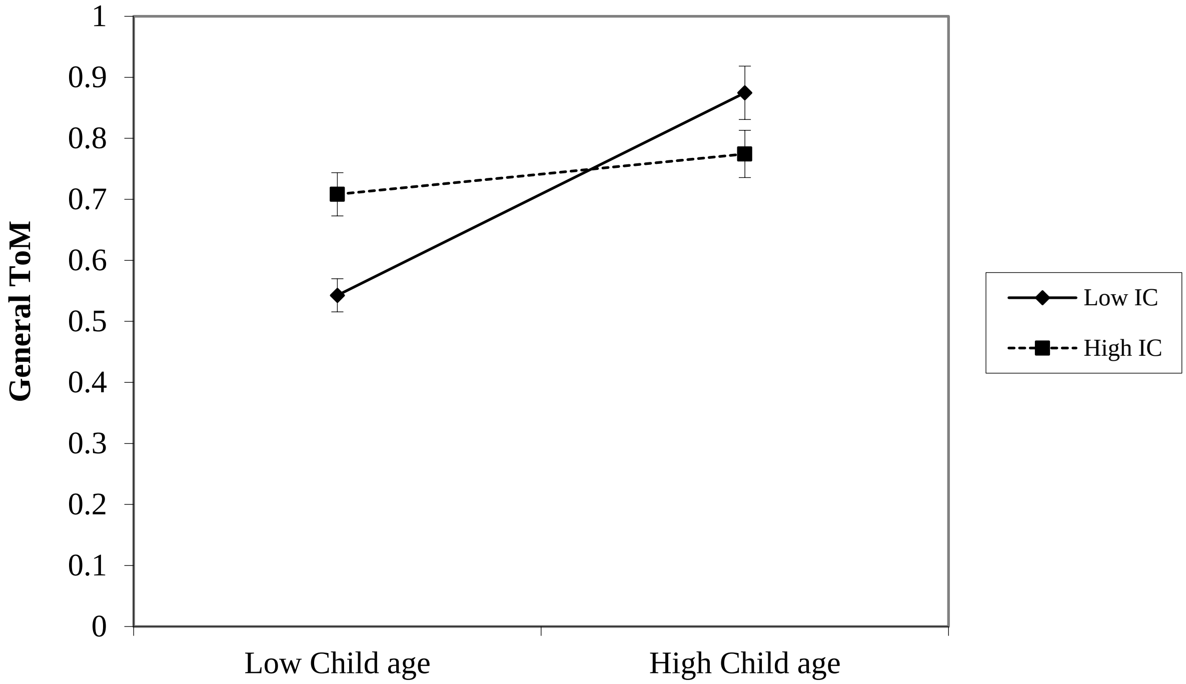


Figure 2. Moderation Effect of IC in the Relationship Between Child Age and General Theory of Mind (95% confidence interval).

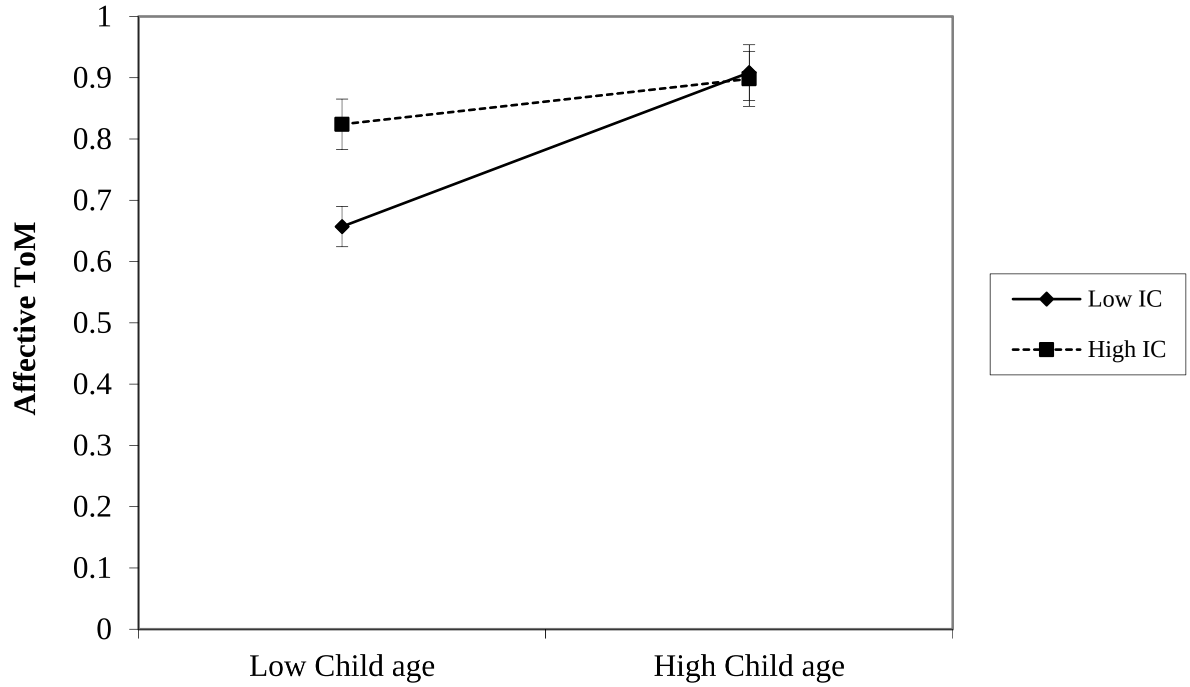


Figure 3. Moderation Effect of IC in the Relationship Between Child Age and Affective Theory of Mind (95% confidence interval).

