

From mind to mind: Understanding the role of mothers in children's theory of mind

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ABSTRACT

Theory of mind (ToM) enables children to comprehend mental states of themselves and others. In this first study investigating the mediating role of mothers' mental state talk between mothers' sociocognitive skills (i.e., mothers' ToM and parental reflective functioning) and children's ToM, 89 children ($M(SD)_{age} = 57.0$ months (5.49)) and their mothers from Türkiye participated. Results revealed that mothers with higher prementalization scores used fewer affective and desire words. Mothers exhibiting greater interest and curiosity in mental states used more cognitive words, while those with more proficient ToM skills tended to use more mental state terms indicating certainty (e.g., 'perhaps'). Furthermore, mothers' use of certainty words mediated the relationship between mothers' ToM and children's ToM. These cross-sectional findings underscore the significant role of mothers' socio-cognitive abilities in mother-child interactions regarding mental states and the development of children's ToM skills, and call for a longitudinal investigation into these relationships.

Introduction

Theory of mind (ToM), which involves understanding mental states such as desires, beliefs, knowledge, and emotions in oneself and others (Premack & Woodruff, 1978), is a fundamental socio-cognitive ability that is related to many important outcomes such as peer cooperation, school achievement, and communication skills (e.g., Astington & Pelletier, 2005; Etel & Slaughter, 2019; Resches & Pereira, 2007; Viana et al., 2023). Longitudinal and cross-sectional studies show correlations between parents' discussions about mental states with their children and the children's understanding of these concepts (Devine & Hughes, 2018; Pavarini et al., 2013). Variations in parents' mental state conversations with their children have been attributed to parents' mindfulness of their child's mental state, parent-child attachment, and parental sensitivity (Lundy & Fyfe, 2015; McElwain et al., 2011; Oppenheim et al., 2001; Reynolds et al., 2020). However, as of now, no study has investigated the connection between parents' socio-cognitive skills, such as parental reflective functioning (the ability to comprehend both one's and one's child's mental states and their behavioral influence), and parents' own ToM skills, in relation to their discussions about mental states with their children. Thus, the primary objectives of this study were to examine (1) the relationship between individual differences in parental talk about

mental states directed to their children and parents' reflective functioning and ToM skills, and (2) whether parents' mental state talk mediates the link between these socio-cognitive skills of parents and their children's ToM.

The development of ToM skills is intricately linked to various social and environmental factors such as family size (Lewis et al., 1996), peer interactions (Jenkins & Astington, 1996; Wang & Su, 2009), and socioeconomic status (Cole & Mitchell, 1998). One of the most extensively studied social factor concerning children's ToM is parents' mental state talk when interacting with their children (e.g., Howard et al., 2008; Ontai & Thompson, 2008; Ruffman et al., 2006). According to Vygotsky's sociocultural theory (Vygotsky, 1978), engaging in conversation with mature individuals, referred to as 'more knowledgeable others', fosters the development of cognitive skills. Learning occurs and knowledge is constructed through social interactions. In adult-child interactions, adults often use dialogues to reveal the underlying motives and rationales behind human actions, encompassing intentions, objectives, emotions, and beliefs, thereby scaffolding their children's mental state understanding (Thompson, 2006). In line with this suggestion, children who are exposed to a higher amount of mental state expressions like "think", "wonder", "know", or "feel" by their parents exhibit enhanced performance in ToM tasks (Adrián et al., 2005; Devine &

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Hughes, 2019; Dunn et al., 1991; Ensor & Hughes, 2008; Ruffman et al., 2002, 2006; Slaughter et al., 2007; Symons et al., 2006; Taumoepeau & Ruffman, 2006, 2008). Variations in children's ToM abilities are not only associated with the frequency of mental state discussions in parent-child interactions but also with the specific categories of mental state terms used, such as cognitive, emotion, and desire terms (Adrián et al., 2005; Adrián et al., 2007; Dunn et al., 1991; Ruffman et al., 2002). A meta-analysis showed that mothers' use of cognitive terms exhibits a stronger correlation with children's ToM skills compared to desire or emotion terms (Tompkins et al., 2018). Therefore, understanding the factors linked not only to the frequency of but also to the different types of mental state talk is crucial. In this context, parental characteristics might play a key role in the variations observed in how parents talk about mental states.

There is variability in how parents engage in mental state dialogue with their children. Previous literature has primarily delved into parents' mind-mindedness, sensitivity, and parent-child attachment as potential sources of individual variations in parents' mental state conversations with their children (Lundy & Fyfe, 2015; McElwain et al., 2011; Reynolds et al., 2020). However, a question remains as to what extent parents' own socio-cognitive abilities intertwine with their engagement in mental state discussions with their children. Parents who better understand their own mental states, as well as those of their children and others, may engage in more mental state talk. They may frequently converse about these mental states with their children not just because they feel comfortable talking about mental states, but also with the intent to reveal and further comprehend their children's mental states.

Parental reflective functioning embodies the capacity of parents to introspect on their own and their children's mental states, retaining these mental states in mind, and employing this insight to effectively respond to their children's needs and behaviors (Fonagy & Target, 2005; Luyten, Nijssens, et al., 2017; Slade, 2005). Parental reflective functioning encompasses not only parents' considerations of their children's mental states but also extends to their reflections on their own mental states and corresponding behaviors. This makes parental reflective functioning a broader term than parental mind-mindedness, which specifically pertains to parents' awareness of their children's mental states and their proficiency in accurately interpreting their children's internal experiences (Meins, 1997). Through confirmatory factor analysis, it has been posited that parental reflective functioning can be delineated into three dimensions: (1) *prementalization*, signifying the inability to attune to a child's mental states and the attribution of distorted mental states to the child; (2) *certainty about mental states*, reflecting parents' acknowledgment of the uncertain nature of their children's mental states; and (3) *interest and curiosity in mental states*, encapsulating parents' inquisitiveness and eagerness to comprehend their children's mental states (Luyten, Mayes, et al., 2017).

Previous research found a positive relationship between mothers' sensitivity to their children's cues and mothers' mental state talk directed to their children (Reynolds et al., 2020). In a similar vein, mothers who are interested in and curious about their children's mental states may tend to use mental expressions (e.g., "feeling", "wondering", "thinking") more frequently to understand their children's mental states better. Furthermore, mothers who are more mind-minded tend to have more discussions about mental states with their children (Lundy & Fyfe, 2015). Mind-mindedness potentially serves as the opposite of the prementalization dimension of parental reflective functioning, with mind-minded parents accurately interpreting their children's mental states. Therefore, it is likely that mothers who have difficulty in understanding their children's mental states (i.e., prementalization) may engage less in conversations about mental states with their children. Previous research has not explored these potential relationships between mothers' parental reflective functioning and their mental state talk directed to their children. The current study aims to fill this gap in the literature by examining whether the

dimensions of parental reflective functioning are associated with mothers' mental state talk directed to their children.

