MENTAL STATE LANGUAGE IN THE ZONE OF PROXIMAL DEVELOPMENT:

THE LONGITUDINAL ROLES OF ATTACHMENT AND MATERNAL LANGUAGE

by

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Acquiring the language to talk about mental states is an important milestone in early

child development (Bartsch & Wellman, 1995). Current theories of development attribute a

fundamental role in the development of mental state language to social interaction, whereby

children construct an understanding of mind within the context of social interactions (e.g.,

Carpendale & Lewis, 2004; de Rosnay & Hughes, 2006). Beginning in infancy, the

interactions between mother and child provide the child with opportunities to construct an

understanding of the world. In particular, talk about the mind within the context of the

mother-child relationship provides the opportunity to learn about mental states, which in

turn is instrumental in advancing socio-cognitive understanding (Howe, Rinaldi, & Recchia,

2010).

By the second year, children begin to show interest in their own feelings and the

feelings of others, although this early capacity appears to be dominated by understandings of

desires (i.e., wants and needs). Between the child's second and third year, he or she begins

to use mental state language, or words referring to internal states (most often desires and

beliefs), with increasing frequency and complexity (Bartsch and Wellman, 1995). Likely

related to an explosion of language in general and an increase in language about mental

states in particular, children in the third year begin to understand that other people can have

beliefs, desires, and intentions different from the child's (Repacholi & Gopnik, 1997).

Because the development of mental state understanding is hypothesized to begin

with affective attunement among parent-child dyads in the earliest days of life (Fonagy,

Steele, Steele, Moran, & Higgitt, 1991), it follows that maternal input is crucial to this

complex development. Specifically, it appears that the mother's use of mental state talk with the child is key (Brown & Dunn, 1991; Symons, Fossum, & Collins, 2006; Taumoepeau & Ruffman, 2008). However, exactly *how* maternal language impacts the child's mental state language remains unclear. One theory is that maternal mental state talk functions within Vygotsky's (1978) zone of proximal development (e.g., Symons et al., 2006; Taumoepeau & Ruffman, 2008). However, few studies have empirically tested whether or not maternal mental state talk meets Vygotskian criteria. The current study examines mother and child mental state language longitudinally through the toddler and preschool years and seeks to investigate the development of mental state talk within the context of the mother-child attachment relationship. Further, the study examines whether mothers scaffold children's mental state language development in a manner consistent with a Vygotskian framework.

Mental State Language and Socio-Cognitive Development

The ability to understand and use language to represent mental states is critical for social and cognitive development. Frequently, researchers use a child's mental state talk as an indicator of theory of mind development (i.e., a child who can use the words "want" and "think" to talk about the desires and beliefs of others must possess a capacity to understand that others *have* desires and beliefs and act upon these). Mental state language may even be a pre-cursor for theory of mind development (de Rosnay, Pons, Harris & Morrell, 2004; Ruffman, Slade, & Crowe, 2002). That is, acquiring the language to label, define, and differentiate between mental states is essential for the conceptual understanding of those mental states (Booth, Hall, Robison, & Kim, 1997; also see Smith, 1996).

Similar to other constructs for socio-cognitive understanding, such as reflective functioning (Fonagy & Target, 1997), mind-mindedness (Meins & Fernyhough, 1999), and

mindsight (Siegel, 1999), mental state talk is thought to be important for development across the lifespan. Difficulty reflecting on the mental functioning of self or others has been linked to a host of developmental and adult psychological problems, ranging from autism (Baron-Cohen, 1991) to conduct disorder in elementary-aged children (Ha, Sharp, & Goodyer, 2011) to borderline personality disorder in adults (Fonagy, Luyten, & Strathearn, 2011). Conversely, training individuals to think about the mind is thought to encourage self-regulation and emotional balance (Siegel & Shahmoon-Shanok, 2010). In addition, there is evidence that training children in the use of mental state language may facilitate theory-of-mind understanding (Lohmann & Tomasello, 2003).

The Development of Mental State Language

Mental state talk first makes an appearance in a child's language during the second year, but does not become a regular feature in children's speech until the preschool years. Even as mental state talk increases in frequency, it remains only a small portion of children's overall speech. For example, Rudek & Haden (2005) found that mental state talk accounted for only one percent of children's speech at 30 months and four percent at 42 months. Two patterns in early mental state language development are repeatedly demonstrated: that children talk about desires before beliefs and that children talk about their own mental state before the mental states of others.

Desire and Belief Language. The lag between desire and belief understanding in young children is a robust finding in socio-cognitive research (Harris, 1996). This is likely due at least in part to desires being more salient than beliefs (i.e., desires are more often accompanied by facial expression, actions, and tangible references than beliefs) (Taumoepeau & Ruffman, 2008). The gap between when children evidence an

understanding of desires (e.g., wants and needs) and an understanding of beliefs (e.g., thoughts and knowledge) is substantiated by studies suggesting that children correctly judge other people's desires before their beliefs (Wellman & Liu, 2004), that children remember their own desires before beliefs (Gopnik & Astington, 1988), and, most relevant to the current study, that children use desire language before belief language (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982; Taumoepeau & Ruffman, 2008).

Typically, early desire terms appear in language before age two (Dunn, Bretherton, & Munn, 1987) and belief terms sometime after a child's second birthday (Bretherton & Beeghly, 1982; Brown & Dunn, 1991; Shatz, Wellman, & Sibler, 1983). However, these early utterances of belief words are infrequent and likely do not refer to genuine mental state. Rather, these uses are simply repetition of adult language or conversational phrasing, such as, "you know what?" (Bretherton & Beeghly, 1982; Furrow, Moore, Davidson, & Chiasson, 1992; Shatz, et al., 1983). As children approach age three, this belief language begins to increase dramatically in frequency and appears to be more genuine in reference to mental state. The verbs "know" and "think" are the most widely used belief verbs (Furrow et al., 1992; Shatz et al., 1983), but not until around age four do children begin to differentiate between "think" and "know," demonstrating an understanding that "know" requires evidence but "think" does not (Johnson & Maratsos, 1977) or that "know" shows more certainty than *think* (Moore, Bryant & Furrow, 1989). This understanding that mental state terms can show degrees of certainty appears complete by age five. Not until around age five does belief talk become as frequent as desire talk (Bartsch & Wellman, 1995). Among school-age children, the word "know" becomes the most frequently produced

internal state word and continues to grow in complexity of meaning throughout older childhood (see Booth et al., 1997).

Self and Other Language. Piaget (1926) suggested that young children tend to interpret the world in terms of the self. In line with the egocentrism thought to characterize children in the preoperational period, toddler and preschool-aged children talk primarily about their own mental states. Children refer more to their own mental state than the mental states of others, but the frequency with which children refer to others' mental states increases during the preschool years. Brown and Dunn (1991) reported that at age two, only 4% of a child's mental state language referred to others, but by age three, this had increased to 25%. However, although reference to other people increases, it is unclear whether this increase is accompanied by a decrease in self-referencing mental state language or an increase in overall frequency of mental state language, with self-referencing talk continuing to dominate. Booth and colleagues (1997) found that children used internal state words to refer to self more than to others until 45 months of age and then used internal state words to refer to self and others equally at 51 and 57 months of age. Brown and Dunn (1991) found that frequency of reference to others' states increased significantly from age two to three, but frequency of reference to self did not decrease over this period. Similarly, Rudek and Haden (2005) found that children referred more to their own mental state than to that of their mothers at 30 and 42 months. Interestingly, children showed steeper increase in reference to their own mental state than in reference to their mother's mental state over time.

The emerging capacity to refer differentially to self and others likely is linked to the child's developing comprehension and use of pronouns. Pronouns may be of particular importance in language learning because of their frequency and regular co-occurrences with

verbs (Hockema & Smith, 2009). As Laakso & Smith (2007) point out, mental state verbs such as "want," "know," and "think" are especially challenging to young children because these verbs have no observable referents. Thus, understanding these terms requires the regular co-occurrences of pronouns (e.g., "*you* want"). In the researchers' corpus analysis of speech, the most frequent subjects and objects of parental speech to children were pronouns. "You" and "I" were the most frequent subjects, followed by "we." (Interestingly, the most frequent noun in parental child-directed speech that is not a pronoun is "mommy," which is less than 1/30th as frequent as "you.") Lewis and Ramsay (2004) found that self-recognition among children 15-, 18-, and 21-months-old was related to the use of personal pronouns such as "my" and "mine. Although children are able to produce personal pronouns by the middle of the second year, children may have comprehension of personal pronouns much earlier. For example, evidence suggests that 12-month-old infants are able to use possessive pronouns in the language of others as cues to what others know (Saylor, Ganea, & Vázquez, 2011). Thus, pronoun usage may have important connections to mental state language development.

Mother-Child Interactions

That the development of cognitive and language functioning requires social interaction is not a new idea (see Bretherton, Bates, Benigni, Camaionia, & Volterra, 1979 for review). More recent research holds that socio-cognitive development is constructed through social interactions. Given that the parent-child relationship is typically the first social relationship, and that a young child's social interactions come from a parent more than from any other figure, it is not surprising that researchers have given maternal input a special significance in early socio-cognitive development (de Rosnay and Hughes, 2006).

Indeed, Meins and colleagues (Meins et al., 2002) have suggested that maternal mental state language the appropriately reflects an infants' mental state is the "earliest known social predictor of mentalizing development" (p. 1723).

Maternal Mental State Language. Empirical research has established that maternal input plays a major role in socio-cognitive development in general and mental state language development in particular. One aspect of maternal input that appears to be of central importance is the mother's mental state language (Laranjo, Bernier, Meins, & Carlson, 2010; Meins et al., 2002; Ruffman, Slade, Devitt & Crowe, 2006; Taumoepeau & Ruffman, 2008). Notably, other aspects of maternal language, such as the frequency or complexity of speech in general, are not significantly related to children's mental state language (Booth et al., 1997; Rudek & Haden, 2005) or emotion understanding (Steele, Steele, Croft, & Fonagy, 1999), nor is general parenting style (Ruffman et al., 2006).

In general, research suggests that mothers who use mental state language have children who are more likely to use mental state language (Beeghly, Bretherton & Mervis, 1986; Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003; Rudek & Haden; 2005). Furrow and colleagues (1992) found that mothers' use of mental state language with two-year-old children predicted the child's use of mental state language at age three. In addition, Symons, Fossum, & Collins (2006) found significant associations between the child's desire talk (e.g. "want") at age two and mother's concurrent desire talk and between the child's cognitive talk (e.g., "think") and the mother's concurrent cognitive talk. Maternal mental state language is also related to other measures of children's socio-cognitive understanding, such as theory of mind (Adrian, Clemente, Villanueva, & Rieffe, 2005; Symons et al., 2006).

Laks, Beckwith, and Cohen (1990) suggest that mothers might use first person plural and second person pronouns to share in the child's egocentric world while introducing the perspectives of others. If this is true, exposure to and usage of the pronoun "we" would seem to hold particular importance in mental state talk between mothers and young children, yet only one study could be located that examines the role of the word "we" in mother-child discourse and later child development. The findings of a longitudinal study of preterm infants and their mothers conducted by Laks and colleagues (1990) suggest that the pronoun "we" is a significant aspect of mother-child mental state discourse. Mothers' use of "we" with their two-year-old children was significantly related to cognitive development at age eight. In addition, mothers' use of "we" was related to mothers' verbal responsiveness to the child. Of all of the mothers' personal pronouns, only the use of "we" was related to the verbal skill of the child at age two. Further, after controlling for the total amount of maternal talk, only the use of "we" was related to the child talking more and the child's use of personal pronouns. The mother's uses of first person plural pronouns ("we") and second person pronouns ("you"), but not first person singular pronouns ("I" and "me") were concurrently related to the child's development at age two. Further, among all maternal pronoun use at age two, only "we" was significantly related to cognitive development at age eight. Children's language ability alone at two years was not related to cognitive abilities at age eight. Rather, only for children whose mothers used "we" frequently did this link appear. Overall, this study lends support to the importance of the word "we" in building a shared experience in the mother-child dyad and warrants further study.

