Running head: Mind-mindedness and ToM

Mind-Mindedness and Theory of Mind: Mediating Roles of Language and Perspectival

Symbolic Play

Elizabeth Meins, Charles Fernyhough, Bronia Arnott, Susan R. Leekam

and Marc de Rosnay

Abstract

Relations among indices of maternal mind-mindedness (appropriate and non-attuned mind-related comments) and children's (a) internal state vocabulary and perspectival symbolic play at 26 months (N=206), and (b) theory of mind (ToM) at 51 months (n=161) were investigated. Appropriate comments were positively associated with ToM, but were unrelated to internal state language and perspectival symbolic play. Non-attuned comments were negatively correlated with internal state language and perspectival symbolic play, but were unrelated to ToM. Path analyses indicated that the best fit model assumed (a) indirect links between non-attuned comments and ToM via children's perspectival symbolic play; (b) a direct link between appropriate comments and ToM, and (c) an indirect link between appropriate comments and ToM via children's concurrent receptive verbal ability.

Mind-Mindedness and Theory of Mind: Mediating Roles of Language and Perspectival

Symbolic Play

There is now an established literature on social- and interpersonal-related

individual differences in children's understanding of mind. In the two decades since

Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991) first highlighted how

children's family-based exposure to internal state talk relates to their later theory of mind

(ToM) performance, studies have continued to investigate relations between caregivers'

use of internal state language and children's understanding of mind (e.g., Ruffman, Slade,

& Crowe, 2002; Slaughter, Peterson, & Mackintosh, 2007; Symons, Peterson, Slaughter,

Roche, & Doyle, 2005). Research suggests that mothers' tendency to engage in internal

state talk is not driven solely by the child's own interest in or competence with mental

phenomena. For example, the facilitative effect of mothers' internal state talk on

children's ToM performance is maintained when children's own earlier language and

ToM abilities are controlled for; moreover, children's earlier ToM performance has been

found to be unrelated to mothers' later use of internal state talk (Ruffman et al., 2002).

Some studies suggest that mothers' use of a broad range of internal state talk is

positively associated with children's later ToM performance (Dunn et al., 1991; Ruffman

et al., 2002). In contrast, others highlight relations between specific types of internal state

talk and ToM. For example, in two small-scale studies, Slaughter et al. (2007) reported

that children's ToM performance was unrelated to mothers' simple descriptions of

characters' cognitive states and emotions during a book reading task. Only mothers'

explicit references to characters' thoughts and beliefs were positively associated with

ToM performance. Taumoepeau and Ruffman (2006, 2008) reported associations

between specific types of maternal internal state talk and children's emotion understanding. Mothers' desire-state talk at 15 months was positively associated with children's emotion understanding at 24 months, whereas it was mothers' think–know talk specifically in relation to their 24-month-olds' own cognitive states that predicted emotion understanding at 33 months. These findings make sense in light of the fact that infants acquire desire-related words before they talk about thoughts and knowledge (Bartsch & Wellman, 1995), and given the plausible assumption that internal state talk is more effective in promoting an understanding of mind when it is matched to those internal states of which the infant is already aware.

Taumoepeau and Ruffman (2006, 2008) assessed children's emotion understanding (specifically, their ability to match emotional expressions appropriately to either emotional situations or people's bodily orientations), rather than their performance on classic ToM tasks involving belief states. No conclusions can thus be drawn on whether mothers' use of particular mental state terms at specific points in the child's development has a similar facilitatory effect on children's understanding of belief states. Moreover, Taumoepeau and Ruffman assessed mothers' use of internal state language in the context of a picture-describing task, in which over half of the images depicted people expressing emotions, and Slaughter et al.'s (2007) measures of internal state talk were obtained from mothers' narrative accounts of a story involving deception. Thus, the explicit emotional or false belief content of these tasks may have inflated mothers' use of internal state language. Indeed, of the studies mentioned above on relations between caregiver internal state talk and children's understanding of mind, only Dunn et al. (1991)

assessed caregivers' use of internal state language during everyday, non-goal-oriented interactions.

Meins and colleagues have approached the relation between internal state talk and ToM somewhat differently, focusing on the construct of maternal *mind-mindedness*. Mind-mindedness is defined as caregivers' proclivity to treat their young children as individuals with minds of their own, and has been operationalized in terms of caregivers' tendency (a) to describe their pre-schoolers with reference to mentalistic characteristics (Meins et al., 1998), (b) to attribute meaning to infants' early non-word utterances (Meins, 1998), or (c) to comment appropriately on their infants' putative internal states during play interactions in the first year of life (Meins, Fernyhough, Fradley, & Tuckey, 2001).

Unlike studies that have addressed how mothers' general use of internal state language pertaining to any individual or event relates to children's understanding of mind, research on mind-mindedness has investigated how mothers' representations specifically of their children's internal states predict later ToM abilities. Both the preschool and infancy operationalizations of mind-mindedness have been found to relate to superior ToM performance. Meins et al. (1998) reported positive associations between mothers' tendency to describe their 3-year-olds in mentalistic terms and children's performance on ToM tasks at age 4. Positive associations have also been found between mothers' mind-mindedness during infant–mother interaction in the first year of life and children's ToM performance between 4 and 5 years (Meins et al., 2002, 2003).

There is thus compelling evidence that caregivers' use of internal state talk while interacting with their young children facilitates children's subsequent understanding of

mind. What is much less clear is precisely how caregivers' internal state talk achieves its observed facilitatory effect. The first aim of the study reported here was to investigate whether children's early representational abilities could help to explain any causal relation between maternal mind-mindedness in the first year of life and children's ToM performance. Meins et al. (2003) proposed that early mind-mindedness may facilitate the development of children's mentalizing abilities because, in accurately reading their infants' internal states, mothers provide children with a linguistic scaffold for acquiring an understanding of internal states and how they can be expressed through language. If this argument is correct, mind-mindedness should relate to children's acquisition of internal state language as well as to their ToM performance.

Meins et al.'s (2003) study did not include any assessment of children's early language, so previous research has not tested this hypothesis. However, there is evidence for a link between children's own internal state language and their ToM performance. Symons et al. (2005) reported positive concurrent associations between children's internal state discourse and ToM, and Ruffman et al. (2002) found that children's earlier use of internal state talk predicted their later performance on a battery of tasks assessing false belief and emotion understanding. Ruffman et al. used regression analyses to explore longitudinal predictors of children's ToM performance, but specific mediation models were not formally tested, precluding firm conclusions about precise developmental pathways linking mothers' internal state language, children's internal state language, and children's ToM. Of note, however, is the fact that Ruffman et al.'s findings highlight a facilitatory effect only for children's early use (at mean age 3) of internal state talk: a later assessment of internal state talk was unrelated to children's subsequent

understanding of mind. This suggests that precocity in acquiring internal state vocabulary may reflect children's corresponding precocity in acquisition of a representational ToM.