Parents' own ToM skills may be another contributing factor to the variability in their mental state conversations with their children. Parents who possess a proper understanding of mental states may effectively enhance their children's comprehension of these states by deliberately incorporating mental state terms into their conversations. Surprisingly, only one study has explored the link between parents' ToM skills and their mental state talk directed to their children (Devine & Hughes, 2019). While this research did not find a significant correlation, its focus was on the overall quantity of parents' mental state talk, rather than conducting a detailed analysis of its various components (such as cognition, desire, emotion terms). This implies that a more detailed exploration of these subcategories might reveal a more complex relationship. Additionally, despite limited research regarding the link between ToM and mental state talk in adult populations, a study conducted with school-aged children found that behavioral ToM performance predicted their use of mental state language in both narrative and informational texts (Kim et al., 2021). Therefore, it is plausible to suggest that a comparable relationship may exist between ToM and mental state conversations in adults, which is one of the focal points of the present study.

When considering the association between children's ToM and parents' discussions about mental states with their children, as well as the potential relationship between parents' socio-cognitive skills and their mental state talk with their children, it is plausible that both parental reflective functioning and parental ToM could be related to children's ToM through the mediation of parents' mental state talk directed towards their children. Recent studies have shown that children of mothers scoring higher on prementalization exhibited poorer performance on ToM tasks, while mothers displaying more interest and curiosity in their children's mental states had children achieving higher scores on ToM tasks (Cowes & Santelices, 2020; Nijssens et al., 2021). The relationship between parents' ToM and their children's ToM has been limitedly explored, with only two studies reporting positive associations between these variables (Devine & Hughes, 2019; Sabbagh & Seamans, 2008). So far, no research has been conducted on the mediating role of parental mental state talk between parents' socio-cognitive skills and children's ToM. The present study aims to address this gap and determine whether parents' mental state talk mediates the relationship between parental reflective functioning, parental ToM, and children's ToM. Additionally, the study aims to enhance ecological validity by assessing children's ToM through both behavioral tasks and maternal report, broadening the scope beyond the traditional focus on false belief understanding in the existing literature (Devine & Hughes, 2018).

To sum up, in the present study, we aimed to address two primary research questions: (1) Can maternal reflective functioning and mothers' ToM skills account for variations in mothers' mental state talk with their children?, and (2) Does mothers' mental state talk with their children act as a mediator in the relationship between mothers' socio-cognitive skills (specifically parental reflective functioning and their own ToM skills) and their children's ToM skills? Regarding the first research question, we hypothesized that mothers would engage in more mental state talk with their children when their interest and curiosity in their children's mental states is high, prementalization is low, and ToM skills are more advanced. Given the limited number of existing studies including the certainty about mental states subscale of parental reflective functioning, we did not have an a priori hypothesis. For the second research question, we expected parental mental state talk to mediate the relationship between mothers' socio-cognitive skills (reflective functioning and ToM) and children's ToM such that mothers with more advanced socio-cognitive skills would produce more mental state talk, which in turn would be positively associated with their children's ToM skills. For both of the research questions, in assessment of mental state talk, we explored not only the amount of total mental-state talk but also specific subcategories (e.g., affective, cognitive, motivational).

Method

Participants

The sample for this study consisted of 89 Turkish-speaking children ($M(SD)_{\text{age}} = 57.0$ months (5.49), *age range* = 48–69 months; 49 girls) and their mothers ($M(SD)_{\text{age}} = 34.0$ years (4.38), *age range* = 24–50).¹ Of all the participants, 59 mother-child dyads (66.3 %) were recruited from Istanbul, while the remaining participants were recruited from various cities across Türkiye, with one participant from Germany. Participants were recruited through social media platforms such as Instagram and Facebook. To be eligible for participation, children were required to meet the inclusion criteria of being fluent in Turkish and having no reported developmental disabilities or mental health issues that could potentially interfere with the study. Mothers gave their consent for both themselves and their children to participate in the study at the beginning of the online survey. Participants' SES was computed as a composite score of maternal education (0: elementary or middle school, 1: high school, 2: Bachelor's degree, 3: Masters' or graduate degree), employment (0: unemployed, 1: employed), and household income² (0: 1600 TL and lower, 1: 1600–4000 TL, 2: 4000–5500 TL, 3: 5500–11,500 TL, 4: 11500 TL and higher) following Berzofsky et al. (2014). Based on this composite score, the latest SES index presents a mean value of 4.9 with a standard deviation of 1.7.

Procedure

Data were collected online in February 2022 due to COVID-19. Mothers were invited to participate in the study through the Qualtrics platform, where they were provided with a participant number and asked to complete the demographic information form, Parental Reflective Functioning Questionnaire (Luyten, Mayes, et al., 2017), Reading the Mind in the Eyes Test (Baron-Cohen et al., 2001), and Children's Social Understanding Scale (Tahiroglu et al., 2014) in order. After completing the online survey, a video conference session was scheduled on the Zoom platform for the same day. At the beginning of the session, mothers provided their consent for video recording. The video conference session commenced with the presentation of behavioral ToM tasks (Wellman & Liu, 2004) to the children, covering diverse desires, knowledge access, diverse beliefs, content false belief, real-apparent emotion tasks. Throughout this phase, mothers were instructed to review the wordless picture book, previously shared with them via email or messaging, which they would later narrate to their children following the completion of the tasks. Following the conclusion of the children's ToM tasks, mothers were asked to narrate the story depicted in the book to their children, mirroring their usual practice at home. Finally, the expressive vocabulary subtest of the Turkish Expressive and Receptive Language Test (Berument & Güven, 2013) was administered to the children. The first author conducted the entire session of behavioral tasks with the children. The entire duration of the online session was approximately 60 min. As a token of appreciation, a gift card was provided to each participating mother at the conclusion of the session.

Materials

Children's ToM

Children's ToM skills were evaluated using two separate assessment tools: the Five-Item Theory of Mind Scale (Wellman & Liu, 2004) and the

parent report Children's Social Understanding Scale (Tahiroglu et al., 2014).

Five-item theory of mind scale. The Turkish translation (Etel & Yagmurcu, 2015) of the widely utilized five-item theory of mind scale developed by Wellman and Liu (2004) was employed in this study. The order of the presented tasks was as follows: diverse desires, knowledge access, diverse beliefs, content false belief, and real-apparent emotion. In each task, the child was tasked with responding to questions about both their own mental state and that of the protagonist, as well as questions solely concerning the protagonist's mental state. Children were required to answer both control and target questions accurately in a task to be deemed successful. If children did not answer the control question correctly, it was repeated up to two more times. If they failed to answer correctly after three attempts, they were considered to have failed. The cumulative score for each child was determined by summing the scores of either pass (1) or fail (0) achieved in each task, with potential total scores ranging from 0 to 5. The description of the scale and the passing rates among children for each task are presented in Table 1.