Because it is well documented that children begin using mental state language around age three, the majority of the research on children's mental state language focus on

preschool-aged children. However, if maternal language is key to this development, it is reasonable to assume that mother's mental state language to children is present before this age. Indeed, Bretherton and colleagues documented children using emotion words as young as 18 months old (Bretherton, McNew, & Beeghly-Smith, 1981) and possessing a large vocabulary of mental state terms by 28 months (Bretherton & Beeghly, 1982), suggesting it is important to examine mental state talk among very young children and their mothers. Meins and colleagues (Meins & Fernyhough, 1999; Meins et al., 2002) found that mother's appropriate use of mental state language with six-month-old infants predicted theory-of-mind at 45 and 48 months. Similarly, mother's mental state language with toddlers at 13, 20, and 28 months was related to the child's mental state language at 28 months (Beeghly, Bretherton & Mervis, 1986).

Attachment Security. There is a robust link between attachment and socio-cognitive development, including associations between attachment security and concurrent emotion understanding, (Fonagy, Redfern, & Charman, 1997; Ontai & Thompson, 2002; Raikes & Thompson, 2006; Repacholi & Trapolini, 2004), and between attachment security and later theory of mind (Meins, Fernyhough, Russell, & Clark-Carter, 1998; Steele et al., 1999). Relevant to the current study, attachment security has been linked to later mother-child emotional discourse (Laible, 2004; Ontai & Virmani, 2010) and the development of the child's mental state language (Lemche, Kreppner, Joraschky, & Klann-Delius, 2007; Mcquaid, Bigelow, McLaughlin, and MacLean, 2007).

Although it is unclear exactly *how* maternal mental state talk facilitates mental state language development in children, it stands to reason that children's mental state language develops over time amid repeated experiences with mental states in the mother-child

relationship. Thus, mother-child attachment security provides an important context for examining mental state language learning. Researchers give attachment a formative role in socio-emotional development, suggesting that security in attachment may provide the foundation for an organized understanding of mind and emotion (Steele et al., 1999) and that attachment insecurity could restrict mother-child communication, thus hindering socio-emotional development (Ontai & Thompson, 2002). Just as the security provided by the attachment relationship together with mother-child communication is thought to facilitate emotion understanding, attachment and mother-child communication should facilitate mental state language development.

In a secure attachment dyad, the caregiver and infant are in synchrony (Sroufe, 2005). The mother is sensitive and responsive to the child's needs and the child, in turn, uses the mother as a secure base from which to explore the world and to return for safety and comfort (Ainsworth, 1979). In an insecure attachment relationship, however, the mother and child may be out of sync. The mother may not be sensitive to the infants' needs or may respond inconsistently. The child develops a working model of the world based on inconsistent, insensitive, or unresponsive caregiving and adapts his or her behavior in response. This may happen in one of two ways. Repeated interactions in which the mother has not successfully interpreted and responded to her child's needs and the child has not been able to seek comfort from the caregiver lead to an insecure anxious-avoidant attachment pattern. In contrast, repeated interactions in which the mother has not responded in a consistent manner and the child has not been able to predict the mother's response lead to an insecure anxious-ambivalent attachment pattern.

Attachment security is likely to influence mother-child mental state language learning both directly and indirectly. In a discussion of cognition, communication, and attachment, Bretherton and colleagues (Bretherton, Bates, Benigni, Camaioni, & Volterra, 1979) make an important point: Research on mother-child interactions suggests that preverbal interactions scaffold language development. However, attachment theory adds to these findings by suggesting that the "harmoniousness of the relationship between mother and child contributes to the emergence of symbolic thought directly via mother-child interaction, but that it also contributes indirectly by enhancing the child's capacity to explore the environment on his or her own" (p. 224). Thus, characteristics of a secure attachment relationship, such as maternal sensitivity, responsivity, open communication, and warmth could *directly* facilitate talk about mental states by providing more exposure to and conversations about mental states in a safe and supportive environment (Ontai & Thompson, 2002). Studies suggest that secure mother-child dyads make more reference to emotion in conversation (Raikes and Thompson, 2006) and even discuss negative emotions more frequently (Laible, 2004). In addition, research suggests that mothers of securely attached children may be better teachers to their children (Meins, 1997). Perhaps mothers in a secure dyad are better equipped to teach their children *directly* about mental states (e.g., by providing sensitive, appropriate comments such as, "I think you are upset because you know it is time to leave").

Because a secure child can use the mother as a safe base from which to explore the world, the child can devote himself to learning about the environment, including mental states, in ways that a child who is stressed or unsure about the mother's availability and responsiveness cannot. Thus, characteristics of a secure attachment relationship could also

indirectly bolster mental state language learning. This corresponds with research suggesting that securely attached children may be better learners in general, as secure attachment is linked to language and cognitive development (Bretherton et al., 1979; van IJzendoorn, Dijkstra, & Bus, 1995). This could mean that children who are securely attached are better able to use social information, such as the mental state talk of other people, in learning to talk about mental states themselves.

The factors that appear to make maternal mental state language important for children's mental state learning, such as talk that is appropriate and genuine and the "mother's engagement with her child at a mental level" (Sharp, Fonagy, & Goodyer, 2006, p.197), are consistent with characteristics of a secure attachment relationship. It is likely that maternal mental state talk that accurately reflects the mental state being referenced and is pitched at a level appropriate to the developmental capacity of the child is a reflection of the larger context of the mother-child relationship. In line with this, it is necessary to examine mental state language in the larger context of the attachment relationship.

Questions regarding the stability of the association between attachment security and socio-cognitive development warrant attention. Socio-cognitive functioning, including mental state talk, requires complex internal representational abilities. For mental state talk, this requires the capacity to "hold in mind" (Olson, 1993, p. 297) the mental state of the self and others and comment on it (e.g., "Mommy thinks I am in my room"). Attachment theory holds that repeated interactions with the caregiver lead to the development of the internal working model, through which the developing child views the self, the caregiver, and the world around him (Bowlby, 1969/1982; Bretherton & Munholland, 2008). Thus, representational abilities, shaped by attachment experiences, would figure prominently into

socio-cognitive functioning. However, internal working models are not thought to be stable or well-established until children are four or five years old (Bowlby, 1980), leading researchers to question how attachment behavior can be related to socio-cognitive measures of internal representations in very young children (Meins et al., 2002; Ontai & Thompson, 2002). Rather than a consistent association between attachment and socio-cognitive development, then, researchers should anticipate that the association changes over time. As this is a formative time in attachment representations, the association between attachment and socio-cognitive development among two-year-olds may be different than the association among four-year-olds. Although there does not appear to be many longitudinal studies to examine this, Ontai and Thompson (2002) did not find a significant relationship between attachment and emotion-understanding among children at age three but did find a significant relationship at age five, when the internal working model is thought to be more stable.

Does Maternal Mental State Talk Change?

Although children's mental state language is known to increase in frequency and complexity over the toddler and preschool years, less is known about the course of the *mother's* mental state language during this time. It is reasonable to expect the mother's language to change with the child's as the mother facilitates and responds to the rapid development of the child's language. Laakso and Smith (2007) found that the most frequently used verb in parental speech to young children was "know," followed by "want" and "think." This is in line with the mental state words used most frequently by young children. What is of interest, however, is that among all parental usages of "want," 70% were with the subject "you" (parent referring to the child's wants). Among usages of "think," however, only 12.9% were with the subject "you," whereas 82.1% were with the

subject "I" (parent referring to their own thoughts). This has important implications for the reciprocal nature of parent-child mental state discourse. The authors point out that if a child merely reproduced aspects of the regularities of pronoun-verb co-occurrences, this would not make sense for the parent-child interaction, where the parent typically "knows" and the child typically "wants." The child who has a deeper understanding of these concepts should use belief words (e.g., "think" and "know") more to talk about others, especially parents, but use desire words (e.g., want) to talk about self. Thus, mother-child discourse should change in response to the child's emerging capacity to engage in conversation, but it should not be expected that mothers and children use the same words at the same rates.

Mothers may change their mental state language both in the type of language they are using and in whose mental state they are referencing. Brown and Dunn (1991) found that mother's did not increase the frequency of desire words with children from age two to three, but did increase the frequency of belief words. In addition, although mothers continue to refer most to the child's mental state, references to the mental states of others increases significantly from age two to age three (Brown & Dunn, 1991) and from 30 months to 42 months (Rudek & Haden, 2005). These findings, that mothers talk more about beliefs as children age and that mothers increase their references to the mental state of others as children age, are consistent with the known pattern of children's development of mental state language previously discussed.

In a Vygotskian framework, mothers would tailor their mental state language to fit within the child's zone of proximal development. That is, to challenge the child with something the child cannot understand on his own while not being so advanced as to frustrate the child. If mothers' mental state talk to their children were stable across the

child's first few years, a Vygotskian perspective would not be suitable for maternal mental state language. However, the findings that maternal language reflects changes in the child's mental state language suggest this may be an appropriate framework.

Maternal Input in a Vygotskian Framework

The influence of maternal input on children's socio-cognitive development and mental state language capacities is well established, but exactly *how* maternal input contributes to young children's socio-cognitive understanding is unclear. Maternal input, particularly the mother's mental state talk to the child, can be viewed in a Vygotskian framework. According to Vygotsky (1978), higher mental functions, such as language, are experienced first between the learner and another person (i.e., on the interpsychological plane) before being internalized within the learner (i.e., on the intrapsychological plane). This can be seen in interactions between adults and young children, whereby, for children developing language, the first experience with language is with a more experienced adult who directs the child's behavior (Astington, 1996). Later, the child begins to direct her own behavior and talks to herself aloud, which Vygotsky (1962) referred to as egocentric speech. Gradually, egocentric speech becomes internal speech and is no longer spoken aloud. Thus, for mental state language learning, exposure to maternal mental state talk does not just encourage the child's development of mental state talk, but is the mechanism by which mental state talk first occurs.

The interpsychological plane, where mental function occurs between two people, is essentially the zone of proximal development, one of Vygotsky's most widely known ideas. Vygotsky defined the zone of proximal development as, "the distance between the actual developmental level as determined by independent problem solving and the level of

potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). For mental state language learning, this would mean that mother's pitch their mental state talk to be more advanced than what the child understands independently but not so advanced as to confuse or frustrate the child. Similarly, mothers might "scaffold" children's mental state language in a similar way that mothers and other competent adults "scaffold" children's task-learning or general language development (for a more thorough discussion of scaffolding and working within a child's "region of sensitivity to instruction," see Wood, Bruner, & Ross, 1976; Wood & Middleton, 1975)

Examining the development of mental state language in a Vygotskian framework corresponds with the attachment perspective previously discussed. In a secure attachment relationship, the mother is sensitive and consistent in responding to her child, perceiving her child's needs and adjusting to meet them. She provides the appropriate feedback based on her attunement to her child. In a Vygotskian framework, the mother scaffolds the child's socio-cognitive development by fine-tuning her response to be appropriate to the level of the child's understanding. This requires sensitivity and flexibility on the mother's part (Wood & Middleton, 1975). To effectively work in the zone of proximal development, the mother must be attuned with what the child can be challenged to learn without becoming too frustrated. Thus, the influence of maternal mental state talk on the child's mental state talk is expected to function within the context of attachment. If the mother is sensitive and consistent in responding to child, as demonstrated in attachment security, it is expected that she is a better scaffolder. Thus, her child's mental state language would be more advanced. Van IJzendoorn and colleagues (1995) suggest that a secure attachment relationship

provides better conditions for language development, whereby secure parents are "better 'teachers'" and secure children are "better motivated 'students.'" Similarly, Meins (1997) theorized that the mother's ability to work within the zone of proximal development is related to the attachment relationship between mother and child. Meins suggested that mothers with secure attachment relationships with their children may make better tutors. Compared to insecure dyads, mothers of securely attached three-year-olds gave proportionately more positive and less negative feedback, were less likely to use physical intervention unless the child requested help, were more likely to intervene at the child's request, and were more likely to pitch their instructions at an appropriate level based on feedback from the child.