An alternative possibility is that mind-minded interactions predict children's later ToM abilities by facilitating children's early understanding of perspectival difference, rather than their acquisition of internal state language. Fernyhough (2008) has proposed that mind-mindedness has its effects on children's developing social cognition not through influencing the acquisition of mental-state concepts, but by presenting children with alternative appropriate perspectives on reality in such a way that they can be readily assimilated. This argument draws on evidence that exposure to perspective-shifting discourse contributes to improvements in ToM reasoning (e.g., Hale & Tager-Flusberg, 2003; Harris, 2005; Lohmann & Tomasello, 2003), and with findings that exposure to explicit metacognitive language is less important as a driving force in ToM development than situations in which children are specifically required to think about alternative perspectives (Peskin & Astington, 2004). On this view, caregivers' attunement to their infants' thoughts and feelings may help to foster children's understanding that different people hold different perspectives on the world. In support of this suggestion, Laranjo, Bernier, Meins, and Carlson (2010) reported that mothers' tendency to comment appropriately on their infants' internal states at age 12 months was positively associated with children's later (24 months) understanding that another person's preference could be at odds with their own.

Symbolic play is another context in which children's understanding of perspectival difference has been assessed. In order to engage in pretense, children need to understand that an aspect of reality can be 'taken' in different ways; from different

perspectives on the play scenario, a given object could represent any number of things (Hobson, 1993). Perspectives may differ between individuals, but individuals are also free to change their own perspectives during object-based pretense: the child may begin by using the pencil as a toothbrush, but then swap to using it as a comb. This change in object representation can be instigated independently by the child or in response to a comment from a playmate. For example, the play tasks used by Lewis and Boucher (1988) and Meins and Russell (1997) required children to act on an experimenter's suggestion as to how a junk object could be used within a symbolic play scenario (e.g., treating a plastic lunch box as a bath for a doll). Children were only given credit if they incorporated the experimenter's suggestion into their play, and thus the task did not assess children's underlying competence in symbolic play.

Meins et al. (1998) reported that children's ability to incorporate an experimenter's perspective into their symbolic play was positively associated with mothers' proclivity to describe their children with reference to their mental characteristics. In addition, collaborative symbolic play (and not solo symbolic play) has been identified as a predictor of children's ToM performance (Astington & Jenkins, 1995; Youngblade & Dunn, 1995), suggesting that children's willingness or ability to incorporate others' perspectives in the context of symbolic play may be one pathway via which children's social interactions relate to their later ToM performance.

There are thus a number of alternative possible pathways linking early maternal mind-mindedness and children's understanding of mind. Children's nascent internal state concepts (reflected in their internal state language) or their understanding of perspectival difference (reflected in their perspectival symbolic play) could be associated with mind-

mindedness and potentially mediate the relation between mind-mindedness and ToM. Alternatively, both internal state language and perspectival symbolic play could act as mediating variables. Moreover, it is possible that different aspects of mind-mindedness might be differentially associated with children's internal state language, perspectival symbolic play, and ToM.

The interaction-based assessment of mind-mindedness in the first year of life allows for a fine-grained investigation of how mothers' references to their infants' internal states during on-line interaction might facilitate children's understanding of mind. The mind-mindedness coding scheme distinguishes between comments that are appropriate interpretations of the infant's putative thoughts or feelings (appropriate mind-related comments), and those that appear to misrepresent the infant's likely internal state (non-attuned mind-related comments). Previous research has shown that mothers' scores for appropriate and non-attuned mind-related comments are unrelated (Meins et al., 2002), and appropriate comments occur five times more frequently than do non-attuned comments (Meins et al., 2003). Recent research also shows that the two mind-mindedness indices are associated with different aspects of obstetric history; appropriate comments were associated with planned conception and perception of the pregnancy as being easy, whereas non-attuned comments were related to mothers' feelings immediately after birth (Meins, Fernyhough, Arnott, Leekam, & Turner, 2011). Moreover, appropriate and non-attuned mind-related comments have been found to make independent contributions in predicting attachment security, with high versus low scores on the two mind-mindedness indices distinguishing between mothers of infants in the different insecure categories (Meins et al., 2012).

These findings suggest that early mind-mindedness is not a unidimensional construct, raising the possibility that each type of comment might make independent contributions to children's later understanding of mental phenomena. Supporting this view, Meins et al. (2002) reported that mothers' appropriate mind-related comments at age 6 months were positively correlated with children's ToM performance, accounting for 11% of the variance in ToM scores. In contrast, mothers' mind-related comments that were not attuned to their 6-month-olds' internal states did not predict children's later ToM performance.

In investigating predictive links between mind-mindedness and children's later internal state language, perspectival symbolic play, and ToM, the study reported here sought (a) to address an important question about the developmental pathways through which mind-mindedness relates to later ToM; and (b) to establish whether the same developmental relations were observed for both indices of mind-mindedness. Although null findings for the relation between non-attuned mind-related comments and children's later ToM were reported by Meins et al. (2002, 2003), this does not preclude the possibility that such comments may relate to children's early grasp of internal state language or perspectival symbolic play. For example, if Meins et al. (2003) are correct to argue that early mind-minded discourse acts as a linguistic scaffold for children's mentalizing abilities, having a mother who tends to misrepresent her infant's internal states might have a detrimental impact on the child's early acquisition of internal state language. Indeed, one could argue that such mislabelling of the infants' cognitive and affective states will impact more strongly on infants' acquisition of internal state language than will mothers' appropriate mind-related comments. Finally, it was

important to establish that any observed relations were specific to mothers' mind-mindedness in the first year of life rather than their more general responsive caregiving. To establish the specificity of this association, the study reported here accordingly included a measure of maternal sensitivity (Ainsworth, Bell, & Stayton, 1971, 1974).

In summary, the present study investigated whether both indices of early maternal mind-mindedness—appropriate and non-attuned mind-related comments—related to children's internal state language and perspectival symbolic play at age 2, and their ToM performance at age 4. We also explored whether children's early language or symbolic play mediated the relation between early mind-mindedness and children's ToM performance.

Method

Participants

Participants were 206 mothers and children (108 girls), who were recruited through local health care professionals and mother-and-baby groups. The vast majority of the mothers (203) were White. The Hollingshead Index (Hollingshead, 1975) showed that participants came from wide-ranging socioeconomic status (SES) backgrounds, with around half of the sample (n=90) falling into the lowest two Hollingshead categories (no post-16 education, unemployed, unskilled–menial, or semi-skilled–manual occupation). At the beginning of the study, maternal age was M=28.08 years, SD=5.48, range 16–41, and 86 (41.7%) infants were first-born.