Children's social understanding scale. Children's ToM skills were further evaluated using the Children's Social Understanding Scale (CSUS), which is a parent-report scale developed by Tahiroglu et al. (2014) for children aged 3 to 6 years and adapted into Turkish by Besiroglu et al. (2022). This scale comprises 42 items, each rated on a 4-point Likert scale (ranging from 1 = definitely untrue to 4 = definitely true), with an additional "don't know" option available. The items on the scale assess children's grasp of mental states across six dimensions: belief (e.g., "understands that telling lies can mislead other people"), knowledge (e.g., "is good at playing 'hide and seek'"), perception (e.g., "talks about the difference between the way things look and how they really are"), desire (e.g., "talks about differences in what people like or want"), intention (e.g., "talks about the difference between intentions and outcomes"), and emotion (e.g., "understands that different people can have different feelings about the same thing"). The scale score was computed by averaging the item scores, excluding responses indicating "don't know". Previous studies have demonstrated the strong psychometric properties of the CSUS. The scale exhibits high internal consistency in its long form across three different studies in the original research, with Cronbach's alpha values of 0.94, 0.91, and 0.90, respectively (Tahiroglu et al., 2014). Similarly, the Turkish adaptation of the short scale also shows excellent internal consistency ($\alpha = 0.94$) (Ekerim Akbulut et al., 2023). Furthermore, the scale has consistently shown significant correlations with behavioral ToM tasks (Ekerim Akbulut et al., 2023; Gluck et al., 2021). In the present study, Cronbach's alpha coefficient for the scale was 0.90.

Parental reflective functioning

Maternal reflective functioning was measured using the Turkish version (Arikan et al., 2020) of the Parental Reflective Functioning Questionnaire (PRFQ; Luyten, Mayes, et al., 2017). Administered as a self-report questionnaire, the PRFQ comprises 18 items that are rated on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The PRFQ encompasses three dimensions of parental reflective functioning, each assessed by six items. The first dimension, *prementalization*, pertains to parents' challenges in comprehending and attending to their children's inner realms (e.g., "My child cries around strangers to embarrass me"). The second dimension, *certainty about mental states*, evaluates the degree to which parents believe they possess a complete understanding of their children's mental states (e.g., "I can always predict what my child will do"). The final dimension, *interest and curiosity in mental states*, reflects parents' inclination to take an interest in their children's mental states (e.g., "I try to see situations through the eyes of my child"). In the original study, all three dimensions demonstrated good internal consistency, with Cronbach's alpha values of 0.70

¹ According to Fritz and MacKinnon (2007), a sample of 78 participants is necessary to detect medium-sized effects for both the path between the predictor, and the mediator and the path between the mediator and the outcome variable, with a power of 0.80 when using the percentile bootstrap method.

² During the data collection period, the minimum wage in Türkiye was 4250 TL/month (Republic of Türkiye, 2021, p. 16)

Table 1
Description of the five-item theory of mind scale and passing rates (N = 88).

ToM Scale Item	Description	Correct Answer	Passing Rate	
			N	%
Diverse desires	The child first states their preferred food. The experimenter then indicates that the character's preferred food is the other option presented on the slide. The child is then asked which food the character would choose to eat.	The correct answer is the food that is different from the child's preferred choice.	79	89.8 %
Knowledge access	The task involves showing a child a toy dog inside an unidentifiable box, then introducing the character who has never seen inside the box. The child is asked if the character knows what is inside and if the character has seen inside.	Correct answers are "no" for both, indicating the child's understanding of the character's perspective.	77	87.5 %
Diverse belief	The task involves showing a child a character and two possible hiding spots for a cat (bushes or behind a car). The child is asked where they think the cat is. Regardless of the child's answer, the researcher says the character thinks the cat is in the opposite location. The child is then asked where the character will look for the cat.	Correct answers are based on recognizing the character's belief, not the child's own belief.	49	55.7 %
Content false belief	The task involves showing a child a crayon box that actually contains a bandage. The child is asked what they think is inside. The researcher reveals the bandage, then asks if the character has seen inside the box and what the character, who has not seen inside, will believe is inside.	Correct answers are "crayons" for the character's belief and "no" for whether the character has seen inside.	31	35.2 %
Real-apparent emotion	The task involves showing a child an image of a boy with his face turned away and asking them to identify emotions using a scale with happy, neutral, and sad faces. After confirming the child understands the emotions, the researcher tells a story about Mehmet, who receives a gift he dislikes but must hide his true feelings. The child is then asked how Mehmet truly feels (answer should be sad or neutral) and how he tries to appear (answer should be happy or neutral).	Correct answers require that Mehmet's true feelings are more negative than his outward appearance.	31	35.2 %

Note. One participant was identified as an outlier and excluded from the analyses.

for prementalization, 0.74 for certainty about mental states, and 0.82 for interest and curiosity in mental states (Luyten, Mayes, et al., 2017). Additionally, the PRFQ showed convergent validity through significant associations with the Parent Development Interview-Reflective Functioning Scale (Anis et al., 2020). In the present study, the corresponding alpha values were determined to be 0.62 for prementalization, 0.82 for certainty about mental states, and 0.76 for interest and curiosity in mental states.

In line with the previous literature (e.g., Nijssens et al., 2020; Rutherford et al., 2017), mothers' total scores on each of these three dimensions were computed by summing the scores on the items after reversing the values for the reverse-scored items.

Parental ToM

Mothers' ToM skills were assessed by using the Turkish version (Girli, 2014) of the Reading the Mind in the Eyes Test (Baron-Cohen et al., 2001). In each of the 36 trials, mothers were presented with an image depicting only the eye region of a human face, specifically the area just above the eyebrow and the middle of the nose. Each image was accompanied by four mental state adjectives, with one of these adjectives accurately representing the mental state conveyed by the eyes in the picture. The total score was calculated by summing the number of correct responses on the test. The test demonstrates strong test-retest reliability, with intraclass correlation coefficients reported as 0.63 ($p < .01$) in one study, 0.65 ($p < .01$) in another, and 0.83 (95 % $CI = 0.745$ to 0.902) in a third study (Fernández-Abascal et al., 2013; Vellante et al., 2013; Yıldırım et al., 2011). The test has also demonstrated convergent validity, as evidenced by its significant correlation with other ToM measures (Ferguson & Austin, 2010; Torralva et al., 2009; Vellante et al., 2013).

Parental mental state talk

To assess mothers' mental state talk, the wordless picture book "Frog, Where Are You?" by Mayer (1969) was used. This 29-page picture book narrates the story of a boy searching for his pet frog with his dog. The storyline presents numerous occasions for readers to introduce various mental state expressions. This book has been widely used to assess parental talk directed to children (Baptista et al., 2016; Bekar et al., 2018; Bürümlü-Kısa et al., 2023; Devine & Hughes, 2019). Since the study was conducted online, the book's pages were displayed on the screen for the participating mothers, and the experimenter moved

between the pages upon mothers' request. There was no time constraint for the picture book reading session. For the coding of the mental state talk, please see the Transcription and Data Coding section below.