Although there has been substantial interest in investigating maternal talk within a Vygotskian framework (e.g., Brown & Dunn, 1991; Fernyhough, 1996; Symons et al., 2006; Zimmerman et al., 2009), only one study could be located that gives a detailed hypothesis of *how* maternal talk might fit Vygotsky's criteria. As part of a longitudinal study examining the relations between mother's internal state talk and young children's later internal state language and emotion understanding (Taumoepeau & Ruffman, 2006; Taumoepeau & Ruffman, 2008), Taumoepeau and Ruffman (2008) propose that two components are necessary for a Vygotskian framework to be appropriate. First, mothers should talk about desires first and then thoughts and knowledge, which is consistent with the established developmental timeline for understanding mental states. Second, mothers should talk about the child's mental states before talking about the mental states of others, which is consistent with children's propensity to think about the world in terms of themselves before others. Taumoepeau and Ruffman found support for Vygotskian criteria, reporting that maternal

talk about child's desires at 15 months predicted the child's mental state language and emotion understanding at 24 months. At 24 months, maternal talk about others' thoughts and knowledge predicted child's mental state language at 33 months. The authors conclude that a Vygotskian framework is suitable for explaining how maternal mental state language affects young children's socio-cognitive development. However, replication of this study is necessary.

The Current Study

The purpose of the current study is to examine the longitudinal development of mental state language in mother-child interactions within a Vygotskian framework. To this end, the study has three goals. The first goal is to describe the mental state language of both mothers and children at age 16, 26, 44, and 52 months. In line with established research on the trajectory of mental state language development in young children (e.g. Bretherton & Beeghly, 1982; Brown & Dunn, 1991), it is expected that mental state language will increase dramatically in children over this time period. However, although maternal mental state language has been identified as an important factor in children's socio-cognitive development, less is known about specific longitudinal characteristics. Therefore, the relative stability or changes in maternal mental state language as the child ages is of interest.

The second goal of the study is to examine associations in mental state language between mental state word types and between referents at each time point, across time, and between mother and child talk. In line with previous research suggesting the importance of the mother's use of mental state talk (Ruffman et al., 2002), maternal mental state language is expected to be associated with child mental state language. If maternal mental state fits the Vygotskian framework suggested by Taumoepeau & Ruffman (2008), then changes in

what type of mother talk predict child mental state language is important. At early time points, the mother's desire talk about the child should predict the child's mental state language. At later time points, the mother's think/know talk about others should predict the child's mental state language.

The third goal of the study is to examine changes in mother and child mental state language over time and the factors that influence this development. Also of interest is whether changes in maternal mental state language could reflect talk that fits within the zone of proximal development, as has been suggested by Vygotskian and more recent social-interaction theorists (e.g., Brown & Dunn, 1991; Fernyhough, 1996; Symons et al., 2006; Zimmerman et al., 2009). Following the Vygotskian criteria identified by Taumoepeau and Ruffman (2008), the current study has two expectations regarding changes in mental state language. First, in line with established research on the lag between desire and belief talk in children's talk (Harris, 1996), the proportion of maternal belief talk should increase with the child's age relative to desire talk. Second, consistent with established research suggesting that children talk about themselves before they talk about others (Brown & Dunn, 1991), the proportion of maternal talk about the mental state of others should increase with age relative to talk about the child's mental state. In addition, as it appears to be relatively unstudied, the current study will include mother and child's usage of the pronoun "we" as a reference to the mental state of the dyad. Finally, given that the parent-child attachment relationship is thought to provide an important context for socio-cognitive development (Lemche et al., 2007), attachment security is expected to influence mother-child mental state discourse.

The current study has strengths worth noting. First, to my knowledge, this would be only the second study to empirically test whether maternal mental state language fits within

a Vygotskian framework. Given that numerous studies suggest that maternal language might act as scaffolding, and given that social interaction theories point to early experiences with mental state language discourse as having a causal role in socio-cognitive development, empirically testing these claims is a necessary step.

The second strength of the current study is the time frame. That the study is longitudinal allows for more conclusions to be drawn regarding the association between mother and child mental state language. The toddler and preschool years are fundamental for emerging language skills, conceptual understanding, and attachment representations. It is possible that dramatic changes in mental state language can be captured over this period. In keeping with a developmental framework, early time points are especially important (de Rosnay & Hughes, 2006). Although the mental state language of three- to five year olds is well established, studies are not typically conducted with children earlier than this, given the rarity of mental state language before age three. However, de Rosnay and Hughes (2006) suggest that the earlier years may be of "disproportionate importance for children's developing socio-cognitive understanding " (p. 21). To date, it appears as if only a few studies (Meins & Fernyhough, 1999; Ontai & Virmani, 2010; Slaughter, Peterson, & Carpenter, 2009; Taumoepeau & Ruffman; 2008) have studied the mother's use of mental state talk with infants or young toddlers. In addition, although Taumoepeau and Ruffman (2006, 2008) found a longitudinal relation between mental state talk in mothers and children age 15-, 24-, and 33 months old, the study does not report on children beyond 33 months, which is a critical time for language and socio-cognitive development. The current study adds to the existing research by following the mental state language of mothers and children from an earlier age about which little is known about maternal mental state language

through a time during which there is a well-documented explosion in children's use of language and understanding of mind.

The third strength of the current study is the context of the mother-child discourse. Numerous studies have suggested that the role of mother-child discourse for socio-cognitive development depends on the context of the discourse (Howe et al., 2010; Laible, 2004), yet many conclusions regarding mental state language are drawn based on a small amount of assessment settings (primarily reminiscing tasks, picture descriptions or picture book reading). The current study can provide valuable information on mental state language during block tasks in which mothers are to assist their children in completing potentially frustrating tasks.

Method

Participants

Participants were taken from an archival dataset that consisted of 100 mother-child dyads participating in a longitudinal study of child development. Participants were originally recruited from the Bureau of Vital Statistics birth log. All families with first-born children born within a four-month time frame were sent information packets. Of the 803 families sent packets, 100 met the criteria for the original study. Criteria included two-parent, Caucasian, English-speaking families, having a child with no pre-, peri-, or post-natal complications, and parents with no auditory, visual, or motor problems. As part of the study, all children completed a hearing screening. The current study is comprised of 35 mothers and children who were still involved with the project when the children were 52 months old and whose data were complete.   A previous analysis demonstrated that children not continuing the project at the 44 month assessment were not significantly different from

those continuing in terms of attachment classification, Bayley Scales of Infant Development, or socioeconomic status (Mason, 1991).

Procedure

As part of the longitudinal study, assessments were conducted in multiple phases. The current study includes assessments conducted in six phases beginning when the child was 12 months old and ending when the child was 52 months old. At 12 months, infant attachment style was assessed using the Strange Situation. At 20 months, the child's communication development was assessed using the Revised Sequenced Inventory of Communication Development. General language abilities were assessed again with the Peabody Picture Vocabulary Test-Revised at 52 months. Mental state language of the mother and the child were assessed during mother-child block-building tasks conducted at 16 months, 26 months, 44 months, and 52 months of age.

Assessments and Scoring

Demographic Information. Demographic information was collected through parent-report as part of the intake forms during the first wave of assessments. In line with Page et al., (2010), control variables that have the potential for affecting mental state language were included in the analysis. These variables include maternal age, maternal education level, and child gender.

Language Abilities. General language abilities were assessed with the Revised Sequenced Inventory of Communication Development (SICD-R) when the child was 20 months old and with the Peabody Picture Vocabulary Test-Revised (PPVT-R) when the child was 52 months old.

SICD-R. Communication development was assessed with the SICD-R when the child was 20 months old. The SICD-R is a standardized test that utilizes both parent report and observed behaviors to quantify communication skills in children (Hedrick, Prather, & Tobin, 1984). The test is administered individually to a child by a two-person team: the examiner, who administers the test items, and the recorder, who documents the child's progress in detail. The test takes approximately 30 to 75 minutes to administer. The SICD-R is comprised of two scales, the Receptive Scale and the Expressive Scale. The Receptive Scale tests the child's sound and speech discrimination, awareness, and understanding, such as turning when his or her name is called. The Expressive Scale tests imitating, initiating, and responding behavior, as well as length and grammatical and syntactic structures of utterances, such as using pronouns. The SICD-R items are grouped into 4-month blocks between 4 and 48 months, allowing for the determination of a Receptive Communication Age and an Expressive Communication Age.

PPVT-R. Receptive vocabulary was assessed with the PPVT-R when the child was 52 months old. The PPVT-R is an individually administered, standardized test that takes approximately 15 minutes to administer (Dunn & Dunn, 1981). The assessment consists of a series of pictures and requires no reading or writing. The PPVT-R can be used with individuals from age three through adulthood.

Attachment Style. Mothers and children participated in Ainsworth's Strange Situation (Ainsworth, Blehr, Waters, & Wall, 1978) when the child was 12 months old. The Strange Situation is a widely used and well-validated (Solomon & George, 2008) measure of infant attachment that assesses a young child's behavior when reunited with his or her attachment figure after a brief separation. Specifically, the Strange Situation scores the child

on proximity seeking, contact maintaining, avoidance, and resistance during the reunion episodes. Children's attachment was classified into three categories: secure (B), insecure-avoidant (A), and insecure-ambivalent (C).

Mental State Language. As part of an assessment on mother-child interactions (Heckhausen, 1984), mothers and children participated in age-appropriate problem-solving block tasks at four time points. The assessments were conducted in a laboratory setting and videotaped for further study. Block tasks were chosen for mental state language assessment because they provide a context for "collaborative communication" between the child and the more skilled mother. Tasks that require such collaborative communication are thought to be key in facilitating socio-cognitive development (Carpendale & Lewis, 2004).

Infant Block Tasks. Mothers and children completed the infant block tasks when the child was 16 months old. The infant tasks consisted of two problem-solving block tasks, a tower-building task and a shape-sorting task. Each task consisted of three levels of increasing difficulty. The entire session took approximately 30 minutes, with each problem-solving task lasting approximately 5-10 minutes.

Mothers and children sat on the floor and engaged in a brief free-play session for warm-up. For the first level of the tower task, the researcher entered the room with four blocks of equal size, gave instructions to the mother, and left the room. The mother was instructed to assist her child in stacking the blocks in whatever way was typical. The researcher brought in the next level of blocks when the child had reached the criteria set by protocol. The shape-sorting task was similar in procedure and instructions, but the objective was to fit the various shapes into the appropriate opening of the shape-sorter. A complete overview of the task can be found in Appendix A.

Toddler Block Tasks. The toddler block tasks were completed when the child was 26 months old. The tasks consisted of the two highest levels of the 16-month tower-building tasks: six blocks of graduated size and eight nested blocks. Procedure and instructions were similar to the 16-month task and can be found in Appendix A.

Preschool Block Tasks (I and II). The preschool block tasks were completed when the child was 44 months old and again when the child was 52 months old. The tasks are based on an assessment used by Wilkinson (1982), made up of five problems in which children attempt to stack different combinations of wooden blocks onto a rod. The tasks took approximately 20 minutes and were similar in instructions and procedure to the preceding block tasks. A complete overview can be found in Appendix A.

Mental State Language Scoring. The content of each mother-child block-task interactions were transcribed verbatim. Useages of the terms "want," "think," and "know," in addition to variations of these three terms (e.g. "wanna," "thought," and "knowed") were tallied for both mothers and children during the videotaped block task at each of the four time points. The decision to focus on these three terms was primarily based on Bartsch and Wellman (1995), who, based on findings that "want" accounts for 97% of desire words and that "think" and "know" account for 96% of belief words (26% and 70%, respectively) among children sampled longitudinally from 18 months to six years of age, suggested that future investigators could draw many important conclusions by limiting their analyses to these three terms. In addition, Furrow and colleagues (1992) reported that "think" and "know" accounted for 75% of all mental terms used by mothers and over 80% used by children at either age two or three. In line with previous research suggesting that most of parents' use of "think" and "know" refers to genuine mental state (Bartsch & Wellman,

1995; Booth et al., 1997) and that all use of mental state talk could be valuable for the child to hear (Jenkins et al., 2003; Taumoepeau and Ruffman, 2008), all use of mental state words were included, not just "genuine" terms. However, immediate repetitions (e.g., "I want…I want…I want a tall tower") were excluded.