At Phase 1, children were 8 months old (M=8.52, SD=0.48, range 7.0–10.2), at Phase 2 children were age 26 months (M=26.04, SD=0.86, range 24.1–28.9), and were age 51 months (M=51.53, SD=0.85, range 49.00–53.00) at Phase 3. All 206 infants

participated in the Phase 1 and 2 testing sessions, and 161 were followed up at age 51

months. Attrition was due to families either moving away from the area or being unable

to schedule convenient testing times. Compared with the families who were retained

throughout the study, those who failed to complete the Phase 3 testing did not differ with

respect to the mind-mindedness, age-2 language, and symbolic play variables, ts < 1.80,

ds < 0.31. However, families who dropped out of the study had lower SES scores than

those who completed all three phases, $t(204) = 3.98$, $p < .001$, $d = 0.70$. Nevertheless, the

Phase 3 sample remained socially diverse, with 39% of families falling into the low SES

group.

Overview of Testing Procedures

All of the testing phases were conducted in the University's developmental

laboratories. At Phase 1, maternal mind-mindedness and maternal sensitivity were

assessed from a free-play infant–mother interaction. Children's internal state language

and perspectival symbolic play were assessed at Phase 2. At the final testing phase,

children completed a battery of ToM tasks and their receptive verbal ability was assessed.

Phase 1: Maternal Mind-Mindedness

The mind-mindedness assessment formed part of a battery of measures in a

testing session that lasted approximately 1 hour. Mothers and their infants were filmed in

a 20-minute free play session, with the only instruction to mothers being to play with

their infants as they would do if they had a few spare minutes together at home. A range

of age-appropriate toys was available, and mothers were free to move around the room,

although every session began with the mother and child together on a play mat in the

center of the room. Mind-mindedness was coded using the procedures outlined by Meins

et al. (2001). Mothers' speech during the sessions was transcribed verbatim, and all comments which included an internal state term referring to the infant's mind or emotion (mind-related comments) were identified from the transcripts. Mind-related comments included references to wishes and desires, mental states (e.g., thoughts, knowledge, interests), mental processes (e.g., recognition, remembering, decision-making), emotions, and attempts to manipulate people's beliefs (e.g., joking, teasing). Comments where the mother "put words into her infant's mouth" so that her speech took the form of a dialogue were also classified as mind-related.

Each mind-related comment was then classed as appropriate or non-attuned by a researcher who was blind to all other measures. Appropriateness was assessed by watching the filmed interaction and using the verbatim transcript to identify all mind-related comments. A comment was classified as an appropriate mind-related comment if any of the following criteria were met: (a) the independent coder believed the mother's reading of her infant's mind to be accurate; (b) it linked the infant's current activity with related past or future events; or (c) it was a suggestion for a new activity after a lull in the interaction (e.g., "You'll like this new toy"). A comment was coded as non-attuned if: (a) the coder disagreed with the mother's reading of her infant's mind; (b) the comment referred to a past or future event that had no obvious relation to the infant's current activity; (c) the mother asked what the infant wanted to do, or commented that the infant wanted or preferred a different object or activity, when the infant was already actively engaged in an activity or was showing a clear preference for a particular object; or (d) the referent of the mother's comment was not clear. A second researcher, blind to all other

measures and to the hypotheses of the study, coded a randomly selected 25% of the

mother–infant interactions. Inter-rater agreement was κ = .70 (87% agreement).

In order to control for differences in maternal verbosity, scores for appropriate

mind-related comments and non-attuned mind-related comments were calculated as a

proportion of the mother's total number of comments made during the 20-minute session.

Phase 1: Maternal Sensitivity

Mothers' behavior during the free-play session was also assessed for maternal

sensitivity. A trained researcher who was blind to all other measures and to the study's

hypotheses scored sensitivity using Ainsworth et al.'s (1974) measure, which rates

general sensitivity and responsiveness on a 1–9 point scale, with five anchor points

between 'highly sensitive' (9) and 'highly insensitive' (1). A second trained, blind

researcher coded a randomly selected 25% of the sessions. (Note that these researchers

were not involved in coding mind-mindedness.) Inter-rater reliability (intra-class

correlation) was .83.

Phase 2: Infant Language

Mothers completed the MacArthur Communicative Development Inventory

(MCI; Fenson et al., 1993). Mothers are required to report on children's acquisition of 14

words relating to internal states. The MCI also assesses mothers' reports of their

children's general expressive language development. Children received a frequency score

for the number of internal state words they were reported to use, and for their non-

internal state vocabulary.

Phase 2: Perspectival Symbolic Play

Children's perspectival symbolic play was assessed using two tasks: the Test of Pretend Play (ToPP; Lewis & Boucher, 1997) and a structured task involving junk objects (Lewis & Boucher, 1988; Meins & Russell, 1997). The ToPP is a standardized assessment of children's symbolic play valid for use with children from 1 to 6 years. Two items from the ToPP were selected to assess absent object use (teddy has a drink) and property substitution (teddy is a bird). For each item children were provided with the necessary prop (in both cases a teddy bear) and allowed to engage in spontaneous symbolic play. The experimenter then asked the child to demonstrate a certain action with the prop (*show me how teddy has a drink* or *show me how teddy can be a bird*). The experimenter then modelled the action with the prop and encouraged the child to copy.

For the absent object item, the child received credit (a score of 1) if they demonstrated teddy taking a drink from an imaginary cup. For the property substitution item, children received credit (a score of 1) if they demonstrated teddy pretending to fly. Children could receive further credit (a score of 1) if they showed another example of either absent object use or property substitution at any time. Children received a total frequency score for the number of symbolic acts performed during the task.

The second play task involved junk objects (e.g., cardboard box, piece of aluminum foil) and two representational toys (a doll and a car) and was based on procedures used by Lewis and Boucher (1988) and Meins and Russell (1997). Children were given one of the toys paired with one of the junk objects and the experimenter asked the child, "What can you do with these?" (elicited play condition). If the child began to engage in a sequence of play, the experimenter asked him or her to explain what was

happening. When the sequence of play ended, or if the child did not engage in any play, the experimenter asked for a specific play sequence to be enacted (instructed condition). For example, for the car–cardboard box pair, the experimenter said, "Can you show me how the car drives into the garage?" The experimenter did not explicitly instruct the child to use the box as a garage; rather, she gave the child an open-ended suggestion of how the play materials might be construed (see Table 1).

Children's responses during the instructed play condition were scored using the criteria outlined in Table 1. All of the play sessions were scored by a researcher who was blind to all other measures and to the hypotheses of the study. Children received a score for the overall level of sophistication of play under the instructed condition, with potential scores ranging from 0 to 24. Scores in the instructed play condition indicated children's tendency to incorporate the experimenter's suggestion into their play and thus index their perspectival symbolic play. Inter-rater reliabilty (intra-class correlation) for the instructed condition was .78.