Children's expressive vocabulary

To screen for any language-related problems, children's expressive vocabulary was assessed with the Turkish Expressive and Receptive Language Test (TIFALDI; Berument & Güven, 2013). This test involved the presentation of 80 images spanning various categories (e.g., toys, vehicles, animals) to the children. The children were asked to provide the names of the object, person, animal, etc., portrayed in each image. The images were displayed to the children based on age-appropriate thresholds. The base score was determined as the point where the child consecutively answered correctly for 8 pictures. The ceiling score was calculated as the place where the child answered at least six of the eight consecutive pictures incorrectly. The total score was computed as the difference between the base score and the ceiling score. The test-retest reliability of the receptive vocabulary subscale of TIFALDI (Berument & Güven, 2013) was reported as 0.97, with a Spearman-Brown coefficient of 0.99 from the split-half method, and a Cronbach's alpha of 0.99 for internal consistency. Although the authors did not report reliability values for the expressive vocabulary subscale, it is frequently used to assess the vocabulary of Turkish-speaking children (e.g., Aktan-Erciyes & Göksun, 2023; Bürümlü-Kısa et al., 2023; Ilgaz et al., 2022; Özkan et al., 2022).

Demographic information

Relevant demographic data pertaining to the participants were gathered through a demographic information form. This form encompassed details such as the age of the mother and child, the child's sex, the educational background of the parents, the household income, the number of children and adults residing in the household, the number of younger and older siblings, and the child's kindergarten attendance status.

Transcription and data coding

To analyze mothers' mental state talk, the video-recorded book reading sessions were transcribed by two undergraduate research assistants utilizing the CHAT transcription format (MacWhinney, 2000). Mothers' mental state talk was coded by two coders based on the coding

Table 2
Coding scheme for maternal mental state talk.*

Mental State Terms	Examples
1. Perception Terms	“look, listen, see, watch” (e.g., <i>The boy started to listen to the voices coming from the tree hollow</i>)
2. Physiological Terms	“be hungry, get hurt, get rest, be injured” (e.g., <i>The foot of the dog was injured</i>)
3. Desire Terms	
3a. Desire Terms-Word Level	“wish, want, hope, beg” (e.g., <i>I want to find the frog right now</i>)
3b. Desire Terms-Conjugation Level	subjunctive mood (–se, –sa) and optative mood (–e, –a).* (e.g., <i>Keşke kurbacıyı yalnız bırakmasaydım</i> ‘I wish I hadn’t left the frog alone’)
4. Motivational Terms	“work, attempt, promise, endeavor” (e.g., <i>The boy promised never to let go of the frog</i>)
5. Affective Terms	“like, have fun, worry, forgive” (e.g., <i>The boy forgave the dog</i>)
6. Cognitive Terms	
6a. Cognitive Terms-Word Level	“remember, think” (e.g., <i>The dog remembered where the frogs lived</i>)
6b. Cognitive Terms of Certainty-Word Level	“probably, maybe” (e.g., <i>They will probably fall into the lake</i>)
6c. Cognitive Terms of Certainty-Conjugation Level	modal verbs of possibility (–malı, –abilir)** (e.g., <i>Köpeğin canının acımasından korktuğu için çocuk köpeğe kızmış olabilir</i> ‘The child might have been angry at the dog because he was afraid that the dog could get hurt’)
6d. Cognitive Terms of Contrastives	“actually, falsely believe” (e.g., <i>They were actually deer antlers</i>)
6e. Cognitive Terms of Perspectives	“I think, you think” (e.g., <i>I think the dog got wet in the lake</i>)

* The conjugation level of subjunctive mood and optative mood are peculiar to Turkish.

** The conjugation level of modal verbs of possibility is peculiar to Turkish.

system developed by Ilgaz et al. (2024) for Turkish-speaking participants. A comprehensive overview of the coding scheme, accompanied by illustrative examples, is presented in Table 2.

Initially, each clause produced by the mothers was categorized into either *being a component of the story narration* (e.g., “Do you think that the boy was upset?”) or not (e.g., “You need to look at the screen to see the pictures.”). Subsequently, only those clauses attributed to the story narration were further assessed to determine whether they contained *references to mental states*. These mental state references encompassed facets such as perception (e.g., smelling, looking), physiological state (e.g., hunger), desire (both at the word and conjugate levels) (e.g., wishing, subjunctive mood), motivation (e.g., attempting), affect (e.g., worrying), and cognition (e.g., dreaming, perhaps). Following the coding of the subcategories of mental state talk, total number of terms that belong to each category was summed to compute the total amount of mothers’ mental state talk. The intraclass correlation coefficients used to measure interrater reliability demonstrated a high level of agreement, evidenced by a coefficient of 0.99 for the total mental state terms.³

Data analysis

Following previous studies (e.g., Howard et al., 2008; Meins et al., 2003), the proportion of mental state terms in mothers’ overall speech was used in the analyses as mothers’ total mental state talk. To compute the proportion of mental state talk, the number of mental state terms uttered by mothers was divided by the total number of words mothers produced. The scores on the maternal report for children’s ToM were missing for 2 participants, and the expressive vocabulary data were missing for 3 participants. There were no missing data in children’s behavioral ToM. No children were excluded based on their expressive vocabulary scores. Outliers were defined as data points beyond ± 3.0 standard deviations from the mean. Outliers identified were: 1 for children’s behavioral ToM, 1 for mothers’ ToM, and 1 for mothers’

interest and curiosity in mental states. Outliers were only removed from the analyses that contained the relevant variables. As the data were not normally distributed (Shapiro-Wilk test, $p < .05$), we used Spearman correlation analyses to assess the relationships between variables. Lastly, mediation analyses were conducted in R (R Core Team, 2021) by using the PROCESS macro (Hayes, 2022). Bootstrapping with 10,000 resamplings and 95 % confidence intervals, using the percentile method, was employed for each mediation model, following the recommendations by MacKinnon et al. (2004).

Results

In the current section, we initially report the relationship between mothers’ socio-cognitive skills and their mental state talk directed towards their children. Subsequently, we provide our findings on the correlations between mothers’ mental state talk and children’s behavioral and parent reported ToM. Finally, we report on the mediating role of mothers’ mental state talk in the relationship between mothers’ socio-cognitive skills and children’s ToM. Descriptive statistics and correlations for study variables are presented in Table 3 and Table 4, respectively. The detailed relationships with the demographic variables are presented in Table A1 in the Appendix.