RESULTS

The goals of the current study were to describe mental state language in mother-child dyads, to examine associations between mother and child mental state language, and to assess changes in mental state language over time. Results will address these goals in three sections. In the first section, descriptive statistics for key measures of the sample will be presented. The second section will examine correlations between mental state word types and between referents at each time point, across time, and between mother and child talk. The third section will address how mental state talk changes over time and the factors that influence this development.

Because of distorted audio on recorded interactions, the mental state talk of one dyad at Time 1 and another dyad at Time 2 was not useable. For both of these cases, the dyads' interactions at the other three time points were included in descriptive statistics (Part I) and correlations (Part II). However, only dyads with complete mental state data at all four time ($n = 33$) points were included in the analysis of variance (Part III).

Part I: Descriptive Statistics

Language Abilities. Age equivalency scores on the SICD-R (assessed at 20 months old) and the PPVT-R (assessed at 52 months) suggest that, in general, children in the current sample are at or above expected language capacities for their age (see Table 1). On the whole, children's general language abilities were unrelated to mother's age, mother's

education, child's gender, or attachment security. Pearson correlations demonstrated that

mother's age at Time 1 ($M = 30.0$, $SD = 3.42$) was not associated with the child's age

equivalence scores on the SICD-R on the PPVT-R. In addition, a one-way analysis of

variance demonstrated that children's language on the SICD-R or the PPVT-R was not

significantly different depending on mother's education level. Finally, independent sample t-

tests showed no significant difference in language abilities for males and females or for

securely and insecurely attached children.

Table 1
Means and Standard Deviations for Child Language Measures

	Age at Assessment	*Mean*	*SD*
SICD-R *(n = 30)*	20 months		
RCA		20.53	3.60
ECA		21.33	4.25
PPVT-R age (*n* = 35)	52 months	63.00	9.36

Note: Means refer to the child's age equivalent in months.

Attachment Security. Overall, 27 (77.1%) out of the 35 children were classified as

securely attached on the Strange Situation. Because of the small number of children

classified insecure avoidant (*n* = 4) and insecure ambivalent (*n* = 4), the two insecure sub-

classifications were collapsed and will be treated as one group in all analyses. Overall,

attachment security did not differ based on any of the demographic variables assessed. An

independent sample t-test showed no significant difference in attachment security by

mother's age. Further, Pearson chi-squares showed no significant difference in attachment

security by mother's education or by child's gender.

Mental State Talk. As seen in Table 2, none of the children used mental state

language at 16 months of age (Time 1). However, all of the mothers used mental state

language with children age 16 months, suggesting that children were exposed to mental state talk in discourse prior to active participation in the conversation.

The number of children who used mental state talk increases from 16 months to 26 months and again from 26 months to 44 months. Unexpectedly, fewer children used mental state talk at 52 months than at 44 months. However, the number of children using more sophisticated mental state talk, such as the word "know" and talk that references the mental state of other people, increases from 26 months to 44 months to 52 months. A more detailed examination of changes in word type and referent will be provided in Part III of the analysis.

The number of mothers who used mental state talk at each time period is more consistent, with the majority of mothers engaging in mental state talk with children at each age (see Table 2). Within the two dyads in which mothers did not engage in any mental state talk at Time 2, the child did not use any mental state talk for the duration of the interaction, either. Similarly, within the two dyads in which mothers did not engage in mental state talk at Time 3, one of the children did not use any mental state talk, either. Again at Time 4, in both cases in which the mother did not engage in any mental state talk at Time 4, the child did not engage in mental state talk, either. Note that the dyads that did not engage in mental state talk were different at each time period, except for one dyad that did not use mental state language at either Time 3 or Time 4.

Table 2
Frequency of Mothers and Children Using Mental State Talk

	Time 1 16 months (*n* = 34)	Time 2 26 months (*n* = 34)	Time 3 44 months (*n* = 35)	Time 4 52 months (*n* = 35)
Total Mothers	**34**	**32**	**33**	**33**
Type				
Want	34	30	32	29
Know	24	11	21	14
Think	21	23	31	28
Referent				
Child	34	30	33	28
Self	25	24	24	25
Dyad	7	2	13	11
Other	7	6	12	8
Total Children	**0**	**11**	**28**	**24**
Type				
Want	0	10	27	19
Know	0	1	10	13
Think	0	0	11	9
Referent				
Self	0	11	27	20
Mother	0	0	4	7
Dyad	0	0	1	2
Other	0	0	1	2

For both mothers and children, mental state talk only accounted for a small proportion of overall speech (see Table 3). As expected, mental state talk made up a greater proportion of overall speech for mothers than for children at each time point. Also of interest, the proportion of speech made up by mental state talk increased over time for both mothers and children.

Table 3
Mental State Talk as a Proportion of Overall Talk

	Time 1 16 months (*n* = 34)	Time 2 26 months (*n* = 34)	Time 3 44 months (*n* = 35)	Time 4 52 months (*n* = 35)
Mothers	.012	.012	.018	.022
Children	.000	.005	.014	.020

Part II: Correlations in Mental State Talk

Pearson product-moment correlation coefficients were computed to examine associations between word types (want, know, think) and between referents (child, mother, dyad, other) for the child and for the mother at each time point, across time, and between mother and child talk. Correlations involving children's mental state talk at Time 1 and Time 2 are limited by the fact that children at Time 1 (16 months) did not use any mental state talk and that children at Time 2 (26 months) did not use all types of mental state talk. In addition, because the block tasks were not timed, mother-child interactions were of varying durations. To account for differences in total word use that could be due to the different durations in interactions, mental state useage rates were computed (word totals/minutes) for all word counts (e.g., the number of times the mother says "want" divided by the duration of the mother-child interaction). Rates of word use over time will be used in all subsequent analyses.

Mother's Word Type. Pearson correlations were used to examine associations between mother's word types within each of the four time points and across time.

Within Time. Mother's word types were largely uncorrelated within each time point. In interactions with children at age 16, 26, and 44 months, no significant correlations were found between mother's uses of want, know, and think. In interactions with children at age 52 months, however, significant correlations were found between mother's use of "think" and use of "want" ($r = .348$, $p = .041$) and between mother's use of "think" and "know" ($r = .457$, $p = .006$).

Across Time. Pearson correlations were used to examine associations in mother's word type across time. Mother's word type over time reveals several significant associations

(see Table 4). Overall, it appears that while word types within any time point are largely uncorrelated, there are significant correlations in mother's word type between time points. Part III of the analysis will address longitudinal changes in maternal word type.

Child's Word Type. Pearson correlations were used to examine associations between word types at each of the three time points in which children used mental state language (26 months, 44 months, and 52 months) and across time.

Within Time. Overall, few correlations were found between children's use of want, know, and think within each time point. At 26 months, at which point none of the children used the word "think," no associations were found between "want" and "know." At 44 months, only the correlation between children's use of "know" and "think" was significant ($r = .385, p = .022$). At 52 months, only the association between children's use of "want" and "know" was significant ($r = .355, p = .036$).

Across Time. Pearson correlations were used to examine associations in word type across time for the three time points in which children used mental state language. Overall, children's word type at 26 months was not correlated with word type at later time points. However, significant associations were found between children's word type at 44 months and 52 months. Specifically, children's use of "know" was significantly correlated at 44 months and 52 months ($r = .470, p = .004$). In addition, children's use of "want" at 44 months was significantly correlated with use of "think" at 52 months ($r = .335, p = .049$).

Mother-Child Word Type. Pearson product moment correlations were computed to examine associations between mother and child mental state talk at each time point and across time.

Within Time. There appear to be few correlations between mother and child mental state word type within each time point. At Time 1, children did not use mental state language. Thus, mother-child word type correlations could not be calculated. At Time 2, only mothers' and children's uses of "want" are significantly correlated ($r = .507$, $p = .002$). At Time 3 and again at Time 4, the type of mother and child mental state talk was unrelated.

Across Time. Pearson correlations between mother and child mental state talk across time reveal few significant associations. The mother's word type at Time 1 was not significantly correlated with children's word type at Time 2, Time 3, or Time 4. The mother's word type at Time 2 was largely uncorrelated with the child's language at other time points with the exception of two marginally significant correlations with the child's word type at Type 3. Specifically, mother's use of "think" at 26 months was correlated with children's use of "think" ($r = .336$, $p = .052$) and children's use of "know" ($r = .329$, $p = .057$) at 44 months.

Turning to the mother's word type at Time 3, use of "know" was significantly correlated with children's use of "know" at Time 2 ($r = .453$, $p = .007$) and negatively correlated with children's use of "want" at Time 4 ($r = -.334$, $p = .05$). No other significant correlations were found.

Finally, examining mother's word type at Time 4 reveals one association between mother's belief talk and children's earlier mental state talk such that mother's use of "know" at Time 4 was significantly correlated with children's use of "know" at Time 2 ($r = .340$, $p = .049$).

Table 4
Pearson Correlations for Mother's Word Type Over Time

		Time 1 (n = 34)			Time 2 (n = 34)			Time 3 (n = 35)			Time 4 (n = 35)		
		Want	Know	Think	Want	Know	Think	Want	Know	Think	Want	Know	Think
Time 1	Want	--											
	Know	-.03	--										
	Think	.16	.20	--									
Time 2	Want	.09	.27	.03	--								
	Know	.34	.00	.10	.32	--							
	Think	.18	.10	.17	.05	.05	--						
Time 3	Want	.05	.06	.08	.01	.11	-.11	--					
	Know	.15	.14	.00	-.06	-.02	.02	-.01	--				
	Think	.12	.17	.38*	.27	.00	.61*	.18	.17	--			
Time 4	Want	-.08	.45**	-.02	.15	.11	.05	.38*	-.02	.18	--		
	Know	.43*	.23	-.01	.17	.39*	-.18	.21	.04	-.14	.26	--	
	Think	.29	.23	.11	.03	.09	.35*	.15	.18	.48*	.35*	.46**	--

*p<.05, **p<.01

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Mother's Referent. Pearson product correlations were used to examine associations in the mother's referent (talk referencing the mental state of the child, self, dyad, or a third person) within each time point and across time.

Within Time. No correlations were found between mother's referents at 16 months. At 26 months, the only significant correlation was between the rate at which mother's referenced the child's mental state and the rate at which mother's referenced their own mental state ($r = .361$, $p = .036$). At 44 months, significant correlations were found between the rate at which mother's referenced the mental state of a third person and (a) the rate at which mother's referenced the mental state of the child ($r = .362$, $p = .032$) and (b) the rate at which mother's referenced the mental state of the dyad ($r = .366$, $p = .031$). Finally, at 52 months, a significant correlation was found between the rates at which mother's referenced the mental state of the child and themself ($r = .366$, $p = .031$).

Across Time. Similar to patterns in mother's word type, Pearson correlations reveal several significant associations in mother's referent between time points (see Table 5). Overall, the pattern of correlations suggests that, although mother's referents within each time point are not correlated, there are significant associations across time, especially between Time 3 and Time 4. As with word type, the pattern of correlations suggests that mother's referent is more stable at later time points than at early time points. Longitudinal characteristics of maternal referents will be addressed further in Part III.