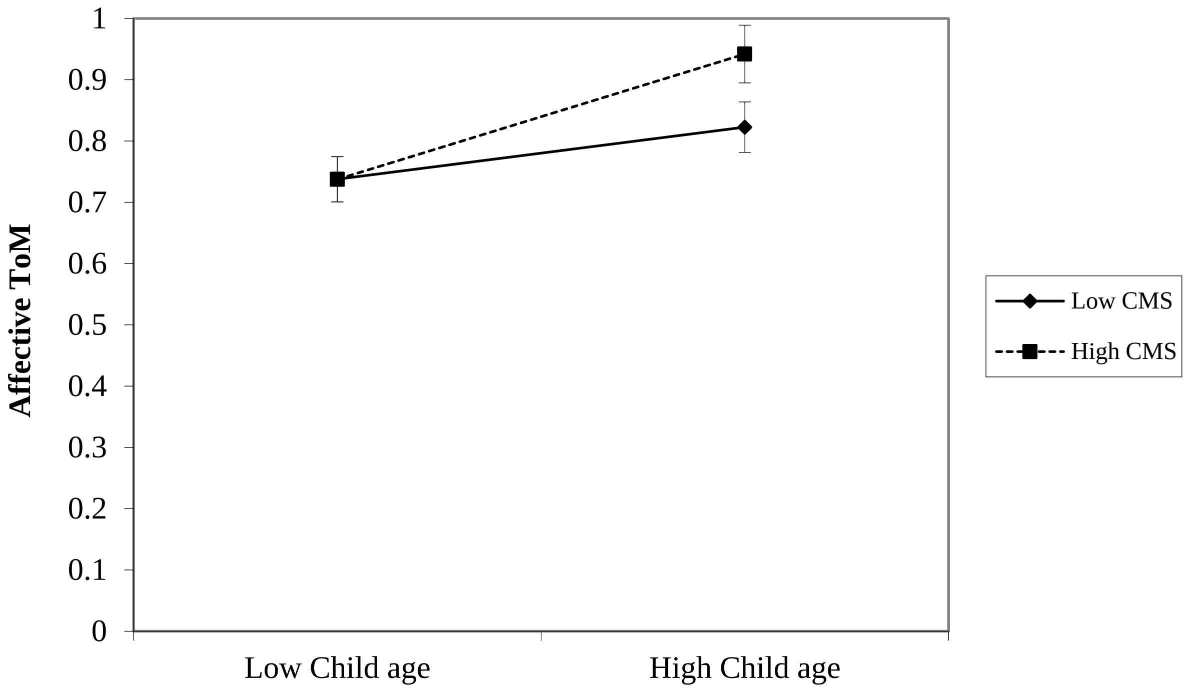


Figure 4. Moderation Effect of CMS in the Relationship Between Child Age and Affective Theory of Mind (95% confidence interval).

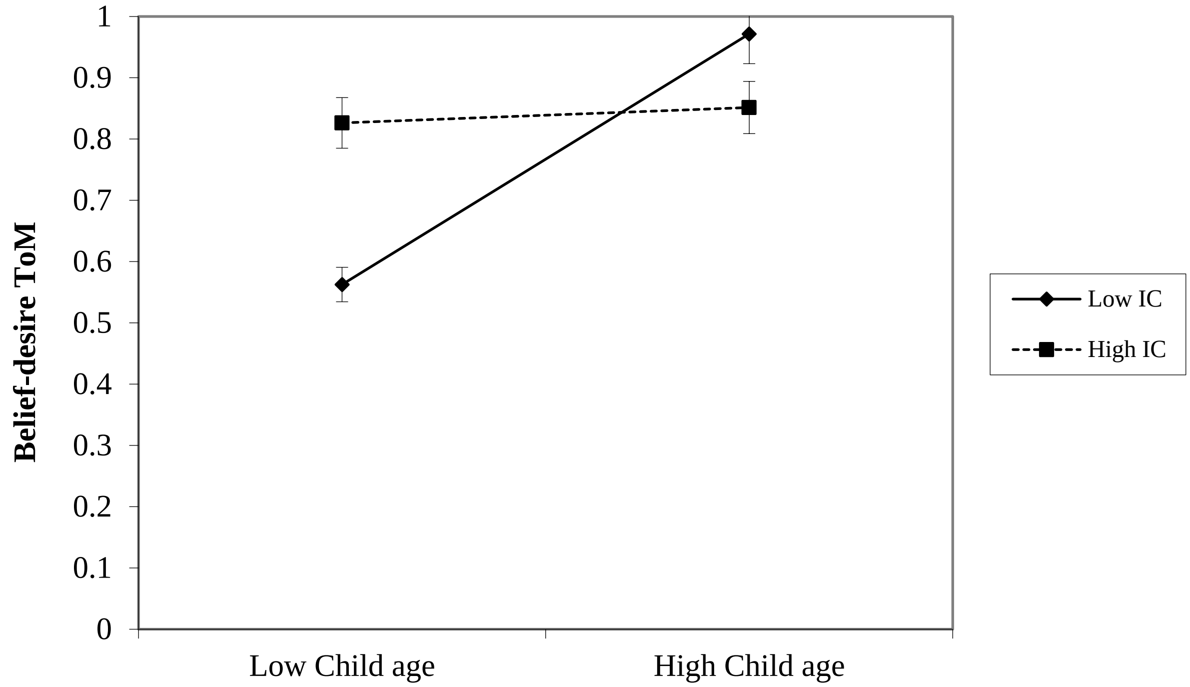


Figure 5. Moderation Effect of IC in the Relationship Between Child Age and Belief-Desire Theory of Mind (95% confidence interval).