Mothers’ socio-cognitive skills and mental state talk

The data did not support our hypothesis regarding significant relationships between mothers’ total mental state talk, ToM, and reflective functioning. However, mothers’ socio-cognitive skills were significantly associated with specific categories of mental state talk (e.g., cognitive words, affective words). Descriptive statistics for the subcategories of mental state talk are presented in Table A2 in the Appendix while Table 5 displays the correlation values. Regarding mothers’ ToM, it exhibited a significant positive relationship only with certainty words (e.g., perhaps, maybe) ($r_s = 0.27, p = .01$). In terms of maternal reflective functioning, we found that mothers’ interest and curiosity in their children’s mental states were significantly and positively associated with mothers’ use of cognitive words (e.g., remembering) ($r_s = 0.23, p = .03$). Conversely, mothers’ prementalization showed a significant

³ The interrater reliability values for the subcategories of mental state talk were 1 for each subcategory, except for cognitive words of certainty, which was .99.

Table 3

Descriptive statistics of the study variables.

	M	SD	Min	Max
Child age (months)	57.0	5.5	48	69
Socioeconomic status	4.9	1.7	1	7
Children's ToM				
Behavioral ToM score	3.0	0.9	1	5
Reported ToM score (CSUS)	3.1	0.4	2.2	3.8
Parental reflective functioning				
Prementalization	14.5	5.8	6	31
Certainty about mental states	28.1	6.5	10	42
Interest and curiosity in mental states	37.8	3.9	25	42
Mothers' ToM	26.1	3.0	19	31
Total number of words spoken by mothers	609.5	237.7	215	1292
Number of different words used by mothers	304.8	95.3	123	561
Mothers' total mental state talk %	11.8	3.3	3.6	20.6
Children's expressive vocabulary	53.6	10.7	25	76

Note. ToM = Theory of mind. CSUS = Children's Social Understanding Scale.

negative correlation with mothers' use of desire words (e.g., wishing) ($r_s = -0.21, p = .04$) and affective words (e.g., happy) ($r_s = -0.23, p = .03$). There was no significant relationship observed between mothers' certainty about their children's mental states and the subcategories of mental state talk.

Mothers' mental state talk and children's theory of mind

We anticipated that children whose mothers used more mental state talk would perform better in behavioral ToM tasks and score higher on maternal reports. As expected, we observed a significant positive association for the behavioral ToM tasks ($r_s = 0.22, p = .04$) but not for the maternal reports ($r_s = 0.18, p = .09$).

Our analysis of mothers' mental state talk subcategories (see Table 5) revealed a significant positive correlation between cognitive words used by mothers and children's ToM skills assessed via behavioral tasks ($r_s = 0.33, p = .002$). Specifically, children's performance in behavioral ToM tasks was significantly associated with mothers' usage of cognitive words ($r_s = 0.24, p = .03$), terms related to certainty ($r_s = 0.31, p = .004$), contrastives ($r_s = 0.25, p = .02$), perspectives ($r_s = 0.24, p = .02$), and desire terms at the conjugation level ($r_s = 0.23, p = .03$). Additionally, children's ToM scores based on maternal reports demonstrated significant positive correlations with the mothers' use of cognitive words of certainty ($r_s = 0.26, p = .02$) and total certainty terms (i.e., word and conjugation levels) ($r_s = 0.25, p = .02$), as well as with contrastives ($r_s = 0.23, p = .03$) in mothers' speech.

Summary of the correlational results

In summary, mothers who demonstrated increased interest and curiosity regarding their children's mental states used more mental state terms related to cognition (at the word level). Conversely, mothers who scored higher on prementalization used fewer desire and affective words. Additionally, mothers with higher ToM scores produced more

certainty words.

Notably, children who demonstrated better performance on behavioral ToM tasks were exposed to a higher proportion of mental state talk including cognitive aspects, like certainty, contrastives, and perspectives, and desire terms at the conjugation level. Furthermore, children who are reported by mothers to have higher ToM abilities heard a higher proportion of certainty and contrastive terms from their mothers.

Does mental state talk mediate the relationship between mothers' socio-cognitive skills and children's theory of mind?

Our second research question aimed to investigate whether mental state talk mediated the relationship between mothers' socio-cognitive skills (ToM and parental reflective functioning) and children's ToM. Following Hayes (2009, 2022) and MacKinnon and Fairchild (2009), mediation analyses were conducted only when the mediator variable was significantly related to both the predictor and outcome variables. If child age and SES showed a significant relationship with the outcome variable, they were included as a control variable into the respective models. Three mediation models were constructed accordingly.

In Model 1, mothers' ToM served as the predictor variable, mothers' certainty words as the mediator, children's behavioral ToM score as the outcome variable, and children's age as the control variable. The model was significant, $F(3, 82) = 6.23, p < .001, R^2 = 0.18$ (see Fig. 1). A significant indirect effect (*standardized indirect effect coefficient* = 0.086, $SE = 0.04, 95\% \text{ BCA-}CI = 0.008\text{--}0.178$) indicated mediation such that mothers with higher ToM scores used a higher proportion of certainty words in their speech ($B = 0.001, SE = 0.0002, t(82) = 2.51, p = .01$, and $\beta = 0.26$), which in turn was significantly associated with children's better performance on behavioral ToM tasks ($B = 41.53, SE = 14.41, t(82) = 2.88, p = .005$, and $\beta = 0.30$).

In contrast to Model 1, Model 2 featured children's parent-reported ToM as the outcome variable and SES as the control variable. Model 2 was also significant, $F(3, 82) = 3.77, p = .01, R^2 = 0.12$ (see Fig. 2) with a significant indirect effect (*standardized indirect effect coefficient* = 0.06, $SE = 0.03, 95\% \text{ BCA-}CI = 0.011\text{--}0.143$). This effect indicated that mothers who had higher ToM scores used a higher proportion of certainty words ($B = 0.006, SE = 0.0002, t(83) = 2.47, p = .01$, and $\beta = 0.27$), which was associated with more proficient ToM skills according to maternal reports ($B = 13.80, SE = 6.20, t(82) = 2.03, p = .03$, and $\beta = 0.24$).

Lastly, in Model 3, mothers' interest and curiosity in mental states was treated as the predictor variable, mothers' cognitive words as the mediator, children's behavioral ToM as the outcome variable, and children's age as the control variable. Although the model was significant ($F(3, 82) = 3.73, p = .01, R^2 = 0.12$), the indirect effect was not (*standardized indirect effect coefficient* = 0.043, $SE = 0.04, 95\% \text{ BCA-}CI = -0.010\text{--}0.136$), indicating no mediation.

Table 4

Spearman correlations between the study variables.