Child's Referent. Pearson correlations were used to examine associations in the child's mental state referent (talk referring to the mental state of the mother, self, dyad, or a third person) at each time point and across time. Correlations involving children's mental state talk at Time 1 and Time 2 are limited by the fact that children at Time 1 (16 months)

Table 5

Pearson Correlations for Mother's Referent Over Time

		Time 1 (n = 34)				Time 2 (n = 34)				Time 3 (n = 35)				Time 4 (n = 35)			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Time 1	Child	--															
	Self	.07	--														
	Dyad	-.06	-.12	--													
	Other	.03	.05	.05	--												
Time 2	Child	.17	.10	.01	-.24	--											
	Self	.25	.13	-.01	-.10	.36*	--										
	Dyad	-.01	.46**	-.12	-.11	-.02	.10	--									
	Other	.39*	.12	-.05	.08	.15	-.03	-.10	--								
Time 3	Child	-.11	.36*	-.02	.17	.37*	.13	.27	-.10	--							
	Self	.09	.13	.03	.16	.07	.01*	.17	-.10	.24	--						
	Dyad	.38*	.04	.18	.09	.06	-.12	.11	.34	.02	.00	--					
	Other	.13	.22	-.01	.02	.19	.05	.18	-.05	.36*	.31	.37*	--				
Time 4	Child	-.03	.12	.32	.15	.23	.14	-.06	.22	.47**	.06	.21	.34*	--			
	Self	.12	.37*	.36*	.11	-.05	.05	.24	.46**	.08	.11	.40*	.50**	.37*	--		
	Dyad	.25	-.15	-.12	-.05	-.05	-.05	-.01	-.02	.02	-.02	.30	.35*	.24	.08	--	
	Other	.37*	-.04	-.10	-.10	-.03	-.06	-.02	.47**	-.09	-.18	.23	.02	-.03	.12	.12	--

*p<.05, **p<.-1

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did not use any mental state talk and that children at Time 2 (26 months) only used mental state talk to refer to their own mental state.

Within Time. At 44 months, the earliest time point at which children referred to the mental state of others, no correlations were found between referents. At 52 months, the only significant correlation was between the rate at which children referenced the mental state of their mother and the rate at which children referenced the mental state of the dyad ($r = .532$, $p = .001$). Overall, the referents of children's mental state talk at each time point were almost completely uncorrelated.

Across Time. Pearson correlations reveal no significant associations between the rate at which children talk about their own mental state at 26 months (the only kind of mental state talk children used at 26 months) and the rate at which children referenced any mental states at 44 months or 52 months. Regarding children's referents at later time points, significant correlations were found between children's self-referencing talk at 44 months and 52 months ($r = .369$, $p = .029$) and between children's other-referencing talk at 44 months and 52 months ($r = .652$, $p < .001$). Thus, it appears that the rate at which children reference their own mental state and the mental state of others is more stable at later time points than at early time points.

Mother-Child Referents. Pearson correlations were used to examine the associations between mother and child referents at each time point and across time. Correlations could not be performed with children's referents at Time 1 because no child used mental state talk at Time 1.

Within Time. At Time 2, the first time at which children used mental state talk, a significant correlation was found between the rate at which children referenced their own

mental state (the only kind of mental state talk children used at 26 months) and the rate at which mothers referenced the mental state of the child ($r = .467$, $p = .005$). No other correlations were found. At Time 3, no associations were found between mother and child referents. At Time 4, a highly significant correlation was found between the rate at which mother's referenced the mental state of the mother-child dyad ("we") and the rate at which children referenced the mental state of the mother ($r = .570$, $p < .001$).

Across Time. Pearson correlations were used to examine associations between mother and child mental state referents across the four time points. Starting with mother's mental state referents at Time 1, no significant correlations were found with children's mental state referent at Time 2, Time 3, or Time 4. Turning to mother's referents at Time 2, only one significant correlation was found with children's referents at later time points, that between the rate at which mother's referenced their own mental state at Time 2 and the rate at which children reference their own mental state at Time 3 ($r = .367$, $p = .033$).

With mother's referents at Time 3, only a significant correlation with children's referent at Time 4 was found, such that the rate at which mother's reference the mental state of the child at 44 months was negatively correlated with the rate at which children referenced the mental state of others at 52 months ($r = -.352$, $p = .038$). In other words, the higher the mother's rate of talk about the child's mental state at 44 months, the lower the child's rate of talk about the mental state of other people at 52 months.

Finally, regarding associations between mother's referents at Time 4 and children's referents at earlier time points, only a significant correlation between the rate at which mother's talked about the mental state of the child at 52 months and the rate at which children talked about their own mental state at 44 months ($r = .402$, $p = .017$).

Part III: Multivariate Analyses of Variances in Mental State Talk

In order to examine changes in mother and child mental state talk over time, multivariate analyses of variances (MANOVAs) was conducted for both word type and referent. Results regarding word type will be presented first, followed by the results for referent. Means and standard deviations for all referents and word types at each time point can be found in Appendix B.

Changes in Word Type. MANOVAs were conducted with time (4 levels: 1, 2, 3, 4), person (two levels: mother, child), and word type (three levels: want, know, think) as the within-subjects factors, attachment (two levels: secure, insecure) as the between-subjects factors, and gender (two levels: male, female) and child language scores (RCA, ECA, and PPVT-R) as covariates. Means and standard deviations for mental state talk by time, person, type, and attachment are found in Table 6. Gender yielded no significant differences and was removed from the analysis. The child language scores also yield no significant differences and were removed from the analysis. Overall multivariate effects will be reported, but the same pattern of effects held on the univariate tests.

A significant main effect for person, $F(1, 31) = 51.77$, $p < .001$, reveals that mothers used mental state talk at a significantly higher rate than did children. In addition, a significant main effect for type, $F(2, 30) = 41.20$, $p < .001$ suggests that word types were used at significantly different rates. Pairwise comparisons reveal that "want" was used at a significantly higher rate than either "know" or "think". No main effect was found for time or for attachment security.

Table 6

Means and Standard Deviations of Rates of Mental State Talk for Within-Subjects and Between-Subjects Factors (n =33)

Factor	Levels	*Mean*	*SD*	*F*	*p*	η_p^2
Time				1.13	.353	.105
	1	.09	.05			
	2	.10	.06			
	3	.11	.07			
	4	.13	.11			
Person				51.77	.000**	.625
	Mother	.19[a]	.09			
	Child	.04[b]	.03			
Type				41.20	.000**	.733
	Want	.19[a]	.08			
	Know	.06[b]	.05			
	Think	.08[b]	.07			
Referent				29.37	.000**	.752
	Child	.21[a]	.10			
	Mother	.08[b]	.05			
	Dyad	.02[c]	.02			
	Other	.03[c]	.03			
Attachment				0.89	.353	.028
	Secure	.12	.05			
	Insecure	.10	.05			

Note. By factor, row means with different superscripts differed significantly at *p* < .05.
**(*p* < .01)

Also present were three significant two-way interactions. First, there was a significant interaction for person x time, $F(3, 29) = 5.63$, $p = .004$, such that for mothers, overall mental state talk does not change significantly across time, but for children, there are significant differences between every time point except between Time 3 and 4, with an overall increase in mental state increases across time (see Table 7). The significant interaction for person x type, $F(2, 30) = 16.70$, $p < .001$ (see Table 8) reveals that, for both mothers and children, there were significant differences between word types. However, mothers and children differed in that mothers use "want" at the highest rate, followed by "think," then "know," whereas children also used "want" at the highest rate, but did not show

Table 7

Means and Standard Deviations for Person x Time Interaction (n = 33)

$F (3, 29) = 5.63, p = .004, \eta_p^2 = .368$

Person	Time	*Mean*	*SD*	*F*	*p*	η_p^2
Mother				1.28	.300	.113
	1	.55	.28			
	2	.48	.37			
	3	.53	.33			
	4	.68	.56			
Child				15.66	.000*	.610
	1	$.00^a$	.00			
	2	$.04^b$	.07			
	3	$.22^c$	.19			
	4	$.22^c$	.28			

Note. Row means with different superscripts differed significantly at $p < .05$.
**($p < .01$)

significant differences in their usages of "know" and "think." Next, there was a significant

two-way interaction for time x attachment, $F (3, 29) = 4.07, p = .016$ (see Table 9) such that,

for secure dyads, there were significant increases in overall mental state talk over time, $F (3,$

$22) = 9.31, p < .001$, but for insecure dyads, there were no significant differences in overall

mental state talk over time, $F (3, 5) = .411, p = .752$.

Table 8

Means and Standard Deviations for Person x Word Type Interaction (n = 33)

$F (2, 30) = 16.70, p < .001, \eta_p^2 = .527$

Person	Word Type	*Mean*	*SD*	*F*	*p*	η_p^2
Mother				60.35	.000**	.796
	Want	$.31^a$	.14			
	Know	$.08^b$	.08			
	Think	$.17^c$	.13			
Child				15.70	.000**	.503
	Want	$.07^a$	.06			
	Know	$.03^b$	.06			
	Think	$.02^b$	.02			

Note. By person, row means with different superscripts differed significantly at
$p < .05$. **($p < .01$)

Significant three-way interactions qualify many of the main effects and two-way interactions previously reported. First, a significant three-way interaction was found for person x type x time, $F(6, 26) = 5.57$, $p < .001$ (means and standard deviations are found in Table 10). As seen in the left panel of Figure 1, for mothers, there was a significant type x time interaction, $F(6,186) = 5.53$, $p < .001$, such that the rate at which mother's used "want" decreased significantly from Time 1 to Time 2 and Time 3. In addition, the rate at which mothers used "think" increased significantly over time. The rate at which mothers used "know" did not change significantly over time. As seen in the right panel of Figure 1, for children, there was a marginally significant type x time interaction, $F(1, 186) = 2.14$, $p = .051$, such that children's use of "want," "know," and "think" all increased significantly over time (see Table 10 for pairwise comparisons on all levels of the interaction).

Table 9
Means and Standard Deviations for Time x Attachment Interaction (n = 33)
$F(3, 29) = 4.07$, $p = .016$, $\eta_p^2 = .296$

Attachment	Time	*Mean*	*SD*	*F*	*p*	η_p^2
Secure				9.31	.000**	.559
	1	.55[a]	.25			
	2	.46[a]	.31			
	3	.82[b]	.42			
	4	.99[b]	.67			
Insecure				0.41	.752	.198
	1	.56	.38			
	2	.71	.54			
	3	.52	.31			
	4	.59	.53			

*Note.* Row means with different superscripts differed significantly at $p < .05$. **($p < .01$)

Table 10
Means and Standard Deviations for Person x Type x Time Interaction (n = 33)
$F(6, 26) = 5.57, p = .001, \eta_p^2 = .562$

Person	Type	Time	Mean	SD	F	p	η_p^2
Mother					5.53	.000**	.461
	Want				3.69	.023*	.270
		1	.37^a	.21			
		2	.26^b	.17			
		3	.26^b	.19			
		4	.36^{ab}	.37			
	Know				0.07	.976	.007
		1	.08	.08			
		2	.09	.20			
		3	.08	.11			
		4	.08	.14			
	Think				4.84	.007**	.326
		1	.10^a	.13			
		2	.14^a	.16			
		3	.19^b	.20			
		4	.24^b	.22			
Child					2.14	.051	.542
	Want				14.88	.000**	.598
		1	.00^a	.00			
		2	.04^b	.06			
		3	.16^c	.16			
		4	.10^c	.12			
	Know				3.87	.019*	.279
		1	.00^a	.00			
		2	.00^a	.02			
		3	.03^b	.06			
		4	.08^b	.19			
	Think				8.65	.001**	.358
		1	.00^a	.00			
		2	.00^a	.00			
		3	.03^b	.04			
		4	.04^b	.08			

Note. By person and word type, row means with different superscripts differed significantly at $p < .05$. **($p < .01$)