Phase 3: Theory of Mind

At 51 months, children completed a ToM battery based on Wellman and Liu (2004): (a) Diverse Beliefs task which assessed children's ability to recognize a belief that differed from their own and to predict the protagonist's behavior on the basis of this belief, (b) Knowledge Access task which assessed children's understanding that knowledge depends on previous access to crucial information, (c) Contents False Belief – Other task which assessed children's recognition that another person will predict the contents of a container on the basis of its outward appearance (potato chips) rather than its actual contents (a toy pig), (d) Contents False Belief – Self task which assessed

children's recognition of their own initial false belief regarding the unexpected contents of a container, (e) Explicit False Belief task which assessed children's ability to predict the protagonist's search behavior on the basis of what they are told about where he or she thinks the object is rather than where the object really is, and (f) Unexpected Transfer task which assessed children's ability to predict the protagonist's behavior on the basis of his or her false belief. The gender of the story protagonists matched the child's gender, and the order in which the tasks were presented was randomized and counterbalanced. Memory and reality control questions were used, and all control questions had to be passed in addition to the test question for the child to be credited with passing the individual task. Ten percent of children failed a control question across the six tasks. For each task that was passed, the child received 1 point, resulting in total possible scores ranging between 0 and 6.

Receptive Verbal Ability

Children's receptive verbal ability was assessed using the British Picture Vocabulary Scale II (BPVS; Dunn, Dunn, Whetton & Burley, 1997) at 51 months. Standardized BPVS scores were used in the analyses.

<div align="center">

Results

</div>

Descriptive Statistics and Preliminary Analyses

Descriptive statistics for all variables are shown in Table 2. Mind-mindedness and sensitivity data were not available for one participant due to a technical problem during Phase 1 recording. MCI data were available for 190 children; missing data were due to mothers failing to complete the MCI. Symbolic play data were available for 197 children;

nine children failed to complete the play assessments due to attention difficulties. Complete datasets across the three testing ages were available for 150 children.

Scores for non-attuned mind-related comments, internal state language, and ToPP were all positively skewed, and transformation did not improve the normality of their distributions. Non-parametric correlations yielded the same results as parametric correlations, and thus parametric correlations are reported for ease of interpreting effect sizes.

Scores on the ToPP and instructed condition of junk object play task were robustly positively correlated, $r(194) = 0.43$, $p < .001$. Scores on these two symbolic play measures were thus totalled to give a composite perspectival symbolic play score. Scores for this composite measure were normally distributed.

Cronbach's α for the ToM battery was .63, Although α was somewhat lower than the level generally accepted as indicating good internal reliability (.70), Pedhazur and Schmelkin (1991) advised that lower levels of α were acceptable when complete homogeneity is not expected across individual measures. The internal reliability of the ToM battery is in line with those reported in studies that have used similar ToM measures (Astington & Jenkins, 1999; Meins et al., 2002), in which internal reliabilities ranged between .50 and .80.

SES was positively associated with (a) maternal sensitivity, $r(203) = .30$, $p < .001$, (b) appropriate mind-related comments, $r(203) = .16$, $p < .05$, (c) children's perspectival symbolic play scores, $r(195) = .35$, $p < .001$, and (d) children's ToM scores, $r(161) = .20$, $p < .025$. SES was unrelated to non-attuned mind-related comments, $r(203) = -.05$, n.s., and children's internal state language, $r(190) = .09$, n.s.

Table 3 shows the correlation matrix for all variables. With regard to relations among the variables assessing infant–mother interaction at 8 months, replicating previous findings (Meins et al., 2001, 2003), (a) appropriate and non-attuned mind-related comments were unrelated, (b) maternal sensitivity was positively correlated with appropriate mind-related comments, and (c) maternal sensitivity was unrelated to non-attuned mind-related comments. (Note that these correlations were previously published in Meins et al. 2011, 2012.)

Relations between Maternal Sensitivity and Child Variables

As shown in Table 3, maternal sensitivity was positively associated with children's perspectival symbolic play scores, but was unrelated to internal state language and ToM scores. Once SES was controlled, maternal sensitivity was no longer related to children's play (see Table 3).

Relations between Appropriate Mind-Related Comments and Child Variables

As shown in Table 3, appropriate mind-related comments were unrelated to children's internal state language and perspectival symbolic play scores at age 26 months, but were positively correlated with ToM performance at 51 months. Mothers' tendency to comment appropriately on their infants' thoughts and feelings at 8 months was associated with better performance on a battery of ToM tasks at 51 months. The partial correlations presented in Table 3 show that this pattern of findings was maintained when SES was controlled.

Due to the robust positive correlation between appropriate mind-related comments and maternal sensitivity, we further partialled out sensitivity to explore whether the relation between appropriate comments and ToM was independent of

mothers' sensitivity. The correlation remained significant when both SES and sensitivity were controlled, $r(157) = .22$, $p < .01$.

Relations between Non-Attuned Mind-Related Comments and Child Variables

As shown in Table 3, non-attuned mind-related comments were negatively correlated with children's internal state language and their perspectival symbolic play scores at 26 months, but were unrelated to children's ToM scores. The negative relation between non-attuned comments and play remained once SES was partialled out, but the relation between non-attuned comments and internal state language was reduced to a non-significant trend ($p = .094$) when SES was controlled (see Table 3). When maternal sensitivity was added as an additional control variable, the same results were found ($r = -.26$, $p < .001$, and $r = -.12$, $p = .093$, respectively).

Pathways to Children's Theory of Mind

One aim of the present study was to investigate whether relations between the two indices of early mind-mindedness and children's later ToM performance were mediated by children's early internal state language and perspectival symbolic play. Path analyses were used to address this question. Path analysis requires that the variables used to test the model arise from a joint multivariate normal distribution, rather than requiring normal distribution of each individual variable. The normality of the multivariate distributions of the variables in the models reported below was assessed on the basis of joint multivariate kurtosis and skewness values. All were less than the critical value of 1.00, and thus joint multivariate normal distribution was assumed. However, given the non-normal distributions of two variables included in the path analyses (mothers' non-attuned mind-related comments, children's internal state language), we adopted the conservative

approach of reporting the Bollen-Stine bootstrap p-value for the overall model fit. This

bootstrapping approach is the preferred method for dealing with non-normality in path

analyses (Bollen & Stine, 1993). The p-values reported below for model fit are thus

calculated using the Bollen-Stine bootstrap method.

