Stepping stones to others' minds: The relation between maternal mental and non-mental state input and social understanding in 15-, 24-, and 33-month-old children

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Thinking

you say tht you think
therefore you are
but thinking belongs
in the depths of the earth
we simply borrow
what we need to know
these islands the sky
the surrounding sea
the trees the birds
and all that are free
the misty rain
the surging river
pools by the blowholes
a hidden flower
have their own thinking
they are different frames
of mind that cannot fit
in a small selfish world

Konai Helu Thaman

Abstract

Recent research has shown that children under two years demonstrate some early social understanding. Previous research has also demonstrated that mother talk about mental states is a factor in older preschoolers' later theory of mind understanding. In order to learn more about the predictive nature of mother mental state talk to very young children, this study examined the relation between mother talk about mental states at 15 and 24 months and their later mental state language and emotion understanding at 24 and 33 months.

At all three time points, 71 mothers and 3 fathers (N=74) described pictures to their infants and mother talk was coded for mental and non-mental state language at 15, 24 and 33 months. In addition, at all three time points, children's mental and non-mental state vocabulary levels were obtained via parental report. At the second and third time points the children were administered an emotion situation and a body emotion task. The mothers' ability to interpret emotion faces was also assessed.

The results showed that mother use of desire language was more prevalent at 15 months, with references to thinking and knowledge increasing at 24 months.

Partial correlations demonstrated that mother use of desire language with 15-month old children uniquely predicted a child's mental state language and emotion situation task performance at 24 months, even after accounting for earlier child language, mother socioeconomic status, mothers' own emotion understanding, and other types of mother non-mental state language. Similarly, at 24 months of age, after accounting for potentially confounding variables, such as child language, mother use of think/know language as well as desire language were both predictors of children's mental state language and emotion task performance at 33 months.

The results further demonstrated that mothers' tendency to refer to the *child's* (versus *others'*) desires at 15 months was the more consistent correlate of children's mental state language and emotion understanding at 24 months. At 24 months a different pattern emerged with both references to the *child's* and *others'* thoughts and knowledge correlating with child mental state language and emotion task performance at 33 months.

It is proposed that Vygotsky's zone of proximal development provides a framework within which maternal talk about specific mental states scaffolds the development of children's later social understanding. I also suggest that such scaffolding motivates mothers to talk more about the child's mental states when they are younger, before introducing talk that focuses on others' mental states.

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It is somewhat tempting to say "you know who you are", but I know that wouldn't do justice to all of you who have helped make what seemed like 'a good idea' three years ago, a truly memorable life changing experience.

Not one to appeal to planetary alignment as a portent of good luck, I nonetheless wonder what the planets were doing when I reflect on my luck in meeting Ted Ruffman, fresh off the plane from Sussex University to take on a new post at Otago. His generous giving of his time, his patient reflection on my often-impetuous ideas and his enthusiastic commitment to my topic of research are just some of the qualities that made him a wonderful supervisor and friend.

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Dedication

For my grandmother Meleane Kafoa

'Oku 'ikai ha tahi kuo lahi ange 'ene tokanga kiate au', mo 'e ne 'ofa 'i a au'.

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Chapter 1 Introduction

I have one very clear memory as a child; I was about 9 years old. My mother had asked me for the umpteenth time to tidy my room, but being a dreamy, bookish kind of child, I was going about this task with a decided lack of vigour. Oblivious to my mother's increasing frustration at my lack of commitment to the job, I suddenly turned to her and said, "Do you know Mum, everything I do in the world is about me, and everything I think of always comes back to me". Those particular philosophical musings regarding my sudden realization of 'self' didn't go down very well at that particular moment, but nonetheless sowed the seed for my interest in the human mind. It is perhaps no coincidence that these childhood reflections on the mind also coincided with my delight in playing 'spying' games, trying to outwit one's opponent by "thinking what they're thinking".

Since having my own children, my interest in the mind of the child took on new dimensions:

> Helen (aged 4): What are you doing Mummy?
> Mummy: I'm thinking.
> Helen: Your brain has gone to Christchurch for a holiday.
> Mia (aged 6): If her brain's gone to Christchurch for a holiday how can she think.

Aside from the lack of disquiet over their mother's brain catching a bus to Christchurch, there were three things that I found so striking about this conversation: First, that children are as interested as adults in making sense of their world or in explaining others' behaviours (in this case, their

mothers' vacant expression directed into the distance). Second, that Helen (the younger child) had an appreciation of the mental process of 'thinking' as reflecting a sort of inaccessible mental content. Finally, that language provided the children with a means to reflect at a meta-level on what it meant to 'think'.

Notwithstanding my own personal interest in these ideas, many researchers all over the world have been intrigued by similar questions. Stated simply: how do children come to learn about the mind and its contents and why is it important for them to have an appreciation of this?

The second question is in some ways simpler to answer than the first. As humans we are naturally social creatures, who live in communities and seek out company. We are also highly sophisticated creatures. We communicate using a symbolic verbal system of sounds and we live in highly developed, complex social groups. And, just as we need traffic lights and signposts to help navigate our physical environment, we also need a system to direct, manage and understand our social encounters.

One step in the right direction in understanding the social world is to construe others' actions and behaviours in terms of their mental states, that is, their intentions, desires, thoughts, knowledge and emotions (these inaccessible contents of the mind). This mental understanding of others has typically been referred to as a 'theory of mind' (Premack & Woodruff, 1978), that is, theoretical representations of (unobservable) concepts which we use to infer the reasons for others' behaviour. To adults, a world without an appreciation of others' mental states seems completely inconceivable, and indeed the conversation described above even attests to children's relatively early appreciation of others' minds.