Figure 1

Type x Time Interactions for Mothers and Children
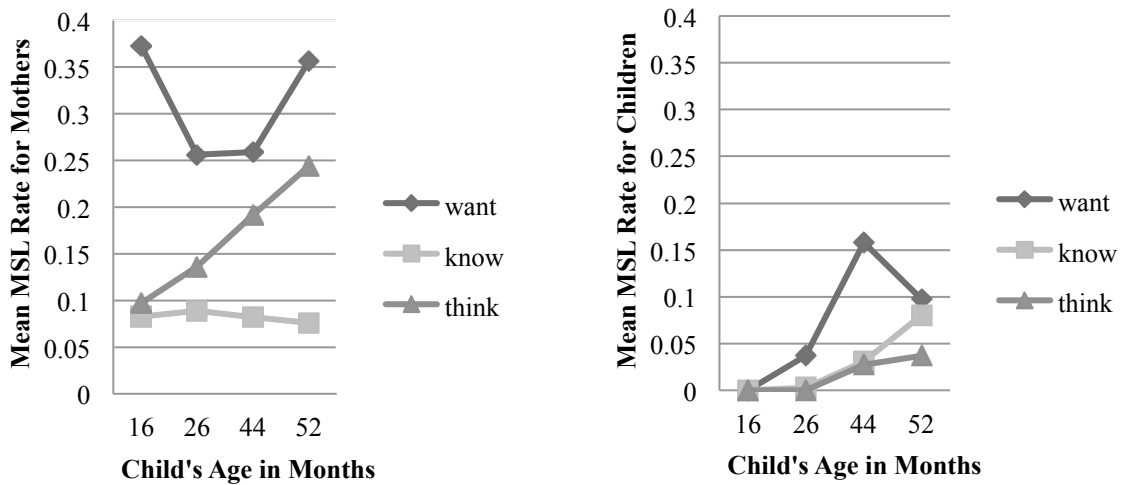
A significant attachment x person x type interaction $F(2, 30) = 3.87$, $p = .032$ suggests that for secure dyads, there is a significant person x type interaction $F(2, 62) = 6.67$, $p = .002$ (see the left panel of Figure 2) but for insecure dyads, there is not a significant person x type interaction $F(2, 62) = .743$, $p = .48$ (see the right panel of Figure 2). For mothers in secure dyads, there are significant differences between the rates at which mothers use each of the three word types. Mothers use "want" most, followed by "think," then "know." For children in secure dyads, there are also significant differences between the rates at which children use different words, but unlike mothers, there is no significant difference between "think" and "know." Means, standard deviation, and significant differences by pairwise comparisons for interaction terms can be found in Table 11.

Figure 2
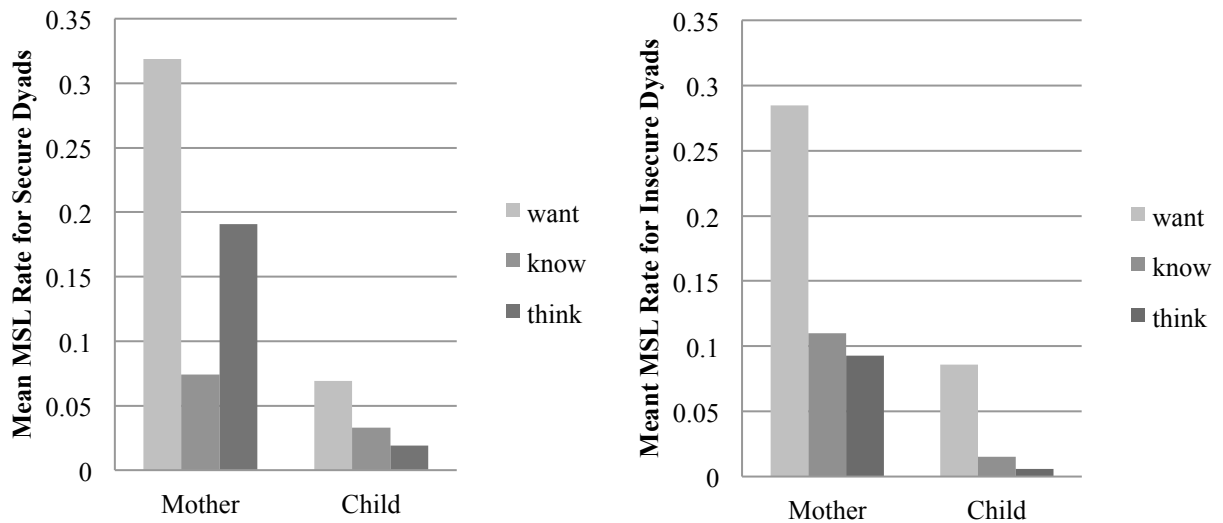*Person x Type Interactions for Secure and Insecure Dyads*

Table 11
Means and Standard Deviations for Attachment x Person x Type Interaction (n = 33)
$F (2, 30) = 3.87$, $p = .032$, $\eta_p^2 = .205$

Attachment	Person	Type	Mean	SD	F	p	η_p^2
Secure					6.67	.002**	.742
	Mother				51.85	.000**	.818
		Want	.32[a]	.14			
		Know	.07[b]	.06			
		Think	.19[c]	.14			
	Child				12.99	.000**	.531
		Want	.07[a]	.06			
		Know	.03[b]	.06			
		Think	.02[b]	.03			
Insecure					.743	.48	.416
	Mother				16.32	.004**	.845
		Want	.29[a]	.13			
		Know	.11[b]	.13			
		Think	.09[b]	.05			
	Child				3.83	.085	.561
		Want	.09[a]	.08			
		Know	.02[b]	.01			
		Think	.01[b]	.01			

Note. By attachment security and person, row means with different superscripts differed significantly at $p < .05$. **($p < .01$)

Changes in Referent. To examine changes in the referent of mother's and children's mental state talk over time, multivariate analyses of variances (MANOVAs) were conducted with time (4 levels: 1, 2, 3, 4), person (two levels: mother, child), and referent (four levels: mother, child, dyad, other) as the within-subjects factors, and attachment (two levels: secure, insecure) as the between-subjects factors. As with the word type analysis, including gender (two levels: male, female) and child language scores (RCA, ECA, and PPVT-R) did not yield significant differences in mental state talk and each was removed from the analysis.

Because the present analysis uses the same mental state talk as the word type analysis above (parceled out by whose mental state is referenced rather than the type of mental state talk used), the effects for time, person, and attachment are redundant. Thus, only effects involving referents will be reported. As with the word type analyses, multivariate statistics will be reported, but the same patterns of results held on the univariate tests.

A significant main effect was found for referent, $F(3, 29) = 29.37$, $p < .001$ (see Table 6). According to pairwise comparisons, there were significant differences in the rate at which dyads used each mental state reference except between references to the dyad ("we") and a third person. Overall, dyads referenced the mental state of the child at a significantly higher rate than any other referent, followed by references to the mother.

A significant two-way interaction was found for person x referent, $F(3, 29) = 17.67$, $p < .001$ (see Table 12). According to pairwise comparisons, for mothers, there are significant differences between the rates at which each referent is used except between references to the dyad and a third person. Mothers reference the mental state of the child significantly more than mothers reference other mental states, followed by references to the

self. Children also reference their own mental state significantly more than the mental states of others. However, unlike mothers, there was no significant difference in the rate at which children reference the mental state of the mother, the dyad, or a third person.

Table 12
Means and Standard Deviations for Person x Referent Interaction (n = 33)
$F(3, 29) = 17.67$, $p < .001$, $\eta_p^2 = .646$

Person	Referent	*Mean*	*SD*	*F*	*p*	η_p^2
Mother				42.21	.000**	.808
	Child	.34[a]	.17			
	Self	.15[b]	.10			
	Dyad	.03[c]	.04			
	Other	.04[c]	.06			
Child				12.21	.000**	.550
	Self	.09[a]	.09			
	Mother	.01[b]	.01			
	Dyad	.00[b]	.01			
	Other	.02[b]	.04			

Note. By person, row means with different superscripts differed significantly at $p < .05$. ** ($p < .01$)

Of greatest interest, a significant three-way interaction for person x referent x time, $F(9, 23) = 3.30$, $p = .010$ reveals a significant referent x time interaction for children, $F(9, 279) = 3.85$, $p < .001$ (see the right panel of Figure 3) but no significant referent x time interaction for mothers, $F(9, 279) = 1.28$, $p = .247$ (see the left panel of Figure 3). For children, there were significant differences between time points in rate of reference to the child's own mental state, $F(3, 30) = 14.17$, $p < .001$. Pairwise comparisons reveal significant differences in children's reference to their own mental state between each time period except Time 3 and 4 (see Table 13 for all significant differences). There were also significant differences between time points in the rate at which children referenced the mental state of their mother $F(3,31) = 5.01$, $p = .013$. More specifically, pairwise comparisons reveal

significant differences between Time 4 and both Time 1 and Time 2, suggesting that

children's reference to their mother's mental state increases significantly from early time

points to 52 months. In children's references to the dyad ("we"), no significant differences

between time points were found. Finally, in the only instance in which an effect was not

significant on the multivariate test but was significant by the univariate test, significant

differences over time were found in children's references to a third person, such that children

referenced the mental state of a third person significantly more at Time 4 than at any other

time point, $F(3, 96) = 4.58$, $p = .038$ by Greenhouse-Geisser.

Figure 3
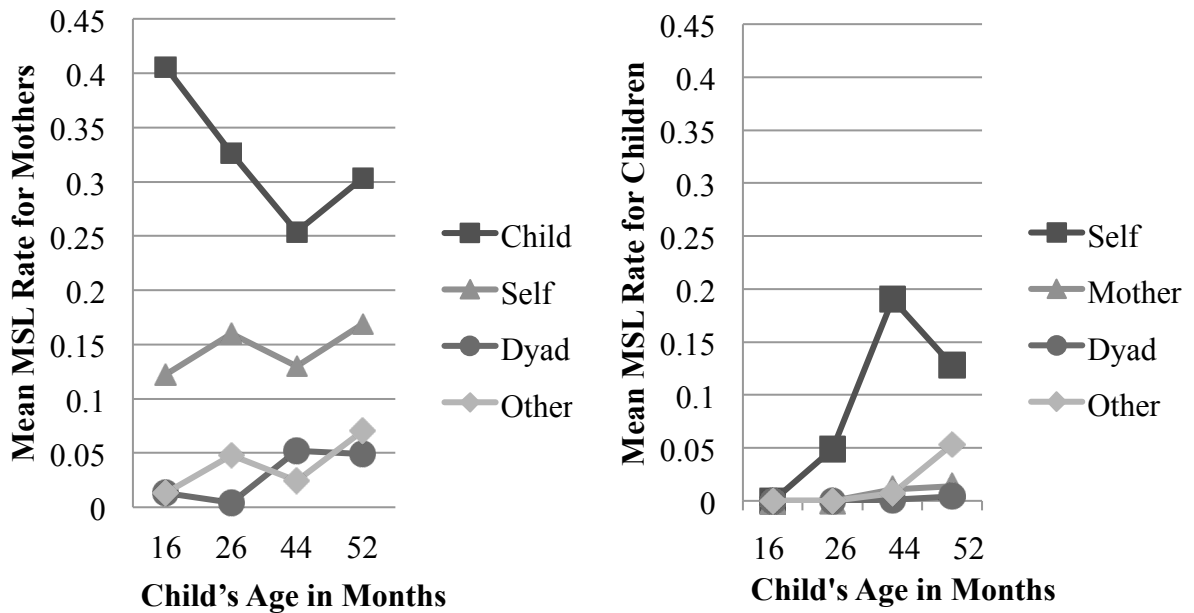*Referent x Time Interactions for Mothers and Children*

Table 13
Means and Standard Deviations for Person x Referent x Time Interaction (n = 33)
$F (9, 23) = 3.30, p = .010, \eta_p^2 = .566$

Person	Referent	Time	*Mean*	SD	F	p	η_p^2
Mother					1.28	.247	.168
Child					3.85	.000**	.639
	Self				14.17	.000**	.586
		1	.00[a]	.00			
		2	.04[b]	.07			
		3	.20[c]	.18			
		4	.14[c]	.20			
	Mother				5.01	.013*	.244
		1	.00[a]	.00			
		2	.00[a]	.00			
		3	.01[ab]	.03			
		4	.02[b]	.04			
	Dyad				1.55	.229	.091
		1	.00	.00			
		2	.00	.00			
		3	.00	.01			
		4	.01	.02			
	Other				2.37	.111	.132
		1	.00[a]	.00			
		2	.00[a]	.00			
		3	.01[a]	.03			
		4	.05[b]	.14			

Note. By referent, row means with different superscripts differed significantly at $p < .05$.
*($p < .05$) **($p < .01$)

DISCUSSION

The goals of the current study were to describe mental state language in mother-child dyads, to examine the associations in mental state language, and to assess changes in mental state language over time. To this end, descriptive statistics were used to assess the general characteristics of mental state language in mother-child dyads. Correlations were used to examine associations in mental state language. Finally, analysis of variance revealed changes in mother and child language over time and the influence of attachment.