The path analyses used maximum likelihood estimation. Four criteria were used

to evaluate the fit of the different models: the χ^2 statistic, the adjusted goodness of fit

index (AGFI), the comparative fit index (CFI), and the root mean error square of

approximation (RMSEA). A model represents an adequate fit to the data if the following

criteria are met: (a) a non-significant result for the χ^2 test; (b) AGFI value above .90; (c)

CFI value above .95, and (d) RMSEA value below .08.

Model 1 assumed full mediation, with no direct paths between either mind-

mindedness variable and children's ToM. Due to the positive correlations shown in

Tables 3 and 4, the following paths were also in Model 1: (a) internal state language to

receptive verbal ability, (e) perspectival symbolic play to receptive verbal ability, and (f)

receptive verbal ability scores to ToM. Model 1 was found to be a poor fit to the data,

$\chi^2(6) = 15.00$, $p = .020$, AGFI = .93, CFI = .78, RMSEA = .10.

Model 1 shows that the assumption that children's internal state language and

perspectival symbolic play mediate the relation between both indices of maternal mind-

mindedness and children's ToM did not fit the observed data. The correlational analyses

(see Tables 3 and 4) can be used to refine the mediational pathways outlined in the

Introduction. The correlations suggest that mediation may be more likely for the relation

between ToM and mothers' non-attuned mind-related comments than for the link

between ToM and appropriate mind-related comments. In contrast, appropriate mind-

related comments were not correlated with internal state language or perspectival

symbolic play. However, the correlational analyses showed a positive association

between mothers' appropriate mind-related comments and children's receptive verbal

ability at age 51 months. Thus, it is possible that children's receptive verbal ability might

mediate the relation between mothers' appropriate mind-related comments and children's

ToM performance.

These findings formed the basis of a second mediational model, Model 2, in

which (a) internal state language and perspectival symbolic play mediated the relation

between non-attuned mind-related comments and children's ToM, and (b) receptive

verbal ability mediated the relation between appropriate mind-related comments and

ToM. This model was found to be a good fit to the data, $\chi^2(8) = 9.89$, $p = .273$, AGFI =

.96, CFI = .95, RMSEA = .04. Models 1 and 2 had different degrees of freedom, enabling

comparisons between them to be made on the basis of change in χ^2. Although individual

fit indices all showed that Model 2 was a better fit compared with Model 1, the change in

χ^2 between these two models was not significant, $\chi^2\text{diff}(2) = 5.11$, n.s.

Given the positive correlation between appropriate mind-related comments and

ToM, we adapted Model 2 by adding a direct path between these variables to investigate

whether this would improve the model. Model 3 (see Figure 1) was found to be an

excellent fit to the data, $\chi^2(6) = 4.63$, $p = .642$, AGFI = .98, CFI = 1.00, RMSEA = .00.

Significant pathways are shown in Model 3. Comparing the models on the basis of

change in χ^2, Model 3 was found to be an improvement on Model 1, $\chi^2\text{diff}(1) = 10.37$, p

< .005, and Model 2, χ^2diff(1) = 5.26, p < .05. Individual fit indices were also higher for

Model 3 than for either of the other models.

There were two non-significant pathways in Model 3: (a) between non-attuned

mind-related comments and internal state language, and (b) between perspectival

symbolic play and ToM. The path analyses were re-run removing each of these pathways

in turn. Removing the path between non-attuned mind-related comments and internal

state language resulted in a non-significant increase in χ^2, showing that the inclusion of

this path did not result in improving the fit of the model, χ^2diff(1) = 1.56, n.s. In contrast,

removing the path between perspectival symbolic play and ToM resulted in a significant

increase in χ^2 for the model, χ^2diff(1) = 6.21, p < .025, showing that removing this

pathway resulted in a significantly worse fit to the data. Thus, in the remaining analyses,

the pathway between non-attuned mind-related comments and internal state language was

removed from the model, but that between perspectival symbolic play and ToM was

retained, resulting in Model 4 (see Figure 2), χ^2(7) = 6.19, p = .587, AGFI = .97, CFI =

1.00, RMSEA = .00.

Next, we investigated whether the relation between appropriate mind-related

comments and children's ToM was purely direct. The pathway between appropriate

mind-related comments and children's receptive verbal ability (the mediated pathway)

was removed from Model 4. The resulting Model 5 was a poor fit, χ^2(8) = 16.05, p =

.042, AGFI = .95, CFI = .85, RMSEA = .07, suggesting that concurrent receptive verbal

ability partially mediated the relation between appropriate mind-related comments and

ToM.

Finally, given that relations with non-internal state language and the other variables were very similar to those for relations with internal state language (see Tables 3 and 4), we replaced the internal state language variable in Model 4 with children's non-internal state language to test whether the observed pathways were specific to children's early acquisition of internal state language. The resulting Model 6 was also a good fit to the data, $\chi^2(7) = 7.76$, $p = .354$, AGFI = .97, CFI = .98, RMSEA = .03. (Note that change in χ^2 between Model 4 and Model 6 could not be calculated because both have the same degrees of freedom.) This suggests that the observed developmental pathways between early language and later ToM hold for overall productive language, not only for acquisition of internal state language.

Discussion

The results of the study reported here extend previous research on links between mind-mindedness and children's social-cognitive development in a number of ways. Our findings suggest that the two indices of early mind-mindedness—appropriate and non-attuned mind-related comments—relate to different social-cognitive developmental outcomes in the child. Mothers' tendency to comment appropriately on their 8-month-olds' putative internal states was directly associated with children's ToM performance at age 4, but unrelated to children's acquisition of internal state language and their perspectival symbolic play at age 2. In contrast, mothers' non-attuned mind-related comments at age 8 months were negatively associated with internal state language and perspectival symbolic play, but unrelated to ToM. Higher scores for mothers' non-attuned mind-related comments at age 8 months were associated with smaller internal state vocabularies and lower levels of perspectival symbolic play at age 26 months.

However, the path analyses showed that the best fit model included a direct link only between non-attuned comments and perspectival symbolic play, and not between non-attuned comments and internal state language. These findings further highlight the multidimensional nature of the mind-mindedness construct.

Our main goal was to shed light on the potential mechanisms via which mothers' mind-mindedness in the first year of life might relate to children's understanding of mind in the preschool years. As discussed in the Introduction, Meins et al. (2003) suggested that appropriate mind-related comments might provide a linguistic scaffold for children's comprehension of internal states, which could in turn lead to the prediction that children's own acquisition of internal state language would mediate the relation between appropriate mind-related comments and ToM performance. We found no evidence to support this prediction. Moreover, replacing internal state language with a measure of children's non-internal state language in the final path analysis also resulted in a good fit to the data, suggesting that children's early language production in general, rather than their specific acquisition of internal state terms, predicts later ToM performance. This conclusion is in line with Ruffman et al.'s (2002) finding that children's earlier general language ability was more strongly related to subsequent ToM (*rs* between .57 and .60) than was their earlier mental state language (*rs* between .09 and .45).