But what do children really know about the mind? Since Premack and Woodruff (1978) raised the question of whether a chimpanzee has a theory of mind, the ensuing debate unleashed a flurry of research directed at how one could test belief understanding in children. Arising out of a commentary on Premack and Woodruff's work by Dennett (1978), Wimmer

and Perner (1983) devised a task which applied a stringent test for understanding the relation and differences between one's own knowledge about the world and a person's false belief about similar events in the world. Their results revealed that 5-year-olds but not 3-year-olds could predict that a person would look for something on the basis of where they *thought* it was, rather than where the child *knew* it to be. Understanding false belief became the 'acid test' of a theory of mind and generated a substantial body of research regarding the representational nature of children's mental state understanding and the processes underlying the development of theory of mind (see Olson, Astington, & Harris, 1988; Perner, 1991; Leslie, 1987; Wellman, 1990).

During those halcyon days of theory of mind research, two conferences in Toronto (1986) and Oxford (1986) brought together ideas that helped explode the boundaries of theory of mind research (Olson et al., 1988). Two strands of research emerged from these early meetings. First, the question of how children represent these mental state concepts especially with respect to the relation between children's understanding of perception, knowledge and inference. In particular, researchers started to think more about how younger children's earlier conceptualisation of mental states such as intentions, desires and emotions serve as a precursor to false belief understanding. In Chapter 2, I present a broad definition of social understanding and examine in some detail the components of children's early theory of mind. I also consider the theoretical frameworks in which children's developing social understanding has been construed.

The second strand of research concerned the role of social interaction and communication. Researchers began to question more forcefully the role of experience in children's developing social understanding. Work by Judy Dunn was especially concerned with capturing an understanding of children's knowledge of the social world, through their family conversations about mental states and especially about emotions. Her main research focus was how emotionally charged

contexts may allow children to reflect on their inner states (e.g., emotions). As such, her findings detailed a relation between conversations about emotions, thoughts and knowledge, and children's later understanding of false belief (Dunn, Brown, & Beardsall, 1991; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991). Drawing together both strands of research, what became increasingly apparent was the importance of language development in a child's developing theory of mind (Astington & Baird, 2005), which I focus on in Chapter 3. The questions surrounding this research focus generated interest in the potentially implicit nature of early mind understanding. Indeed, the subsequent research findings suggested that between 2 and 3 years, children exhibit an earlier implicit understanding of false belief (as measured by eye gaze), despite their verbal responses indicating they judged the protagonist's beliefs in terms of what the child knew to be true (Clements & Perner, 1994; Garnham & Perner, 2000; Ruffman, Garnham, Import, & Connolly, 2001). Furthermore, the spotlight also turned to how the acquisition of specific linguistic components such as syntax and semantics related to theory of mind (Astington & Jenkins, 1999; de Villiers & Pyers, 2002; Hale & Tager-Flusberg, 2003; Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003).

Related to this research direction, a cluster of correlational studies emerged, highlighting a relation between the language mothers used and children's false belief understanding (Astington & Jenkins, 1999; Meins & Fernyhough, 1999; Ruffman, Slade, & Crowe, 2002). Thus, continuing on from the Ruffman et al. (2002) study and influenced by the work of Meins and Fernyhough (1999) I wanted to examine how maternal input (both mental and non-mental state) directed at children who were just beginning to use language, related to their understanding of mental states and emotion understanding. I was particularly interested in situating this research within Vygotsky's theoretical construct of the zone of proximal development. I hypothesized that parental talk about mental states, when appropriately timed with the child's current level of mental state

understanding, may bootstrap further understanding of mental state language as well as mental life in general, such as emotion understanding. Furthermore, I hypothesized that mothers' focus on the *child's* rather than *others'* mental states, particularly when they are still learning about the relation of behaviours to underlying mental states, provides another opportunity to scaffold and deepen mental state understanding. I specifically focus on one aspect of communication, that is, picture description, as it provides a standard semi-controlled context in which to examine mothers' talk over subsequent time points (see Chapter 4). In my analysis (Chapters 5 and 6), not only do I consider how specific mother mental state terms may relate to children's later mental state language and emotion understanding, but I also examine how mothers' referring style (i.e., referring to the child's, their own or others' mental states) may assist in children's later understanding of mental life (Taumoepeau & Ruffman, 2006). As such, this study represents a novel contribution to some of the questions concerning how very young children might learn about mental states and in what ways mother input may assist in this learning (see Chapter 7).

Chapter 2 Children's Social Understanding

The ability to ascribe others with mental states and to interpret a person's behaviour on the basis of these mental states is a particularly useful human tool, rendering us extremely efficient social navigators. What's more, the capacity to ascribe others with false beliefs and to happily acknowledge that a person could act or behave on the basis of their false beliefs has been considered a hallmark of our adult folk psychology.

Based on Premack and Woodruff's (1978) seminal examination of mind-reading abilities in apes, the first classic human false-belief task administered on a group of children, revealed that only 5-year-olds could pass specific tasks that tested their ability to ascribe others with false beliefs (Wimmer & Perner, 1983), with subsequent research lowering the passing age to include 4-years-olds (Wellman, Cross, & Watson, 2001). Since this finding, the field of social cognition in children has enjoyed consistent and thoughtful exploration, providing important insights into the development of social understanding.

The aims of this chapter are to: (1) provide a working definition of social understanding, (2) discuss ways in which social understanding has been measured in infancy and early childhood, and (3) present the principle theories as to how children's social understanding has been construed.