Part I: Descriptive Statistics

Consistent with other low-risk samples, children in the current sample had language abilities at or above age equivalency on both the SICD-R at 20 months and the PPVT-R at 52 months. Overall language abilities did not differ significantly by any demographic variables, nor did general language abilities yield any significant differences in mental state language as a covariate. In the current sample, in which all children had receptive and expressive language capacities on-par with children's expected development, general language abilities do not appear to make significant contributions to mental state language development.

The current sample also exhibited a high rate of secure attachment, in line with other low-risk samples (van IJzendoorn & Kroonenberg, 1988). As with general language abilities, attachment security did not differ significantly by any demographic variables. However, unlike general language abilities, attachment security appears to play an important role in mental state language in mother-child interactions. Thus, the influence of attachment on mental state language will be addressed later in the discussion.

Consistent with the expected trajectory of children's mental state language development, none of the children used mental state talk at 16 months and only about one-third of children were using mental state talk at 26 months. In line with the anticipated acceleration of mental state talk from age two to age four, the majority of the children (80%) used mental state talk at 44 months. Surprisingly, fewer children used mental state talk at 52 months (67%) than at 44 months. However, the percentage of children using more sophisticated mental state talk, such as the word "know" and talk that references the mental state of other people, increases from 26 months to 44 months to 52 months, indicating that

mental state talk may continue to increase in complexity even if it does not increase in frequency. (Indeed, mental state talk remains such a small proportion of overall speech among both children and mothers that it is notable that significant changes can be identified at all!)

At each time point, all or almost all of the mothers used mental state language when talking to their children during a relatively short interaction. Thus, as expected, children are exposed to mental states through everyday interactions with their mothers before becoming active participants and continue to be exposed to mental state language over early childhood. That mother's do not use significantly more mental state talk with older, more conversationally mature children than they do with 16 month olds who do not yet participate in mental state talk speaks to the importance of studying maternal input at different time points, not just with the preschool-aged children most often studied.

Part II: Correlations in Mental State Talk

Mother's Mental State Talk. Although more correlations were found in mother's mental state talk than in children's talk, the pattern remains sporadic. One interpretation is that there are no correlations at early time points because there is a lot of variation in what mothers say to very young children. However, by 44 and 52 months, a more consistent pattern has emerged, such that, for example, the more frequently mothers say "think" at 44 months, the more frequently mothers say "think" at 52 months.

Children's Mental State Talk. Overall, children's mental state talk was uncorrelated within each time point both by word type and by whose mental state the children were referring. Across time points, significant associations in children's mental state word type or in children's referent were not found until 44 and 52 months, suggesting there may be a lot

of variability among children's early mental state talk. However, patterns of mental state talk may be more consistent from 44 months to 52 months.

Mother-Child Word Type. There appear to be few correlations between mother and child mental state word type within each time point. At 26 months, there are only two significantly correlations between mother and child talk: between mother and child use of "want" and between mother and child references to the mental state of the child. Although initially it might seem surprising that mother and child mental state talk is not more related during an interaction, this finding is in line with expected results, in that the mental state talk of children age 26 months is thought to consist primarily of their own desires. Thus, mothers and children are expected to use desire words in tangent. That mother and child use of either "know" or "think" are not correlated could suggest that, in line with children's expected development, dyads are using belief terms with a lot of variability at age two.

Associations were not found within mother-child mental state talk at later time points with the exception of a negative correlations between the mother's talk about the dyad and the child's talk about the mother at 52 months. In other words, the more the mother uses "we" to refer to the mental state of herself and her child, the less the child talks about the mental state of the mother. The lack of correlations between mothers and children at 44 months and again at 52 months, might suggest that children do not simply reproduce the mental state talk of the mother, but respond in novel ways. In other words, if mother-child mental state talk within an interaction was highly correlated, it could suggest that children simply repeat the mental state words prompted by the mother, which is not typical in mother-child discourse. As previously discussed, Laakso and Smith (2007) suggested that mother and child word choice in interactions has important implications for the reciprocal

nature of parent-child mental state language, where the mother more often "knows" and the child more often "wants." Thus, the lack of mother-child correlations in the current study is in line with previous research suggesting not that mothers and children should use the same words at the same rates, but that mother-child discourse should change in response to the child's emerging capacity to engage in conversation.

Finally, significant associations were found between mother-child mental state talk over time. Specifically, mother's belief talk at 26 months was significantly correlated with children's belief talk at 44 months. In other words, the more mothers use "think" at 26 months, the more children use "think" and "know" at 44 months. In addition, mother's use of "know" at 44 months is negatively correlated with child's use of "want" at 52 months. In other words, the more mothers say "know" at 44 months, the less children say "want" at 52 months. Further, mother's talk about herself at 26 months predicts child's talk about himself at 44 months. Finally, the less the mother talks about the child at 44 months, the more the mother talks about others at 52 months. Although there are not many correlations between mother and child mental state talk, those that do exist may be evidence of an important pattern. Whether these correlations fit the hypothesized Vygotskian criteria will receive subsequent attention.

Part III: Multivariate Analyses of Variances in Mental State Talk

In the current study, MANOVAs revealed significant findings regarding mental state language in mother-child dyads. Findings related to word type will be discussed first, followed by findings related to mental state referent.

As expected, mothers used mental state talk at a significantly higher rate than did children. In line with research that desire talk is the most frequent mental state talk in

children under age five (Bartsch & Wellman, 1995), "want" was used at a significantly higher rate than either "think" or "know." In addition, consistent with research that toddler and preschool-age children refer more to their own mental state than to the mental state of others (Brown & Dunn, 1991; Rudek & Haden, 2005), children in the current study referred to the mental state of the child significantly more than that of any other person. As many of the main effects and two-way interactions were qualified by the three-way interactions, the three-way interactions will be discussed in more detail.

The significant three-way interaction for person x type x time is central to the current study. To summarize, this interaction suggests a significant time x type interaction for mothers, such that (1) the rate at which mother's say "want" decreases significantly across time, (2) the rate at which mother's say "think" increases significantly across time, and (3) the rate at which mother's say "know" does not change across time. A marginally significant time x type interaction was present for children, such that all three word types increased significantly over time. That children's mental state talk increases with age is in line with previous findings (Rudek & Haden, 2005). However, the interaction between time and word type addresses is an important qualifier in that, although children use the belief terms "know" and "think" significantly more frequently with age, "want" remains the mental state term used at the highest rate at each time point, ruling out the possibility that belief language replaces desire language. Rather, for children, all word types increase in frequency over time. For mothers, that desire talk decreases while belief talk increases over time is consistent with a Vygotskian framework and will receive further attention.

The significant three-way interaction for attachment x person x type is key to addressing the influence of attachment security in mental state language development. To

summarize, a significant person x type interaction was found for secure dyads but not for insecure dyads. The difference between secure and insecure dyads has a number of implications. First, mothers in both secure and insecure dyads talk about desires at the highest rates. However, there are notable differences between mothers in the secure and insecure dyads in their use of belief talk, such that secure mothers talk significantly more about thoughts than they do about knowledge, whereas insecure mothers do not use "think" and "know" at significantly different rates. Thus, the differences between secure and insecure mothers are not in overall mental state talk, but are specific to the types of words used. Perhaps insecure mothers have more trouble moving from the realm of desires, which are more salient and often accompanied by facial expressions action, and tangible references (e.g., "you want the blue block") to beliefs, which requires more of a mental engagement with the child (e.g., "what do you think should go next?"). Maternal talk that reflects an understanding that the child in an independent being with their own mental life has been coined "maternal mind-mindedness" and has been suggested to underlie the relationship between attachment and children's socio-cognitive development (e.g., Meins, Fernyhough, Russell, & Clark-Carter, 1998). Thus, that secure and insecure mothers differ in belief talk but not in desire talk could support the link between maternal mind-mindedness and attachment security.

Also of interest for secure and insecure dyads are differences between mothers and children. For secure dyads, a significant person x type interaction suggests that mothers and children differ from each other in the pattern of word type used. Both mothers and children use "want" at significantly higher rates than "think" or "know." However, in line with previous research (Moore, Bryant & Furrow, 1989), children do not use "think" and "know"

at significantly different rates. Mothers of securely attached children, on the other hand, use "think" at significantly higher rates than "know." Interestingly, there was not a significant person x type interaction for insecure dyads. Although mothers use each word type at a higher rate than do children, mothers and children in insecure dyads show the same overall pattern of word use. Initially it could be expected that the findings be reversed: in a secure dyad, in which the mother and child are in-sync with each other, mirrored patterns of talk should reflect a reciprocal conversation, whereas in an insecure dyad, though to demonstrate lower attunement, mother-child talk would exhibit no clear pattern. However, this is not the case. It is possible that secure mothers, hypothesized to be more sensitive to the needs and abilities of their children, could be challenging their children with mental state talk that is not yet a prominent feature in the child's discourse. In other words, that secure mothers and children differ from each other in the type of mental state talk used while insecure mothers and children do not differ from each other could suggest that mothers of securely attached children are working within the zone of proximal development to facilitate their children's mental state talk.

In the final three-way interaction to note, a significant person x referent x time interaction suggests that there is a significant referent x time interaction for children but not for mothers. In other words, mothers do not change the referent of their mental state talk over time, continuing to talk about the child's mental state at the highest rate, their own mental state at the second highest rate, and the dyad and third person at very low rates across time. That mothers continue to talk most about the child's mental state is in line with previous research (Brown & Dunn, 1991; Rudek & Haden, 2005). However, that references to the mental states of others do not increase significantly over time is contrary to expected

findings. This could be due to task instructions: at each time point, the mother was instructed to help her child with the task. Thus, the interaction remains child-focused across time. Perhaps in an interaction that is not so explicitly child-focused, more references to the mental states of others would occur. Children, on the other hand, change the referent of their mental state talk over time, such that the rate at which children talk about the mental state of their mothers and other people increases from early time points to 52 months. Thus, even on tasks that are overtly child-focused, children talk about the mental state of other people at a higher rate with age. However, the rate of talk about the dyad ("we") remained low and did not change significantly over time for either the mother or the child. Contrary to expectations, use of the pronoun "we" did not factor significantly into the mental state discourse.

Does Maternal Input Fit a Vygotskian Framework?

A key objective of the current study was to examine whether mother-child mental state interactions fit into a Vygotskian framework, in which mothers tailor their mental state talk to fit within the child's zone of proximal development. If maternal mental state language fits the Vygotskian criteria suggested by Taumoepeau & Ruffman (2008), then (1) maternal mental state talk should change to fit the child's current development and (2) the changes should be such that the type of maternal mental state talk that is associated with the child's mental state talk at early time points should be different than the type of maternal mental state talk that is associated with the child's mental state talk at later time points.

The first criterion to meet is that maternal mental state talk changes as the child ages. If mothers are working within the zone of proximal development, than their mental state talk should change such that (a) the proportion of maternal belief talk relative to desire talk

should increase with the child's age and (b) the proportion of maternal talk referencing the mother relative to talk referencing the child should increase with the child's age (Taumoepeau & Ruffman, 2008). Results indicate that, although desire talk ("want") continued to be used at a higher rate than belief talk at every time period, desire talk decreased significantly with the child's age while belief talk ("think") increased significantly with the child's age. In other words, mothers used "want" at the highest rate when children are 16 months old, an age at which children are beginning to acquire the capacity to understand desires, but not thoughts and knowledge. Mothers use "think" at the highest rate when children are 52 months old, an age at which a more complex understanding of thoughts is emerging. These findings are in line with the Vygotskian criteria and support the hypothesis that mothers may use mental state language with the zone of proximal development: challenging the child with mental state terms that are more complex than what the child can understand alone while not being developmentally out of range.