We also considered whether a second variable—children's understanding of perspectival difference as reflected in their symbolic play—mediated the relation between maternal mind-mindedness and children's ToM. Mothers' non-attuned mind-related comments were negatively related to children's perspectival symbolic play, with perspectival symbolic play going on to predict later ToM performance. In contrast,

mothers' appropriate mind-related comments were not associated with children's perspectival symbolic play at age 2. Our findings thus support the notion that children's early perspectival symbolic play mediates the relation between maternal mind-mindedness and children's ToM performance. However, this relation appears to hold only for non-attuned mind-related comments, and not for appropriate mind-related comments.

The different developmental trajectories of appropriate versus non-attuned mind-related comments may help explain the somewhat complex findings in the extant literature with regard to the relation between mothers' internal state talk and children's ToM. For example, while some studies have found evidence for a positive association between ToM and mothers' general use of internal state talk (e.g., Dunn et al., 1991), others have reported facilitatory effects only for certain specific aspects of internal state talk (e.g., Slaughter et al., 2007). The present findings suggest that the actual content of internal state talk may not be the crucial factor; rather, ToM might be associated with mothers' tendency to tailor their internal-state talk to their children's current level of cognitive or emotional engagement with the world.

If children's internal state language and perspectival symbolic play cannot help to clarify the mechanisms via which appropriate (as opposed to non-attuned) mind-related comments facilitate children's later understanding of mind, how else might we account for the observed relation? The path analyses highlighted a potential mediating role for a variable that was not considered initially: children's receptive verbal ability at age 4. The model best fitting the longitudinal data assumed that (a) there was a direct link between appropriate mind-related comments and children's ToM, (b) the relation between non-

attuned mind-related comments and ToM was indirect and functioned via children's

perspectival symbolic play, and (c) there was an additional indirect link between

appropriate mind-related comments and ToM via children's receptive verbal ability at

age 4. Although the effect size for the positive relation between appropriate mind-related

comments at 8 months and children's receptive verbal ability at age 4 was modest (see

Table 3), the path analyses showed that the best fit model included a mediating path from

appropriate comments to ToM via receptive verbal ability.

It is interesting to note that appropriate mind-related comments were related to

later receptive verbal ability but not to children's language abilities at age 2, despite the

fact that the measures of children's early language were robustly positively correlated

with their receptive verbal ability at age 4. One potential explanation for these discrepant

relations between appropriate mind-related comments and children's early versus late

language is the fact that language was assessed in terms of expressive abilities at age 2

and receptive abilities at age 4. Successful performance on measures of receptive verbal

ability arguably requires flexibility in comprehending the meaning of the items. For

example, in standardized tests of receptive verbal ability such as the BPVS, the child has

to choose which of four pictures best matches the word spoken by the experimenter.

Several test items do not involve object labeling using nouns, focusing instead on

adjectives (e.g., wooden) and verbs (e.g., dancing, wrapping, smelling) that require the

child to process and contrast the pictures using different criteria to those involved in

straightforward object labeling. In particular, appropriate attribution of adjectives

arguably requires an understanding of the aspectuality of such labels: the fact that more

than one such label can be appropriate at the same time (Meins & Fernyhough, 2007).

In further investigating this proposal, future research could address whether mothers' appropriate mind-related comments are more strongly related to receptive verbal tasks which explicitly require perspective-taking than to those that also assess more basic object labeling. Children's ToM performance is known to be positively associated with their understanding of synonyms and sub- versus super-ordinate categories (Doherty & Perner, 1998; Perner, Stummer, Sprung, & Doherty, 2002) and their recognition that two different adjectives might be equally correct descriptions of a particular object (Meins & Fernyhough, 2007). These findings suggest that children's understanding of different perspectives in the context of ToM tasks generalizes to their ability to think flexibly about ways in which aspects of the world can be represented and described linguistically. It would thus be interesting to investigate relations between mothers' early use of appropriate mind-related comments and children's performance on such tasks in order to establish whether children's understanding of aspectuality mediates the relation between mothers' appropriate comments and children's ToM performance.

Children's early executive functioning is also a potential candidate for mediating the relation between appropriate mind-related comments and children's ToM. Executive function abilities have a protracted period of postnatal development (e.g., Gur et al., 2012), and there is increasing recognition that the child's early social environment is likely to impact on these abilities. Recent research suggests that mind-mindedness is one aspect of the social environment that predicts children's executive functioning. For example, Bernier and colleagues (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Bernier, Carlson, & Whipple, 2010) reported that mothers' appropriate mind-related comments in infancy were positively associated with children's subsequent performance

on executive function tasks. In addition, there is a well-established link between executive function and ToM abilities (e.g., Carlson & Moses, 2001). In Fernyhough's (2008) model, executive functioning and ToM are linked because both involve *dialogic thinking*, defined as the ability to operate with the internalized, semiotically mediated perspectives of others, which is in turn fostered by interactions with mind-minded others. Future research should thus further explore whether assessment of children's early executive function abilities can help to fill in the developmental picture concerning the observed link between mothers' appropriate mind-related comments and children's ToM.

As well as considering additional child-centered factors that may act as potential mediators of the relation between appropriate mind-related comments and children's ToM, it is also important to explore whether other aspects of maternal interaction play a mediational role. Meins et al. (2003) found no evidence that a later measure of mind-mindedness mediated the relation between appropriate mind-related comments in infancy and children's ToM performance, but research has not yet investigated relations with other aspects of mothers' interactional behavior. Mothers who tend to comment appropriately on their young infants' internal states may be more likely to scaffold their children's behavior in a psychologically attuned manner later in development. For example, Meins et al. (1998) reported a medium size positive correlation between mothers' mental descriptions of their children and their concurrent sensitivity in tutoring their child during a challenging construction task (Meins, 1997). Sensitivity was defined in terms of the mother's tendency to use feedback on her child's performance to alter the level of specificity of her instructions and interventions. It seems reasonable to predict that mothers who tend to comment appropriately on their infants' internal states during

the first year of life will be better able later in development to assess their children's basic ability on tasks, collaborate with them in achieving goals, and structure interactions in such a way to enhance children's sense of their own competence. Future research into the evolving dynamics of the mother–child relationship may thus help shed light on the mechanisms via which mothers' appropriate attunement to their infants' internal states predicts children's later understanding of mind.

References

Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1971). Individual differences in
    Strange Situation behavior of one year olds. In H. R. Schaffer (Ed.), *The origins of
    human social relations*. New York: Academic Press.

Ainsworth, M. D. S., Bell, S. M., & Stayton, D. J. (1974). Infant–mother attachment and
    social development: Socialisation as a product of reciprocal responsiveness to
    signals. In M. P. M. Richards (Ed.), *The introduction of the child into a social
    world* (pp. 99-135). London: Cambridge University Press.