2.1 What is Social Understanding?

An understanding of others' minds allows us shared mental insights, which we use to navigate our social encounters. Although an adult's ability to socially interpret the world assumes an understanding of mind, in children and especially infants, this remains an open question. Typically, mental state understanding is discussed under the rubric of *theory of mind*. However, in charting the development of a child's ability to make sense of their encounters with people and objects in their social world, I use as my point of reference, the phrase 'social understanding' (Dunn, 1988). My reasoning for taking this broader approach (Moore, 1996) is influenced by Dunn's observation of the paradoxical lag between children's overt demonstrations of social understanding (e.g., false belief understanding at 4 years) and the apparent skill of infants in demonstrating an understanding of human behaviour. The participation of infants as social interlocutors may not necessarily entail the understanding that social behaviour is framed by a person's mental attitudes, that is, thoughts, knowledge, desires towards objects and entities in the world. Rather, infants may initially participate in social activities such as joint attention, turn taking and gaze following, through the use of general learning mechanisms that allow them to pick up on behavioural contingencies (Baldwin, 2002; Moore & Corkum, 1994; Perner & Ruffman, 2005; Phillips, Wellman, & Spelke, 2002; Ruffman & Perner, 2005). In other words, infants certainly possess social understanding whether or not this understanding includes insight into mental states.

2.2 Measuring Social Understanding

In the following sections, I examine in some detail how social understanding has been measured in young children. As I am interested in early social understanding in very young children, that is, social understanding which precedes an explicit understanding of false belief

(Bartsch & Estes, 1996), I focus specifically on purported early manifestations of social understanding such as intention, desires and emotions. These insights have been examined in two different ways: (1) laboratory based tasks that test children's ability to interpret and predict others' actions and behaviour, and (2) linguistic and non-linguistic parent-child or family interactions. These two facets of the general measure of social understanding provide complementary information. Laboratory tasks are able to directly target a specific aspect of social understanding within standardized and controlled environments. On the other hand, observing children's appreciation of the social world through naturalistic observation also provides insights into how children's interactions with others assist in facilitating their social understanding. Related to this, Bartsch and Wellman (1995) argued strongly for examining children's own mental state language in order to gain insights into children's developing social understanding. They state, *"Our basic assumption is that children's talk about the mind can reveal their conceptions of the mind. Even though language development does not map onto conceptual development in any strict sense, an analysis of discourse can nonetheless provide an important window onto conception"* (Bartsch & Wellman, 1995, page 17). Therefore, although one cannot be sure that children's mental state language necessarily refers to mental states, mental state language is liable to bear some relation to children's understanding of the social world.

2.2.1 Understanding Intentions

Inherent to an adult's understanding of the social world is the fact that people act and behave on the basis of their intentions, such that a person's mental states are directed at, or are about, certain objects or a state of affairs (e.g., Searle, 1983). More recently, research has focused on the question of whether children understand that others are motivated by their intentions.

Searle (1983) has conceptualized intentions as a dichotomy between 'prior intentions' and 'intentions in action'. Prior intentions are mental states that exist in the mind of the agent, for example, "I will eat my broccoli" or "I'm going to eat my broccoli". Intentions in this sense are carried out or at least attempted by the agent. On the other hand, intentions in action are purposeful behaviors that may or may not be motivated by prior intentions. As Searle elaborates, these types of intentions form a large component of our everyday activities, for example, when concentrating on a particularly thorny problem, one may begin to pick one's nose. Such an activity may not necessarily arise out of a conscious intention to pick one's nose; the intention is intrinsically bound up with the action. The majority of research investigating intention understanding in young children has focused on its relation to action. Meltzoff (1995) demonstrated using an imitation procedure, that 18-month-olds were able to complete target acts after only having observed a partially completed action by a person (but not by a mechanical device). In a similar vein, other studies reported 14-month-olds as understanding accidental versus purposeful action (Carpenter, Akhtar, & Tomasello, 1998), and children as young as 9 months as understanding agents as unwilling versus unable (Behne, Carpenter, Call, & Tomasello, 2005). Meltzoff's and others' main interpretation of these findings is that children understand that an agent has a purpose in mind when performing the action, that is, they interpret a person's goal-directed behaviour as mentalistic, underlaid by their desires, beliefs and knowledge.

Others have interpreted infants' goal-directed understanding of action in less rich ways (Csibra, 2003; Csibra, Biro, Koos, & Gergely, 2003; Csibra & Gergely, 1998). In one of a series of studies, infants observed a large ball following the path of a smaller ball in a familiarisation phase (goal: to chase or catch the small ball). In this same phase, when faced with an obstacle (e.g., an opening too small for the large ball), the large ball skirted around the obstacle to continue following the path of the smaller

ball. Then in the test phase, in the condition incongruent with the intended goal (i.e., to chase or catch the small ball), the large ball overshot the path of the smaller ball (i.e., not "chasing" the small ball) whereas in the congruent condition, the large ball caught up with the small ball. Infants looked longer at the condition that violated the intended goal. Yet rather than ascribing an understanding of goals to infants, these researchers suggest that infants take a "teleological stance", meaning that infants understand end states as goal-driven without necessarily attributing desires or beliefs in an understanding of those goals.

Moore (1999) and Moore and Corkum (1994) have also adopted a leaner perspective on infants' intention understanding. Moore's (1999) account is best conceptualized within the triadic relation of child, adult and object. On this account, Moore charts a developmental progression in which the infant initially does not view the adult's intentional orientation towards an object as independent of the infant's orientation towards the object. Similarly, an infant's understanding of their own intentions is also viewed within the triadic interaction, that is, via the adult's orientation towards the object. It is not until later, that children disengage from this "intentional we", and develop the capacity to understand the intentional attitude of another by simulating the intention as it relates to themselves. Likewise, when reflecting on their own intentions they are able to simulate the action or state of affairs from the other's perspective. It is not until this latter stage that Moore claim children understand the psychological relation between agents and objects.