Next, the proportion of maternal talk referencing the mother relative to talk referencing the child should increase with the child's age. Results indicate that although children's referents change significantly over time, mother's referents exhibit no significant changes, with mother's continuing to talk primarily about the child's mental state at every time period and references to the mental state of others remaining extremely low. Thus, this part of the Vygotskian criteria is not met. Surprisingly, not only did mothers not increase references to their own mental state as children aged, but children referenced the mental state of the mother at lower rates than they referenced a third person. Thus, it appears that references to the mother's mental state were not an important feature of the conversation for either mothers or children. Given that the task of each interaction was for the mother to

assist the child in shape-sorting and tower building, it is likely that these particular tasks elicited many more opportunities to talk about what the child wanted, thought, or knew. It is possible that in an interaction that is not so explicitly child-focused, there may be more talk about the mental state of others. However, it could be argued that the majority of children's interactions with their mother during early childhood are by nature child-focused. Thus, everyday interactions might not provide many opportunities to talk about others' mental states, either. Overall, that maternal mental state talk changes in ways consistent with the child's mental state language development is supported by changes in word type but not supported by the lack of changes in referent over time.

The second criterion to meet for maternal talk to fit into a Vygotskian framework is for the changes in maternal talk to be such that the type of maternal mental state talk that is associated with the child's mental state talk at early time points is different from the type of maternal mental state talk that is associated with the child's mental state talk at later time points. At early time points, during which the developmental trajectory of mental state language suggests that children are learning about desires and focused on their own mental state, maternal desire talk about the child should be associated with the child's mental state talk. At later time points, during which the developmental trajectory of mental state language suggests that children are learning about beliefs and becoming more aware of the mental states of others, think/know talk about others should be associated with the child's mental state talk. At 16 months and 26 months, there are no correlations with mother's desire talk and children's later mental state talk. Similarly, there are no correlations with mother's child-referencing talk and children's later mental state talk. Maternal talk at 16 months is not correlated with children's language at all. In addition, contrary to the Vygotskian framework,

correlations between maternal talk at 26 months and later child talk are with maternal belief talk ("think"), not desire talk, and with maternal self talk, not talk about the child. Thus, contrary to expectations, early maternal desire talk about the child is not associated with the child's later mental state talk.

The hypothesis that, at later time points, it is belief talk about other people that is important for children's mental state language development receives partial support from the current study. A negative correlation between mother's belief talk and children's later mental state talk was found such that the higher the rate at which mother's used "know" at 44 months, the lower the rate at which children used "want" at 52 months. A second negative correlation between mother's talk referencing the child at 44 months and the child's talk referencing others at 52 months suggests that the less the mother references the child at 44 months, the more the child references others at 52 months. These correlations may be meaningful if they indicate that mothers who begin using belief talk at higher rates as the child ages have children who decrease desire talk over time and mothers who refer less to the child's mental state have children who refer more to the mental state of others. However, more research is necessary to draw these conclusions.

Overall, the condition that, for maternal mental state talk to function within the zone of proximal development, the time points at which certain maternal talk is evident is important for children's later mental state talk, is only partially supported.

Limitations and Future Research

One potential drawback of a longitudinal study is the attrition rate of participants over time. Although the current sample started with over 100 participants, only 35 had complete data from 12 months to 52 months. The current study is limited by this small

sample size. In particular, this limited the number of insecure attachment dyads in the sample. Another limiting factor regarding attachment security was that children in the current sample were assessed according to a three-way classification system on the Strange Situation (secure, anxious-ambivalent, or anxious-avoidant). Including a fourth classification for children who have no organized attachment behavior (disorganization/disorientation) could strengthen the current study (Main & Solomon, 1999).

Another limitation regarding the current sample could be the generalizability. In the current sample, the mean age of mothers was 30 years old, all mothers were high school graduate and most had at least some college, and the proportion of securely attached mothers and children was high. It is unknown whether findings regarding mother and child mental state language would generalize to a higher-risk sample.

The present study revealed important differences in mother-child mental state discourse between secure and insecure attachment dyads. However, questions regarding attachment remain. For example, what is it about attachment that matters? The current study hypothesized that attachment provides the context for mental state language learning both directly (by providing more opportunities for or more appropriate mother-child mental state talk) and indirectly (by providing a warm and supportive environment in which children are open to learning about mental states from a range of sources). If the differences between secure and insecure dyads are because secure mothers are better at providing appropriate feedback in tune with the child's needs and abilities (scaffolding), then this finding may be accounted for by maternal sensitivity. Future research should assess maternal sensitivity to help hone in on the specific aspects of the attachment relationship that matter for mental state language learning. In addition, although the current study reveals differences between

secure and insecure dyads, there was no main effect of attachment security on overall mental state talk to indicate that securely attached dyads used more mental state talk than did insecurely attached dyads or vice versa. Although previous research suggests that children in secure dyads are more advanced in mental state-related paradigms such as theory-of-mind tasks (Meins, Fernyhough, Russell, & Clark-Carter, 1998; Steele et al., 1999), the current study can only conclude that the conversations are different, not that different conversations have different developmental outcomes. Thus, although it is evident that mental state discourse differs for secure and insecure dyads, further research is needed to examine how these differing conversations predict children's later mental state understanding.

Finally, the current study only found partial support for maternal mental state talk functioning within the zone of proximal development. More specifically, the Vygotskian criteria set forth are supported by longitudinal changes in maternal word type but not maternal referent. As the context of mother-child discourse is hypothesized to be an important factor in mental state talk (Howe et al., 2010; Laible, 2004), it would be valuable to apply Vygotskian criteria to a range of interactions, especially those that represent typical conversations between mothers and children.

Block Tasks
(Adapted from Mason, 1991)

Mother-child dyads worked on block tasks at four time points when children were 16, 26, 44, and 52 months old. All block tasks took place in a laboratory setting and were videotaped for later assessment. At each assessment, the researcher presented block sets to the dyads in sequence, moving on to the next set of blocks when the dyad met one of the termination criteria listed below.

Criteria for terminating the task:
     a. The dyad reaches the three-minute maximum.
     b. The child becomes frustrated (defined as getting out of seat twice or getting out of seat once but not returning to seat in one minute).
     c. The dyad completes the task.

Infant Block Tasks
16-Month Assessment

Task Overview:
The infant block tasks consist of three tower-building tasks of ascending difficulty and three shape-sorting tasks of ascending difficulty. Each mother-child dyad works with all three sets of blocks for the Tower Tasks, followed by all three sets for the Shape-Sorting Tasks. Each set of blocks are presented to the dyad by the researcher. Termination criteria listed above determine when to move on to the next set of blocks.

Tower Tasks:
Tower Task #1: Four blocks of the same color (red) and the same shape (oblong).
Tower Task #2: Six square, pink blocks of graduated size.
Tower Task #3: Eight nested, multi-colored blocks of graduated size.

Shape-Sorting Tasks:
Shape-Sorting Task #1: Plastic sorter with three different shapes (nine blocks total).
Shape-Sorting Task #2: Wooden sorter with four different shapes (twelve blocks total).
Shape-Sorting Task #3: Wooden sorter with five different shapes (15 blocks total).

Procedure:
1. Researcher greets mother and child and indicates where to sit on the floor. Allow 10 minutes with the barn toy as a warm-up period.
2. Researcher enters room and tells the mother that they will be doing a number of activities today and that the researcher will be coming in with each and giving instructions for each.
3. Researcher puts Tower Task #1 between mother and baby. Mother is instructed to help her child stack the blocks in any way that she normally would. Mother is told

that the researcher will return when the child gets bored with the task, becomes frustrated, or completes the task. The researcher leaves the room.
4. Episode is terminated in accordance with criteria listed above.
5. Steps 3 and 4 are repeated for second and third tower task.
6. After Tower Tasks are complete, steps 3 and 4 are repeated with Shape Sorter tasks.
7. When Shape Sorter tasks are complete, dyads are thanked and dismissed.

Toddler Block Tasks
26-Month Assessment

Task Overview:
The toddler block tasks consist of two tower-building block sets (identical to Infant Tower Task #2 and #3). Mothers are instructed to assist their children in constructing a tower in whatever way feels most natural. Unlike the Infant Block Tasks, however, after the parent assists the child in building a tower, the child is asked to build a tower independently (no parental assistance). Termination criteria and other procedures are in line with the Infant Block Tasks.

Tower Tasks:
Tower Task #1: Six square, pink blocks of graduated size
Tower Task #2:Eight nested, multi-colored blocks of graduated size.

Preschool Blocks Tasks (I and II)
44-Month Assessment and 52-Month Assessment

Task Overview:
The preschool block tasks consist of five problems involving different combinations of wooden blocks that the child must stack on a rod affixed to a wooden base. Each problem is brought in one at a time and a new problem is initiated when the child reaches the termination criteria listed above. The task is based on an assessment used by Wilkinson (1982). Mothers are instructed to assist their children in any way that they would typically.

Block Dimensions (height x width x depth in inches):
A: 1 X 3 X 2
B: 2 x 3 X 2
C: 3 X 3 X 2
D: 4 X 3 X 2
B': 2 X 4 X 2
D': 4 X 2 X 2

APPENDIX B

Mean Rates of Mental State Talk for Children and Mothers (n = 33)

	Time 1 16 months	Time 2 26 months	Time 3 44 months	Time 4 52 months
Children				
Type				
Want	.00	.04	.16	.10
	(.00)	(.06)	(.16)	(.12)
Know	.00	.00	.03	.08
	(.00)	(.02)	(.06)	(.19)
Think	.00	.00	.03	.04
	(.00)	(.00)	(.04)	(.08)
Referent				
Self	.00	.04	.20	.14
	(.00)	(.07)	(.18)	(.20)
Mother	.00	.00	.01	.02
	(.00)	(.00)	(.03)	(.04)
Dyad	.00	.00	.00	.01
	(.00)	(.00)	(.01)	(.02)
Other	.00	.00	.01	.05
	(.00)	(.00)	(.03)	(.14)
Mothers				
Type				
Want	.37	.26	.26	.36
	(.21)	(.17)	(.19)	(.37)
Know	.08	.09	.08	.08
	(.08)	(.20)	(.11)	(.14)
Think	.10	.14	.19	.24
	(.13)	(.16)	(.20)	(.22)
Referent				
Child	.38	.30	.30	.39
	(.22)	(.24)	(.20)	(.39)
Self	.14	.14	.14	.18
	(.16)	(.16)	(.16)	(.19)
Dyad	.01	.01	.06	.06
	(.03)	(.02)	(.09)	(.12)
Other	.02	.03	.03	.06
	(.04)	(.10)	(.05)	(.15)

Note: Rates of Mental State Talk = word count/duration of interaction. Standard deviations are in parentheses

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ABSTRACT

MENTAL STATE LANGUAGE IN THE ZONE OF PROXIMAL DEVELOPMENT:
THE LONGITUDINAL ROLES OF ATTACHMENT AND MATERNAL LANGUAGE

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Maternal input is thought to play an important role in young children's development of mental state language (i.e. words referring to desires and beliefs). Maternal mental state language is thought to influence children's own mental state language and socio-cognitive understanding (e.g. theory of mind), but the mechanism is unclear. In addition, the association between security of attachment and mental state language has been examined but has failed to yield consistent results. The current study examines the longitudinal association between mother and child mental state language in the context of the attachment relationship. Further, the study examines whether maternal mental state language functions in the zone of proximal development, in which mothers scaffold children's mental state language according to Vygotskian criteria. Results reveal partial support for a Vygotskian framework such that mother's desire talk decreases while belief talk increases over time. In addition, a significant three-way interaction for attachment security x person x type suggests important differences in mental state discourse for secure and insecure attachment dyads. Implications for a Vygotskian framework are discussed.