Astington, J. W., & Jenkins, J. M. (1995). Theory of mind development and social
    understanding. *Cognition and Emotion, 9*, 151-165.

Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relation between
    language and theory of mind development. *Developmental Psychology, 35*, 1311-
    1320. DOI: 10.1037//0012-1649.35.5.1311

Bartsch, K., & Wellman, H. M. (1995). *Children talk about the mind.* New York: Oxford
    University Press.

Bernier, A., Carlson, S. M., Deschênes, M., & Matte-Gagné, C. (2012). Social factors in
    the development of early executive functioning: A closer look at the caregiving
    environment. *Developmental Science, 15*, 12-24. DOI: 10.1111/j.1467-
    7687.2011.01093.x

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-
    regulation: Early parenting precursors of young children's executive functioning.
    Child Development, 81, 326-339. DOI: 10.1111/j.1467-8624.2009.01397.x

Bollen, K. A., & Stine, R. A. (1993). Bootstrapping goodness-of-fit measures in

structural equation models. In K. A. Bollen & J. S. Long (Eds.), *Testing structural*

equation models. Newbury Park, CA: Sage Publications.

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and

children's theory of mind. *Child Development, 72*, 1032-1053. DOI: 10.1111/1467-

8624.00333

Doherty, M. J., & Perner, J. (1998). Metalinguistic awareness and theory of mind: Just

two words for the same thing? *Cognitive Development, 13*, 279-305. DOI:

10.1016/S0885-2014(98)90012-0

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. M. (1991). Young

children's understanding of other people's feelings and beliefs: Individual

differences and their antecedents. *Child Development, 62*, 1352-1366. DOI:

10.1111/j.1467-8624.1991.tb01610.x

Dunn , L. M., Dunn, L. M., Whetton, C., & Burley, J. (1997). *British Picture Vocabulary*

Scale (2nd edn.). Windsor, UK: NFER-Nelson.

Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, P., et al. (1993). *The*

MacArthur Communicative Development Inventories. San Diego, CA. Singular

Publishing Group.

Fernyhough, C. (2008). Getting Vygotskian about theory of mind: Mediation, dialogue,

and the development of social understanding. *Developmental Review, 28*, 225-262.

DOI: 10.1016/j.dr.2007.03.001

Gur, R. C., Richard, J., Calkins, M. E., Chiavacci, R., Hansen, J. A., Bilker, W. B., et al.

(2012). Age group and sex differences in performance on a computerized

neurocognitive battery in children age 8–21. *Neuropsychology, 26*, 251-265. DOI:

10.1037/a0026712

Hale, C. M., & Tager-Flusberg, H. (2003). The influence of language on theory of mind:

A training study. *Developmental Science, 6*, 346-359. DOI: 10.1111/1467-

7687.00289

Harris, P. L. (2005). Conversation, pretense, and theory of mind. In J. W. Astington & J.

A. Baird (eds.), *Why language matters for theory of mind* (pp. 70-83). Oxford, UK:

Oxford University Press.

Hobson, R. P. (1993). *Autism and the development of mind.* Hove: Lawrence Erlbaum

Associates.

Hollingshead, A. B. (1975). *Four Factor Index of Social Status*. New Haven, CT: Author.

Laranjo, J., Bernier, A., Meins, E., & Carlson, S. M. (2010). Early manifestations of

children's theory of mind: The roles of maternal mind-mindedness and infant

security of attachment. *Infancy, 15*, 300-323. DOI: 10.1111/j.1532-

7078.2009.00014.x

Lewis V., & Boucher, J. (1988). Spontaneous, instructed and elicited play in relatively

able autistic children. *British Journal of Developmental Psychology, 6*, 325-339.

Lewis V., & Boucher, J. (1997). *The Test of Pretend Play*. London: The Psychological

Corporation.

Lohmann, H., & Tomasello, M. (2003). The role of language in the development of false

belief understanding: A training study. *Child Development, 74*, 1130-1144. DOI:

10.1111/1467-8624.00597

Meins, E. (1997). Security of attachment and maternal tutoring strategies: Interaction within the zone of proximal development. *British Journal of Developmental Psychology*, *15,* 129-144.

Meins, E. (1998). The effects of security of attachment and maternal attribution of meaning on children's linguistic acquisitional style. *Infant Behavior and Development*, *21,* 237-252. DOI: 10.1016/S0163-6383(98)90004-2

Meins, E., & Fernyhough, C. (2007). Preschoolers' understanding of multiple orientations to reality: The adjectives task. *Cognitive Development, 22*, 289-297. DOI: 10.1016/j.cogdev.2006.10.008

Meins, E., Fernyhough, C., Arnott, B., Leekam, S. R., & Turner, M. (2011). Mother-versus infant-centered correlates of maternal mind-mindedness in the first year of life. *Infancy, 16*, 137-165. DOI: 10.1111/j.1532-7078.2010.00039.x

Meins, E., Fernyhough, C., de Rosnay, M., Arnott, B., Leekam, S. R., & Turner, M. (2012). Mind-mindedness as a multidimensional construct: Appropriate and non-attuned mind-related comments independently predict infant–mother attachment in a socially diverse sample. *Infancy*, 17, 393-415. DOI: 10.1111/j.1532-7078.2011.00087.x

Meins, E., Fernyhough, C., Fradley, E., & Tuckey, M. (2001). Rethinking maternal sensitivity: Mothers' comments on infants' mental processes predict security of attachment at 12 months. *Journal of Child Psychology and Psychiatry*, *42*, 637-648. DOI: 10.1017/S0021963001007302

Meins, E., Fernyhough, C., Russell, J., & Clark-Carter, D. (1998). Security of attachment as a predictor of symbolic and mentalising abilities: A longitudinal study. *Social*

Development, *7*, 1-24. DOI: 10.1111/1467-9507.00047

Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development, 73*, 1715-1726. DOI: 10.1111/1467-8624.00501

Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2003). Pathways to understanding the mind: Construct validity and predictive validity of maternal mind-mindedness. *Child Development*, *74*, 1194 - 1211. DOI: 10.1111/1467-8624.00601

Meins, E., & Russell, J. (1997). Security and symbolic play: The relation between security of attachment and executive capacity. *British Journal of Developmental Psychology*, *15,* 63-76.