Other alternative accounts to a rich mentalistic interpretation of infant understanding of intention propose that success on these tasks could be accounted for through learning, possibly via stochastic means (Baldwin, 2002). That is, infants might detect contingencies between particular actions and end states. In this way, infants' accumulated experience in performing and observing actions might provide the basis for predicting actions and behaviour, rather than requiring them to infer goals.

To briefly summarize, what is unclear based on these infant studies is the extent to which children's understanding of people's intentions needs to be conceptualized as mentalistic. Regardless, however, of whether children interpret others' intentions as psychological relations between people and objects or on the basis of contingent responding (i.e., the ability to predict their actions), their success on intention tasks shows that they are skilled when it comes to understanding many social interactions.

2.2.2 Understanding Desires

An integral part of an adult's social understanding is the understanding that people are motivated by their desires, intentions and goals. Such an understanding allows adults to predict and interpret actions based on the antecedents and consequences of desires. To illustrate this, adults understand that a person may try to obtain something they desire and feel happy or sad depending on whether the desire is fulfilled or not. Adults also understand that not only do others have desires which may differ from their own, but that the way in which they satisfy their desires may be different.

Researchers have also been interested in when young children begin to understand that behaviour is framed by a person's internal experience of desiring. As noted in section 2.2.1 on intention understanding, it is plausible that children's initial understanding of desire may not be mentalistically construed. For example, young children may construe desire as inherent in objects in that some objects may be more desirable than others. Additionally, a naïve conceptual understanding of desire may manifest itself egocentrically, that is, children may believe all people will desire things that they desire. These naïve conceptualizations of desire would thus lead children to occasionally make inaccurate predictions about a person's desires.

To explore some of these ideas, Repacholi and Gopnik (1997) examined the relation between very young children's understanding of

desires. They found that 18- but not 14-month-olds were able to determine which of two foods, would be most desired by a person based on their previous affective responses. Eighteen-month-olds offered broccoli to an adult when the adult had expressed desire towards broccoli and disgust toward crackers, even though children themselves chose crackers. In contrast, 14-month-olds only gave crackers, the food that they themselves preferred.

Wellman (1990) showed that children aged between 2.5 and 3.0 years would accurately predict when a person would continue or stop searching for an object depending on whether their desire had been fulfilled (i.e., whether they had found the desired object). Such children were also able to judge how a person would feel based on their success or failure in fulfilling a desire (i.e., that the person would feel happy when they get what they want, and sad when they don't). In addition, older 3-year-olds reason that someone who emotes positively toward an unseen object desires that object (Wellman, Phillips, & Rodriguez, 2000).

Other studies have considered the language children use as an index of their desire understanding. Bartsch and Wellman (1995) systematically examined child talk for references to genuine mental states, that is, mental states which reflected an understanding of their own and others' minds rather than simply being conversational devices. Their naturalistic observations have shown that by 18 months, children begin to use genuine desire terms (e.g., I want to play with it), with 'want' reported to be one of the earliest examples of mental state language.

Bretherton and Beeghly (1982) reported more general references to 'volitional' states (including desire) than to cognitive states amongst 28-month-olds. They also found that mother reports of 28-month-olds' internal state vocabulary correlated with children's performance on an emotion recognition task. This finding is consistent with the idea that children's mental state language is a genuine indicator of their social understanding.

In a study which looked at the connectedness of desire language with other types of internal state language, Wellman, Phillips and Rodriguez (2000) identified many instances in which 2.5-year-olds commented explicitly on the connection between desires and perceptions (e.g., I *see* him, I *want* to go up there), and desires and emotions (I *want* some sugar, I *like* sugar).

To summarize, there are signs that children as young as 18 months pass linguistically simple tasks that tap desire understanding. Tasks which are more linguistically demanding show that older 2-year-olds and 3-year-olds have an understanding of desire.

2.2.3 Understanding Emotions

As discussed in the previous sections, children's understanding of intentions and desires is connected to their understanding of emotions. Indeed, many researchers have emphasized the importance of affective understanding in a young child's broader social understanding (Bartsch & Estes, 1996; Dunn, 1999; Ruffman, 2000; Harris, Johnson, Hutton, Andrews, & Cooke, 1989).

Work by Susan Denham finds support for the idea that understanding emotions is important for general social understanding. She and her colleagues demonstrated a connection between the emotion competence of 3- and 4-year-olds (including their emotional knowledge, emotion regulation and emotion expressiveness) and specific aspects of social competence, including indices of peer popularity, children's sensitivity/cooperativeness and their isolation/withdrawal (Denham, 1986; Denham, Zoller, & Couchoud, 1994; Denham et al., 2003). Of note, especially for the present study, was the finding that the older children in the sample showed much less variation in their emotion knowledge than younger children. As suggested by Denham et al. (2003), the higher degree of variance in younger children's emotion knowledge may make emotion knowledge an especially important factor in children's later social

understanding (e.g., such knowledge might assist children in regulating group situations, particularly concerning group conflict).

A series of studies by Judy Dunn and colleagues has also focused on the central role emotions play in social understanding, within early social encounters. (Dunn, Bretherton, & Munn, 1987; Dunn et al., 1991; Dunn et al., 1991). In particular, Dunn (1999) highlights the opportunities emotionally charged environments provide for advancing children's conceptual understanding of emotions. Emotionally charged environments provide parents and children with opportunities to comment on internal states, a tendency linked to children's later abilities in recognizing emotions in others (Dunn et al., 1991), and in explaining actions in terms of false beliefs (Dunn et al., 1991). In addition, within specific emotional contexts such as disputes, children are also more likely to engage in the discussion of causes regarding a particular behaviour, than when not in disputes (Dunn et al., 1991).