Variables	1	2	3	4	5	6	7	8	9
1. Child's age (months)	–								
2. Expressive vocabulary	0.37***	–							
3. Behavioral ToM score	0.30**	0.34**	–						
4. Reported ToM score (CSUS)	0.09	0.31**	0.25*	–					
5. PRF-Prementalization	0.04	–0.06	–0.11	–0.32**	–				
6. PRF-Certainty about mental states	–0.00	–0.08	–0.02	–0.08	–0.27*	–			
7. PRF-Interest and curiosity in mental states	–0.03	0.01	0.14	0.25*	–0.28**	0.20	–		
8. Mothers' ToM	0.03	–0.01	0.22*	0.20	–0.19	–0.05	0.09	–	
9. Total mental state talk %	–0.10	0.25*	0.22*	0.18	–0.11	0.04	0.11	0.09	–

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. ToM = Theory of mind. CSUS = Children's Social Understanding Scale. PRF = Parental reflective functioning.

Table 5
Spearman correlations between the study variables and subcategories of mental state talk.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Behavioral ToM score	–																			
2. Reported ToM score (CSUS)	0.25*	–																		
3. PRF-Prementalization	–0.11	–0.32**	–																	
4. PRF-Certainty about mental states	–0.02	–0.08	–0.27*	–																
5. PRF-Interest and curiosity in mental states	0.14	0.25*	–0.24*	0.18	–															
6. Mothers' ToM	0.22*	0.20	–0.19	–0.05	0.09	–														
7. Perception words	0.03	–0.06	0.10	0.03	–0.01	0.02	–													
8. Physiological words	0.07	0.02	–0.06	0.10	0.07	0.04	–0.05	–												
9. Desire words	–0.03	–0.09	–0.21*	0.19	0.13	0.04	–0.07	0.05	–											
10. Desire terms-conjugation level	0.23*	0.16	–0.07	–0.15	0.10	0.12	0.12	–0.13	–0.03	–										
11. Total desire terms	0.20	0.12	–0.15	–0.04	0.17	0.13	0.14	–0.14	0.33**	0.88***	–									
12. Motivational words	0.05	–0.02	0.04	0.16	–0.03	–0.09	–0.01	–0.02	0.19	–0.23*	–0.16	–								
13. Affective words	0.06	0.12	–0.23*	0.10	0.16	0.08	–0.19	0.05	0.27*	–0.06	0.06	0.27**	–							
14. Cognitive words	0.24*	0.03	–0.14	0.18	0.23*	–0.01	0.08	0.05	0.14	0.12	0.21	0.12	0.10	–						
15. Cognitive words of certainty	0.30**	0.26*	–0.07	–0.14	0.01	0.27*	0.21*	–0.23*	0.05	0.29**	0.28**	0.06	–0.01	0.12	–					
16. Cognitive terms of certainty-conjugation level	0.19	0.07	–0.17	0.14	0.13	0.07	0.21	–0.05	0.15	0.37***	0.44***	–0.30**	0.04	0.26*	0.34**	–				
17. Total cognitive terms of certainty	0.31**	0.25*	–0.11	–0.01	0.10	0.21	0.25*	–0.24*	0.07	0.37***	0.40***	–0.08	0.02	0.22*	0.87***	0.68***	–			
18. Cognitive words of contrastives	0.25*	0.23*	–0.20	0.19	0.14	0.05	–0.05	–0.05	0.27*	0.07	0.18	0.22*	0.26*	0.33**	0.15	0.01	0.10	–		
19. Cognitive words of perspectives	0.24*	0.10	0.06	–0.10	–0.09	0.07	0.12	–0.16	0.03	0.33**	0.29**	–0.06	0.11	0.27*	0.43***	0.39***	0.49***	0.12	–	
20. Total cognitive terms	0.33**	0.19	–0.13	0.09	0.12	0.08	0.19	–0.13	0.17	0.29**	0.36***	0.01	0.09	0.73***	0.61***	0.58***	0.71***	0.42***	0.59***	–

Note. * $p < .05$, ** $p < .01$. CSUS: Children's Social Understanding Scale, PRF: Parental Reflective Functioning. For the subcategories of mothers' mental state talk, outliers were noted and removed from the analyses of the following variables: 2 data points for perception and physiological words; 1 for desire words, 2 for desire terms at the conjugation level, and 2 total (word and conjugation level); 1 for both motivational and affective words; 1 for cognitive words, 1 for certainty words, 2 for total certainty terms, 3 for perspective words, and 1 for total cognitive terms.

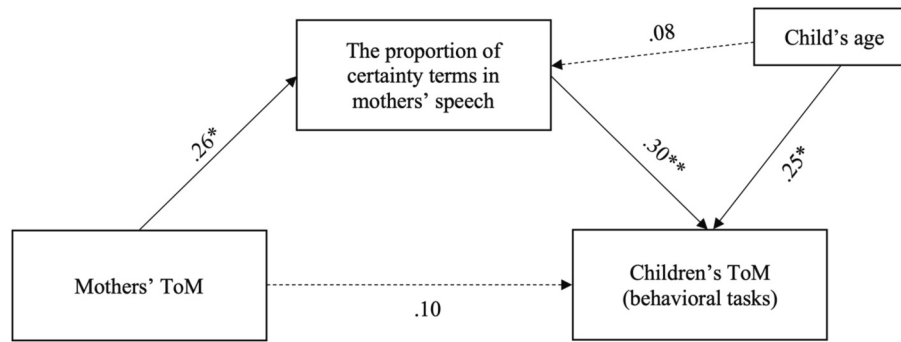


Fig. 1. Mothers' Certainty Terms Mediate the Relationship between Mothers' ToM and Children's ToM Assessed with Behavioral Tasks (* $p < .05$, ** $p < .01$).

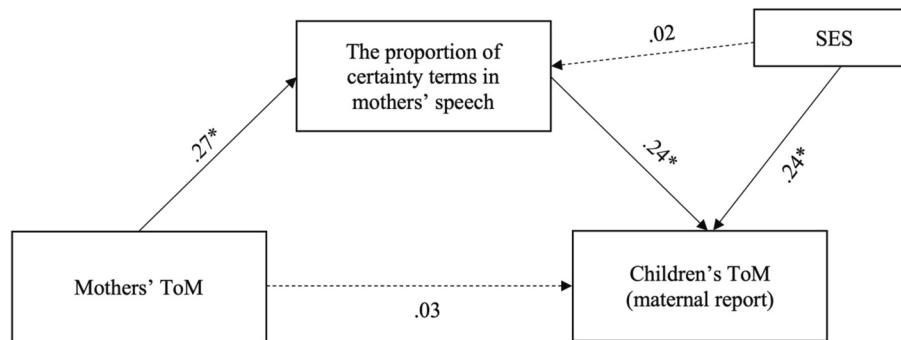


Fig. 2. Mothers' Certainty Terms Mediate the Relationship between Mothers' ToM and Children's ToM Assessed with Maternal Report (* $p < .05$).