Pedhazur, E. J., & Schmelkin, L. P. (1991). *Measurement, design and analysis: An integrated approach*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Perner, J., Stummer, S., Sprung, M., & Doherty, M. (2002). Theory of mind finds its Piagetian perspective: Why alternative naming comes with understanding belief. *Cognitive Development, 17*, 1451-1472. DOI: 10.1016/S0885-2014(02)00127-2

Peskin, J., & Astington, J. W. (2004). The effects of adding metacognitive language to story texts. *Cognitive Development, 19*, 253-273. DOI: 10.1016/j.cogdev.2004.01.003

Ruffman, T., Slade, L., & Crowe, E. (2002). The relation between child and mothers' mental state language and theory-of-mind understanding. *Child Development, 73*, 734-751. DOI: 10.1111/1467-8624.00435

Slaughter, V., Peterson, C. C., & Mackintosh, E. (2007). Mind what mother says:

Narrative input and theory of mind in typical children and those on the autism

spectrum. *Child Development, 78*, 839-858. DOI: 10.1111/j.1467-

8624.2007.01036.x

Symons, D. K., Peterson, C., Slaughter, V., Roche, J., & Doyle, E. (2005). Theory of

mind and mental state discourse during book reading and story-telling tasks. *British

Journal of Developmental Psychology, 23*, 81-102. DOI:

10.1348/026151004x21080

Tamoepeau, M., & Ruffman, T. (2006). Mother and infant talk about mental states relates

to desire language and emotion understanding. *Child Development, 77*, 465-481.

DOI: 10.1111/j.1467-8624.2006.00882.x

Tamoepeau, M., & Ruffman, T. (2008). Stepping stones to others' minds: Maternal talk

relates to child mental state language understanding at 15, 24, and 33 months. *Child

Development, 79, 284-302*. DOI: 10.1111/j.1467-8624.2007.01126.x

Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development,

75*, 523-541. DOI: 10.1111/j.1467-8624.2004.00691.x

Youngblade, L. M., & Dunn, J. (1995). Individual differences in young children's

pretend play with mother and sibling: Links to relationships and understanding of

other people's feelings and beliefs. *Child Development, 66*, 1472-1492. DOI:

10.1111/j.1467-8624.1995.tb00946.x

Author Acknowledgements

Table 1

Scoring for Instructed Play Condition

Car with cardboard box 'garage'	0	pushes car along table
	1	box held upside down on table, car placed inside box
	2	box on table, correct orientation, car placed in box
	3	box on table, correct orientation, car pushed along table into box
	4	as 3, but child closes flap in appropriate orientation when car inside
Car with cardboard inner tube 'tunnel'	0	pushes car along table
	1	pushes car over the tube, or some other interaction between the two objects
	2	tube held upright, car dropped in
	3	tube on table on its side, car pushed along table into the tube
	4	as 3, but 'drives' car out
Car with cardboard 'road' and 'bridge'	0	plays with car or 'road' or 'bridge'
	1	some interaction between car and road or car and bridge
	2	puts road and bridge together but no interaction with car, or drives car underneath bridge
	3	drives car over bridge
	4	drives car along road up to bridge and over the top
Doll with lunch box 'bath'	0	plays with doll
	1	some interaction between doll and box
	2	places box in correct orientation
	3	places doll in box
	4	prepares doll for bath and places her in box, or splashing water on doll when in box

Doll with foil 'mirror'	0	plays with doll
	1	some interaction between doll and foil
	2	places doll on foil, face down
	3	lets doll look at herself in the mirror but with doll in non-attuned position (e.g., upside down)
	4	shows how doll can look face to face in mirror, doll in appropriate position
Doll with muffin case 'plate' and jar lid 'table'	0	plays with doll or 'table' or 'plate'
	1	some interaction between doll and table, or doll and plate
	2	puts plate on table but no involvement with doll; or puts doll at table but no involvement with plate; or some interaction of all three objects
	3	doll eats off plate
	4	doll eats off plate while sitting at table

Table 2

Descriptive Statistics for All Variables

	Mean	Range
Maternal Variables		
Total number of comments	219.22 (69.65)	48–395
Appropriate mind-related Comments (total)	11.94 (8.66)	0–42
Appropriate mind-related Comments (percentage)	5.34 (3.64)	0–19
Non-attuned mind-related Comments (total)	3.53 (4.56)	0–28
Non-attuned mind-related Comments (percentage)	1.59 (1.88)	0–9
Maternal sensitivity	5.64 (1.48)	2–9
Child Variables		
MCI internal state language	4.73 (3.95)	0–14
MCI non-internal state language	317.40 (160.90)	7–637
Test of Pretend Play	3.05 (2.77)	0–17
Instructed play	11.87 (5.12)	0–23
Theory of mind	3.03 (1.75)	0–6
Control variables		
Hollingshead Index	34.00 (14.03)	11–66

Standard deviations are in parentheses.

Table 3

Correlation Matrix for All Variables

	1	2	3	4	5	6	7	8
1. Appropriate MRC								
2. Non-attuned MRC	.07 **.11**							
3. Sensitivity	.39†† **.36††**	.04 **.09**						
4. Child ISL	.11 **.01**	-.19** **-.14**	.04 **.07**					
5. Child non-ISL	.13 **.02**	-.10 **-.10**	.12 **.04**	.88†† **.87††**				
6. Perspectival symbolic play	.10 **.04**	-.24†† **-.22††**	.21† **.08**	.13 **.08**	.19** **.14**			
7. Theory of mind	.24† **.21****	-.11 **-.10**	.09 **.04**	.38†† **.36††**	.35†† **.32††**	.24† **.17***		
8. Receptive verbal ability	.18* **.19***	-.11 **-.16**	.23† .10	.28†† **.26†**	.31†† **.30††**	.33†† **.19***	.40†† **.38††**	
9. Hollingshead (SES) score	.16*	-.05	.30††	.09	.09	.35††	.20*	.32††

$^{*}p < .05$; $^{**}p < .01$; $^{†}p < .005$; $^{††}p < .001$.

Note: MRC = mind-related comments; ISL = internal state language. Partial correlations (controlling for SES) are shown in bold.

Figure Captions

Figure 1. Model 3: Mediation via internal state language and perspectival symbolic play

for the relation between non-attuned mind-related comments and theory of mind; direct

and mediated (via receptive verbal ability) relations between appropriate mind-related

comments and theory of mind

Note: Standardized regression coefficients are shown on the individual pathways.

$^*p < .05$; $^{**}p < .01$; $^{†}p < .005$; $^{††}p < .001$.

Figure 2. Model 4: Mediation via perspectival symbolic play for the relation between

non-attuned mind-related comments and theory of mind; direct and mediated (via

receptive verbal ability) relations between appropriate mind-related comments and theory

of mind

Note: Standardized regression coefficients are shown on the individual pathways.

$^*p < .05$; $^{**}p < .01$; $^{†}p < .005$; $^{††}p < .001$.

Non-attuned MR comments

−.24†

Symbolic play

.11

−.11

.22†

ToM

Internal state language

.28††

.25††

.26††

Receptive verbal ability

.15*

Appropriate MR comments

.20†