Studies of infants' and young children's understanding of emotion also strongly suggest a developmental progression in children's understanding of the referential role for emotion. To illustrate, Phillips, Wellman and Spelke (2002) found that infants as young as 12 but not 8 months made the connection between the actor's emotional regard towards an object (e.g., repeated reaching for one object rather than another) and a subsequent tendency to reach for the object. Furthermore, they discovered that for 14-month-olds but not 12-month-olds, emotional regard on its own (i.e., positively emoting toward one object without reaching) was a sufficient cue for causing infants to expect one to subsequently reach for that object. Moses, Baldwin, Rosicky and Tidball (2001) throw light on this discrepency by examining the cues 12- and 18-month-old infants use to disambiguate the referential intent of a person toward a novel but ambiguous stimulus. Moses et al. showed that 18-month-old infants were less likely to approach an ambiguous novel object if it had been paired with an expression of disgust. Unlike older infants, 12-month-old infants did

not show any indication of responding differentially to the referential cues offered by the speaker and therefore under these conditions do not appear to use emotion as a cue for social referencing.

What is also interesting about the changes in 12- to 18-month-olds' emotion understanding is the concurrent change in their understanding and use of affective language. Children as young as 18 months have been reported to use emotion language (Bartsch & Wellman, 1995; Dunn et al., 1987; Ridgeway, Waters, & Kuczaj, 1985). Although there is some disagreement over which terms are more frequently used, the most common emotion words seem to be references to delight, distress, fear and anger (Bretherton & Beeghly, 1982; Dunn et al., 1987; Huttenlocher & Smiley, 1990). Furthermore, children will frequently use emotion and desire language together to explain a person's behaviour (Wellman et al., 2000). Other studies have looked more directly at the relation between children's internal state vocabulary (including emotion and desire language) and their emotion understanding. For instance, recall that Bretherton and Beeghly (1982) found that mother reports of 28-month-olds' internal state vocabulary correlated with children's performance on an emotion recognition task. These findings lend support to the idea that emotion understanding is an important component of early social understanding.

2.2.4 Understanding Beliefs

Standard false belief tasks

Another component of a theory of mind is belief understanding. Typically, in order to measure beliefs in children, researchers have used tasks that tap *false*-belief understanding. An example of such a task is the 'unexpected transfer task' (Wimmer & Perner, 1983). In this task, a child observes a scene in which a boy 'Maxi' places some chocolate in a box (Location 1). Maxi then leaves the room during which time his mother

moves the chocolate to a cupboard (Location 2). On Maxi's return, the child is asked where he thinks Maxi will look for the chocolate. Children who understand or are able to imagine another person holding a belief that is different from their own will state that Maxi will look in the original location (Location 1). That is, despite seeing the chocolate transferred and therefore knowing the chocolate is in a different location, the child must realize that Maxi 'thinks' the chocolate is in Location 1 (rather than in Location 2). In other words, children cannot just ascribe their own belief to the story character. Around 4 years of age, children will indicate that Maxi will look in the location that the chocolate was originally placed in (Wellman et al., 2001).

Implicit understanding of belief

Following this well replicated finding, other researchers have considered whether younger children may exhibit an implicit understanding of false belief (Clements & Perner, 1994; Garnham & Perner, 2000; Garnham & Ruffman, 2001; Ruffman, 2000; Ruffman et al., 2001. Typically, in these studies, children are exposed to a verbal false belief task and they are then tested on both their anticipatory looking to a particular location and their explicit verbalization of where the protagonist will look. To test for anticipatory looking, before the protagonist returns, children are prompted by a question, which is designed to elicit an implicit response measured by their direction of eye gaze to either of the two locations (e.g., experimenter asks "I wonder where Sam is going to look"). Following this anticipatory prompt, the protagonist returns and the children are explicitly asked where the protagonist will go to search for the hidden object. The general finding from these studies is that the majority of children older than 2 years, 11 months will look to the correct location (correctly anticipate), but state incorrectly where the protagonist will search. The vast majority of children younger than 2;11 will not look to the correct location. Therefore, the studies demonstrate a marked shift in understanding at around 2 years, 11 months. These studies suggest that

initially, knowledge may be available implicitly, that is, in a non-verbalizable form before children are able to explicitly make judgements about their own or others' knowledge (Clements & Perner, 1994)

Infant understanding of belief

The most recent research on belief understanding has challenged the findings that children under 2 years, 11 months do not possess even an implicit understanding of false-belief. Onishi and Baillargeon (2005) adapted the verbal unexpected transfer false-belief task (described above) to an entirely non-verbal task suitable for older infants (15-month-olds) using a 'violation of expectation' looking paradigm. If the actor searches in a location which violates where infants 'think' the actor 'thinks' the object should be, infants' increased looking time to that location is taken as an index of their 'surprise'. In this task, the infant is first habituated to an actor placing a toy in one of two locations (Box A). The child is then inducted into one of two conditions: true belief or false belief. In the true belief induction condition, both the child and the actor observe the toy move into the other location (Box B). The actor then goes away. There are then two test conditions. In the first test condition, the actor returns and then proceeds to reach into the box that holds the toy (Box B) (concurs with expectation). In the second test condition, the actor returns and then proceeds to reach into the box that does not hold the toy (Box A). The actor is thus violating the child's expectation of where the actor should look because the actor should believe that the toy is in Box B because they saw it move to Box B. The children in this test condition should look longer at the Box A event. In the false belief condition, only the child is present when the toy is moved from the original location (A) to the new location (B). Similar to the verbal unexpected transfer task, the actor still 'believes' that the toy is in box A, even though it has moved to box B. Again, the children's looking times in two test conditions are measured. When the actor returns, she reaches either to box A (original location where she should 'expect' the toy to be) or to box B, the new location. Infants looked

longer when the actor reaches to box B, because the actor has violated the expectation of where she should look (box A where she originally placed the toy and where she should believe the toy to be).