Discussion

This study represents the first attempt to investigate the role of mothers' socio-cognitive skills, specifically parental reflective functioning and ToM, in their use of mental state language with their children. Moreover, it is the pioneering exploration of whether maternal mental state talk mediates the relationship between mothers' socio-cognitive capabilities and children's ToM. The findings revealed that distinct associations emerged between mothers' socio-cognitive skills and various subcategories of their mental state language. In terms of mediation, it was specifically observed that the frequency of certainty words in mothers' speech acted as a mediator in the link between mothers' ToM and children's ToM assessed through both behavioral tasks and maternal report.

Our findings reveal that mothers demonstrating greater interest and curiosity in their children's mental states engaged in conversations containing more cognitive terms. These results are consistent with Reynolds et al. (2020), who found that parents who are sensitive to their children's verbal or nonverbal cues, similar to displaying interest and curiosity in mental states, engage more frequently in mental state talk, particularly about cognitions. Additionally, considering the foundational role of parental reflective functioning in establishing secure parent-child attachment (Cooper & Redfern, 2016; Ensink & Mayes, 2010; Slade, 2005), our study aligns with the findings of McElwain et al. (2011), where mothers whose children had secure attachment styles were observed to refer more frequently to cognitive terms during interactions with their children. Parents displaying a strong interest in mental states may have employed an increased number of cognitive terms to comprehend their children's thoughts and clarify the mental states of others for their children. This could be due to the abstract nature of cognition, which often lacks concrete real-life representations,

such as facial expressions, compared to desires and emotions (Bartsch & Wellman, 1995).

Conversely, mothers with higher prementalization tendencies tended to use fewer desire and affective words. Challenges associated with prementalization, such as difficulties in accurately attuning to and interpreting mental states and non-verbal cues, likely contribute to this observed communication pattern. Mothers may struggle to correctly interpret affective or desire-driven states, whether exhibited by characters in the story or by their children. This difficulty in accurate interpretation likely leads to a cautious approach when dealing with affective or desire states. Consequently, mothers with higher prementalization may avoid using language that could potentially emphasize these states. Lastly, the findings concerning the prementalization dimension of parental reflective functioning must be interpreted with caution, given that the reliability score for this dimension is around 0.60, which suggests potential issues with its reliability.

In terms of the relationship between mothers' ToM and mental state talk, we found that mothers with better ToM skills incorporated more certainty words into their narrations. Individuals with advanced ToM skills, given their capacity to infer the beliefs, intentions, and behaviors of others (Premack & Woodruff, 1978), are likely to possess a deeper understanding of subjectivity. This enables them to more effectively infer the certainty levels in various situations. In our method, where mothers narrated a wordless picture book, those with advanced ToM were probably more proficient at recognizing and emphasizing the uncertainty surrounding characters' motivations, hence they had increased use of certainty words.

In line with previous research, mothers who had a higher proportion of mental state talk had children who perform better at ToM tasks (Howard et al., 2008; Meins et al., 2003). This finding suggests that parental dialogue that incorporates references to mental states aids

children in understanding and conceptualizing these states more concretely. This supports the sociocultural approach proposing that children who hear more frequent mental state talk can have more opportunity to realize others' mental states (Jenkins et al., 2003; Ruffman et al., 2002; Wellman, 2017).

Additionally, our results revealed that children of mothers who used more cognitive terms displayed enhanced ToM skills in line with previous findings (e.g., Adrián et al., 2005; Ensor & Hughes, 2008; Ruffman et al., 2002; Slaughter et al., 2007). Building on Vygotsky's (1978) zone of proximal development, Taumoepeau and Ruffman (2008) proposed that discussions on mental states enhance younger children's understanding when focused on observable desires, while older children benefit from cognitive term discussions that delve into abstract mental states. Our findings align with this proposal, showing stronger links between mothers' use of cognitive terms and ToM in older children (4–5 years old). Given the abstract nature of cognitive terms (Bartsch & Wellman, 1995), these seem to make unique contributions, potentially to children's understanding of beliefs, which displayed more variability in our sample.

Our study extended previous research demonstrating a positive association between parents' and children's ToM (Devine & Hughes, 2019; Sabbagh & Seamans, 2008) by investigating the mediating role of mothers' mental state talk in this relationship. The results underscored the significant mediating role of mothers' mental state talk, specifically related to the notion of certainty. Cognitive terms associated with certainty highlight the subjective nature of mental states (Ruffman et al., 2002). Mothers with more advanced ToM skills may have a heightened ability to perceive the certainty levels of various situations, as they possess a deeper understanding of the subjectivity of mental states and are likely to express them more frequently. Such terms, which are linked to the understanding of beliefs (Brown et al., 1996; Moore et al., 1990), can aid children in distinguishing between their own beliefs and those of others.

The models in which mothers' ToM was the predictor, children's ToM assessed via both behavioral tasks and parent report was the outcome, and mothers' usage of certainty terms was the mediator yielded significance. However, the mediation model in which mothers' interest and curiosity in mental states was the predictor, mothers' use of cognitive terms at the word level was the mediator, and children's behavioral ToM was the outcome variable, was not significant. Considering that parental reflective functioning includes mentalizing within the parent-child relational context, it is plausible that other variables, such as parental responsiveness, not considered in this study may serve as potential mediators.

Strengths, limitations, future directions, and practical implications

The current study exhibits several strengths. Firstly, mothers' mental state talk was evaluated through story narration within the home environment, providing a naturalistic observation akin to daily life. We utilized a detailed coding scheme tailored to the Turkish language's unique structure, enabling detection of mental states at both word and conjugation levels, including desire and cognitive terms of certainty. Furthermore, we assessed children's ToM through both behavioral tasks and maternal reports, enhancing the ecological validity of our findings and offering a comprehensive view of ToM in real-life settings. Moreover, the online nature of the study enabled us to reach participants from various cities across Türkiye, allowing for the inclusion of diverse family characteristics, cultural backgrounds, and socioeconomic statuses.