The results of this study suggest that 15-month-olds indeed look longer in both true- and false-belief conditions, when actors searched in the location that did not concur with their belief of where the object should be.

These findings add to the seeming paradox of infant versus child behaviour. Such infant mind precocity has engendered a certain amount of controversy and has been interpreted in various ways. On the face of it, Onishi and Baillargeon's study suggests that infants may possess a 'rudimentary and implicit form' of false belief. In particular, the purported success of 15-month-olds on this task has generated debate between theorists who claim that increasing representational capacity progresses incrementally during the pre-school years versus modularity theorists, who claim that children are innately endowed with the capacity to represent beliefs (see below). As discussed in section 2.2.1 on intention understanding in young children, it is difficult to fully attribute infants with a mentalistic understanding of a person's actions, when one could explain the task using non-mentalistic accounts of infants' looking behaviour (Perner & Ruffman, 2005; Ruffman & Perner, 2005). One such explanation offered by Perner and Ruffman (2005) suggests that infants process the actor's actions by forming three-way associations between the agent, object and location. At a neuronal level, these associations reflect sustained firing of neurons. Perner and Ruffman suggest that infants' increased 'looking' times may merely reflect the processing of new associations or, alternatively, may reflect the encoding of recent versus latent information.

2.2.5 Summary

To summarize, social understanding consists of several different components of a theory of mind: emotions, intentions, desires, beliefs and

knowledge. In this thesis, I will focus only on certain aspects of social understanding namely, child mental state language and emotion understanding. The reason for focusing on these two components is that my interest is in early developing social understanding (prior to false belief understanding) and also given time constraints and infants' limited attention, it was not possible to test everything in young children.

2.3 Theories of theories of mind

As outlined above, a theory of mind might contain a number of different mental states or components. Other questions, however, concern the ways in which these components might be organized, the way they might arise, and the precise way in which children might reflect on others' minds. There are several approaches that attempt to answer these questions.

2.3.1 Theory-theories

One influential stance takes as its model of cognitive development the notion that children's understanding of the mind (folk psychology) is analogous to the development of a scientific theory. Based on original work by philosophers working within the philosophy of science (e.g., Popper, Kuhn), some have argued that children's theory of mind is akin to a scientific theory. The essence of this framework lies in the structural, functional and dynamic components that define a theory (Gopnik & Meltzoff, 1997). In addition, theories are *abstract* entities or laws that are used to *explain* and *predict* evidence. They are also *coherent,* in that the laws governing various aspects of a theory are structured so that they relate to one another. Theories are also *dynamic* and are thus subject to change based on *counterfactual* evidence. With this framework in mind, conceptual changes in children's understanding of desires, beliefs and knowledge, evidenced in their differential success on various tasks that tap mind understanding (described above), reflect the updating of a general

representational "theory-of-mind". There are a number of different strands of the theory-theory.

Josef Perner

Perner (1991) argues that children move from explaining behaviour on the basis of what they know to be true about the world, to the idea that people may behave under a false notion of the state of the world or a 'false belief' (Wimmer & Perner, 1983).

Perner (1991) explains this conceptual shift in children's explanatory powers in terms of a change in children's representational abilities. In this view children are hypothesised to move from a single updating model of reality in which only the current reality can be represented, to the ability to conceive of multiple models of reality (e.g., the child's desire versus someone else's desire), which would emerge around 18 months when children begin to engage in pretend play, and talk more about desires. To illustrate using children's developing understanding of desire, being able to entertain multiple models of reality may enable children to mentally represent desires, rather than simply treating desires as 'relations to desired situations' (Perner, 1991, page 205). This change in representational capacity enables children to understand that not only may desires differ between people, but also that they may change.

Perner (1991) has also argued that children's demonstrations of empathy around the second year of life indicate an emerging understanding of emotions as 'mental'. In Perner's view, the transition to 'mental' entails an understanding that emotions refer to inner experiences, act as "a theoretical construct for understanding another's distress" and are intentional by virtue of their relation to other mental states such as desires, thoughts and knowledge. Children feel empathic toward one in distress because, with multiple models, they can now conceive of how a situation causes another person to feel sad, even though the situation does not make them feel sad. Finally, around 4 years of age, children move from being

able to have multiple models to understanding a model (representation) as a representation. For example, in understanding false belief children must represent the protagonist's representation of reality (the false belief), and understand this as a representation (i.e., must metarepresent).

Henry Wellman

Along similar theoretical lines, Wellman (1988, 1990) suggests that the central tenet in children's 'theory of mind' is a *'belief-desire'* psychology. On Wellman's account, older 2-year-olds start by viewing their social world in terms of a *simple desire* psychology. At this age, Wellman contends that most of children's social understanding centers around people's desires and not on their thoughts and knowledge. Thus, in a simple desire psychology (as described above in section 2.2.2), an older 2-year-old child may accurately predict that a person will stop looking for an object once they have found it and will feel happy. Where a simple desire psychology falls short is when a child needs to reason about the person's beliefs in order to accurately predict their desires, e.g., she wants bananas, she thinks bananas are in the red cupboard (bananas are actually in the blue cupboard), so where will she look? Using only a simple-desire psychology, a child will inaccurately predict where a person will search, because the child will reason using their knowledge about the banana's location (true state of the world). In this case, children need to move beyond their own knowledge about objects and events and frame another's desire using that person's beliefs about objects and events. Wellman proposes, in keeping with the notion that children's social understanding is comprised of a number of inter-related theories, that 3-year-old children begin to think about others' behaviour in terms of their beliefs and their desires when they come across unexplainable events (e.g., discovering that others may not like the same food that the child likes). This new naïve theory (*desire-belief* theory) allows children to occasionally appeal to others' beliefs to explain their actions. However, as naïve theorists they are

unaware of the power of this new theory. Evidence for this theory as a precursor to the fuller *belief-desire* theory is found in children's talk about desires, then beliefs, and eventually their talk about false beliefs (Bartsch & Wellman, 1995).

2.3.2 Modularity theories

Alan Leslie

In direct contrast to the notion that social understanding may *develop* as a representational theory of mind, modular accounts propose that the capacity to interpret people's behaviour as mentally construed is innate. Such accounts employ information processing models based on the concepts of modularity (i.e., have restrictions in information flow, are encapsulated, fast, domain-specific, Fodor, 1983).

One of the key problems identified by Leslie in trying to understand how children interpret the social world, is how children manage to attend to such abstract entities as mental states. Leslie asks "How is the young brain able to attend to mental states when mental states cannot be seen, heard, or felt? I call this the *fundamental* problem of "theory of mind" because if the child cannot attend to mental states, then how can he or she learn about them?" (Leslie, 2000, page 1235, emphasis in original). Leslie's solution to this problem is to propose that children are endowed with a piece of cognitive architecture known as the Theory of Mind Mechanism (ToMM), which deploys metarepresentations (M-representations) of mental states such as pretence, belief and desire. The mode of operation of such a mechanism is inherently supported by the 'principle' that people act to satisfy their desires on the basis of their beliefs (Leslie, Friedman, & German, 2004). Thus, the role of this mechanism is to 'direct attention to otherwise unattendable mental states and thus promotes learning' (Leslie, 2000, page 1238).

There are two points of difference in Leslie's theory compared to theory theories of mind. The first point is that the fundamental

components of children's social understanding are innate or genetically endowed. Consequently, Leslie is particularly interested (especially most recently) in how a cognitive architecture allows for the development of 'belief', which he sees as pivotal to children's mind understanding. In addition, he believes the particular cognitive processes that specify social understanding are domain-specific and therefore are not shared with other types of cognitive processing (e.g., general learning). As a result, Leslie's account is at odds with others who prefer to look at social understanding in infancy as initially more dependent on general learning mechanisms (Moore & Corkum, 1994; Perner & Ruffman, 2005). An advantage of his account in Leslie's view is that impairment in the ToM module can explain the selective impairment in social understanding found in autism. Leslie argues that if social understanding is based on a general theory of representational development then children with autism should be equally impaired on tasks tapping representation even when the tasks don't require an understanding of *mental* representation. As evidence for his view, he discusses the dissociation in performance on false-belief versus out-of-date photos (Zaitchik, 1990). Autistic children do better on the out-of-date photo task, thereby providing evidence that the difficulty they experience on false-belief tasks results from an impairment of the module concerned with social understanding in particular.

In conjunction with the modular component of mind understanding, Leslie also proposes another non-modular penetrable mechanism called the selection processor (SP) (Leslie & Thaiss, 1992) The purpose of this processor is to inhibit true belief default settings so that other types of belief scenarios can be entertained, e.g., false beliefs. Inhibition takes place by reducing the saliency of true beliefs and providing false beliefs as viable alternatives. Children's ability to cope with false-belief explanations at 4 years depends on the degree to which the selection processor has matured, and in particular, on their ability to inhibit reality. Leslie suggests that as executive inhibitory control develops, so does the ability to inhibit belief

default settings (Leslie et al., 2004). It seems therefore, that despite strongly arguing for a *domain-specific* module, dedicated to mind understanding, the SP is a more malleable mechanism, which directly influences performance and is thus open to more general maturational developments.

The focus of Leslie's theory is largely based around the development of belief, a feature of older children's theory of mind. Other researchers such as Baron-Cohen have built on Leslie's theory by proposing additional developmentally earlier mechanisms which feed into the basic ToMM (Baron-Cohen, 1994). Baron-Cohen's theoretical model includes the Intentionality Detector (ID), the Eye-Direction Detector (EDD) and the Shared Attention Mechanism (SAM). These first two modules build dyadic representations of behaviour such as the intentional reading of actions as goals and representations of eye behaviour as 'look' or 'see'. The ID and the EDD feed into the SAM forming *triadic representations,* which coordinate dyadic representations, such that eye-direction is read in terms of an agent's intentions and desires. At this point, the SAM coordinates with Leslie's ToMM (above) to trigger or deploy the necessary mental states.

2.4 Simulation theories

Paul Harris

Alternative theoretical explanations for social understanding have proposed that children's developing understanding of the mind arises from an improvement in their ability to simulate or imagine a person's desires, thoughts, or knowledge (Harris 1991, 1993; Johnson 1988). Rather than formulate theories about people's behaviours based on their mental states, simulationists argue that children will interpret others' mental states on the basis of simulating within a current reality. To use desire as an example, the simulation is purported to work from the basis of the child's own default settings of their current intentional stance towards the desired object or state of affairs and the current state of the world as known to the self. By over-riding the default settings (the child's own mental states

regarding the world), the child is able to predict how a person will behave towards a certain desired object. For example, if a person smiles towards a piece of broccoli, the child over-rides her default setting which specifies her attitude towards broccoli (loathing) and simulates how wanting a piece of broccoli would lead one to seek broccoli. The more default settings the child needs to over-ride, the more complex the simulation. For example, if a child observes a person reaching for something which they mistakenly think is something else, not only do they need to simulate the person's desire towards this object but also the person's belief regarding the object's identity. In this case it is both the desire (e.g., for broccoli) and the belief (e.g., that it is broccoli) that lead the person to reach for something that is in fact not broccoli.