The study also has several limitations. While the sample size was above the threshold determined by the power analysis, some nonsignificant relationships observed between the variables may still be due to the sample not being large enough. Recruiting participants from lower

socioeconomic backgrounds was challenging, possibly due to our study's announcement primarily on social media channels followed by parents from higher socioeconomic backgrounds. Including participants from a wider socioeconomic spectrum could offer more comprehensive insights into the potential influences of life conditions on our findings. Additionally, due to the cross-sectional design of the study, it is not feasible to discern the directionality of the relationships between the variables. This study took the first step in examining the mediating role of mothers' mental state talk in the relationship between mothers' socio-cognitive skills and children's ToM. While we used cross-sectional data to explore this indirect relationship, this study can serve as a foundation for future longitudinal research to generate hypotheses. Future studies should employ longitudinal designs to determine whether mothers' socio-cognitive skills and mental state talk measured at an earlier time point predict subsequent ToM skills in children, controlling for their earlier ToM skills. Furthermore, since the study contained many variables, it is important to note that the high number of correlations increases the probability of committing a Type I error. The online nature of the study can be perceived as a limitation; however, studies have shown that both 3- to 4-year-old and 6- to 10-year-old children exhibited expected patterns in the false belief task when tested online (Schidelko et al., 2021; Schidelko et al., 2022). Additionally, a meta-analysis by Chuey et al. (2024) found no significant differences between online and in-person studies in developmental research. Lastly, in the current study we used the Reading the Mind in the Eyes Test (RMET) to assess mothers' ToM. There is an ongoing debate in the literature about whether the RMET only measures ToM or primarily assesses emotion recognition (Kittel et al., 2022; Oakley et al., 2016). However, RMET has been widely used, found to be reliable, and validated as a measure of ToM in adult populations (Ferguson & Austin, 2010; Fernández-Abascal et al., 2013; Greenberg et al., 2023; Meinhardt-Injac et al., 2020; Vellante et al., 2013; Yildirim et al., 2011). Additionally, it shows convergent validity with other ToM measures (Ferguson & Austin, 2010; Torralva et al., 2009; Vellante et al., 2013). We chose RMET not only for its relevance to our research aims but also because it is easier to administer in an online study format. Future studies might benefit from incorporating multiple tasks to capture a broader range of ToM abilities, including the understanding of cognitions, motives, emotions, and desires.

Our findings hold practical implications and suggest that increased exposure to certainty words from parents may aid children in distinguishing between actual events and individuals' thoughts or assumptions, thereby uniquely contributing to their ToM development. To translate these insights into action, educational programs and parenting workshops could integrate activities fostering the use of certainty-related mental state language. For instance, picture books incorporating characters making guesses about other characters' mental states could serve as an effective pedagogical strategy. This approach aligns with Vygotsky's sociocultural theory (Vygotsky, 1978), which emphasizes the importance of social interaction and guided learning in cognitive development. Similarly, building on Dunn (1999) argument regarding the role of pretend play in enhancing theory of mind skills, board games that require players to role-play characters, guess mental states, and make decisions based on their own and others' certainty levels can provide children with opportunities to practice understanding and differentiating between mental states, thereby improving their comprehension. Parent-child interactions involving games encouraging guessing characters' mental states could significantly contribute to children's mental state understanding. Building on the link between parent-child dialogues and children's social abilities (Black & Logan, 1995), daily routines of parents and children can be powerful tools for fostering children's understanding of mental states. Parents can transform daily routines like cooking or house cleaning into opportunities for

meaningful dialogue by asking questions that prompt their child to evaluate certainty levels. For example, a simple question like, “Where do you think your pajamas are—in the drawer or in your closet?” can turn an everyday task into an engaging activity that encourages the child to reflect on their own certainty. Furthermore, real-life situations provide valuable opportunities to discuss and reflect on both the child’s and others’ mental states. For instance, after a friend’s birthday party, parents might ask, “Why do you think your friend was feeling sad? What could have caused his sadness?” This encourages the child to consider and articulate their understanding of emotions and subjectivity of mental states.

While our research primarily addressed the proportion of mental state terms in mothers’ speech, future studies could broaden this scope to investigate the potential mediating role of parents’ elaborative and causal mental state discussions in the relationship between parents’ socio-cognitive abilities and children’s ToM. This is particularly significant considering potential variations that may emerge when focusing on causal/elaborate mental state talk compared to the proportion or frequency of mental state talk. Furthermore, our study exclusively concentrated on how mothers talk about mental states. To gain deeper insights, future research could explore scenarios involving both parents and children engaging in conversations about mental states. Such studies might provide a better understanding of how children’s traits, including their comprehension and discussion of mental states and vocabulary, influence parents’ discussions about mental states and the specific types of mental states they address.

Conclusion

In conclusion, this study demonstrated that mothers with advanced ToM skills used more certainty terms (e.g., perhaps) during book reading sessions with their children. This, in turn, was associated with higher ToM performance in the children. These findings suggest that mothers

with a better understanding of mental states can appreciate the subjectivity of these states. Consequently, they may emphasize this subjectivity in their conversations by mentioning certainty and uncertainty, thereby helping their children understand and differentiate their own mental states from those of others.

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CRediT authorship contribution statement

Nursena Koç: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Deniz Tahiroğlu:** Writing – review & editing, Methodology, Conceptualization. **Berna A. Uzundag:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that there are no conflicts of interest.

Data availability

The data are available upon request.

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Appendix

Table A1

The relationships between the demographics, maternal language input, and the study variables.

Variables	1	2	3	4	5	6	7
1. Child’s age (months)	–						
2. SES	–0.01	–					
3. Number of adults at home	–0.06	–0.17	–				
4. Number of older siblings	–0.02	–0.06	0.19	–			
5. Number of younger siblings	–0.08	–0.05	–0.07	–0.03	–		
6. Quality of maternal speech	0.05	0.37***	–0.28**	–0.24*	0.16	–	
7. Quantity of maternal speech	0.001	0.29**	–0.27*	–0.23*	0.20	0.96***	–
8. Behavioral ToM score	0.30**	0.01	0.09	0.04	0.05	0.09	0.04
9. Reported ToM score (CSUS)	0.09	0.25*	–0.04	–0.14	0.16	0.22*	0.17
10. PRF-Prementalization	0.04	–0.08	0.21*	0.13	–0.24*	–0.15	–0.16
11. PRF-Certainty about mental states	–0.001	–0.08	–0.16	–0.15	0.24	0.01	0.04
12. PRF-Interest and curiosity in mental states	–0.03	–0.02	–0.22*	–0.32**	0.14	0.24*	0.21
13. Mothers’ ToM	0.03	0.21*	0.07	0.04	–0.03	0.16	0.16
14. Total mental state talk (%)	–0.10	0.12	–0.01	0.01	0.05	0.37***	0.35***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. CSUS: Children’s Social Understanding Scale, PRF: Parental Reflective Functioning.

Table A2
Descriptive statistics for subcategories of mental state talk.

	M	SD	Min	Max
Perception words	4.8	1.6	1.8	10.4
Physiological words	0.6	0.3	0	1.4
Desire words	0.2	0.2	0	1
Desire terms-conjugation level	0.7	0.6	0	3.1
Total desire terms	0.9	0.7	0	3.1
Motivational words	0.2	0.2	0	0.9
Affective words	1.6	0.8	0	4.2
Cognitive words	1.2	0.7	0	3.6
Cognitive words of certainty	0.8	0.7	0	3.0
Cognitive terms of certainty-conjugation level	0.5	0.5	0	1.9
Total cognitive terms of certainty	1.3	0.9	0	3.6
Cognitive words of contrastives	0.5	0.4	0	1.3
Cognitive words of perspectives	0.2	0.3	0	1.3
Total cognitive terms	3.3	1.7	0	8.7

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