An important feature of simulation is that it operates on the basis of an analogical model of reasoning. That is, the child uses her own model of reality as a starting point from which to simulate others' realities. The degree to which children become better at over-riding default settings determines whether they can accurately interpret people's actions.

2.4.1 Hybrid Theories

More recently, some have suggested we use a combination of simulation and theory in understanding others. Nichols and Stich's (2003) theory consists of a cognitive architectural model in which components of that model (e.g., desire module and belief module) are information rich (theoretical) but also operate using integrated and planned simulation.

Their model consists of two systems: In their early mindreading system they have Desire Detection Mechanisms, which enable children to detect goal-directed behaviour and to allow them to formulate beliefs about others' desires. They propose that these mechanisms are partly innate but also that they are enriched by children's learning of the behavioural cues which are associated with various goals. Such desire attribution strategies include: detecting facial expressions, what target says, what others say

about target, and generalizing from one's own (self) behaviour to explain others' behaviour. The other component of this early system is the Planner. The Planner helps determine a plan of action, that is, helps determine how desires are best satisfied. The Planner works using a type of simulation in which the processing mechanism is taken off-line and pretend inputs are fed into the system. The final component is the Mindreading Coordinator, which generates predictions about the future behaviour of the target. The second system includes a mechanism for overriding default belief attributions (attributions the child would make by default), which enable the child to modify their default model of the target's beliefs.

Plaut and Karmiloff-Smith (1993) propose a view that integrates all components of the three theories described above. The main idea is that children's capacity to deal with conflicting evidence (such as in a false belief task) depends on the gradual development of their symbolic representations, which can over-ride conflicting perceptual experiences. Thus, children use simulation to the extent that they gradually understand intentionality through experience but alongside the increasing capacity to use symbolic representations. Language development is critical in this regard in that it supports symbolic representation, thus over-riding any conflict with direct perceptual experience.

2.4.2 Summary

The theories described above provide closely articulated views on the internally driven development of a child's social cognition, whether it be through a developing representational capacity, an innate modular system, or simulation ability. The point of difference in these theories is the extent to which they assign a role to learning and social experience in the development of social understanding. In the following section I consider another group of theories that focus on children's developing social cognition from the standpoint of their social experience rather than their individual mental state development.

2.4.3 Social-constructivist views

The most extreme social-constructivist viewpoint is expressed by Katherine Nelson who claims that: *"the individual child constructs representations – of the real experience world, of desired states, of pretend worlds, of others' worlds – and that these representations are from the beginning constructed in collaboration with social others, adults and peers"* (Nelson, 1996, page 351). Specifically, children construct representations of their world with the support of the structured environment provided by caregivers. This may begin in the early stages through shared mimetic activities evident in early play, which help children understand the roles and perspectives of different social participants. As children get older and they acquire language, they are now in a position to gain knowledge about their own mental states and also others' mental states. What is central to Nelson's ideas is that the enculturation process the child engages in allows her to achieve through *language* "shared meanings of the community".

Other researchers such as Carpendale and Lewis (2004) have distinguished their own social-constructivist theory from the notion of 'passive enculturation' (i.e., the passive adoption of cultural norms). They state that *"concepts of the mind are not just passed on from the social group, nor are they completely formed by individual child-theorists. Instead, children gradually construct social understanding through the regularities they experience in interacting with others"* (Carpendale & Lewis, 2004, page 84). This view focuses on the triadic relationship between the child, others and an object. Central to this theory is the idea that children gradually learn through practical experience (rather than theoretical formulation) about their relationship to people and objects. Within the first year of life, children develop shared social practices, such as joint attention, pointing, requesting, which facilitate the early stages of social understanding. These precursors then support the development of language, which in turn assists in mind understanding.

Along these lines, socio-pragmatic views suggest that children who engage more frequently, and in qualitatively better, linguistically mediated social situations are assisted in their learning of others' minds. These ideas are brought into focus most clearly in studies of deaf children's theory of mind abilities, in which signing deaf children who have been brought up in signing homes had better theory of mind abilities than signing deaf children born to hearing parents (Peterson & Siegal, 1999). What this social interaction affords is the understanding of perspective, specifically, that the perspective required to understand others' points of view is linguistically mediated. Similar views are expressed by Harris (1996) and Lohmann, Tomasello and Meyer (2005) who suggest that the perspective-shifting role of conversation helps children to learn about the mental states of others.

Thus, much of the theoretical framing of this research can be broadly viewed within Vygotsky's thesis that society and culture play an important role in facilitating the acquisition of higher order mental functioning (Astington, 1996; Vygotsky, 1978). In particular, the cooperative task of conversation enables the child to internalise ways of thinking through exposure to conversation about mental states and 'thinking' with adult partners (Symons, 2004; Nelson, 1996). Indeed, research with older preschoolers suggests that parental use of mental state language plays an important role in the development of false-belief (Cutting & Dunn, 1999; Meins & Fernyhough, 1999; Ruffman et al., 2002), emotion (Dunn et al., 1991), and general theory-of-mind (Ruffman et al., 2002) understanding. I consider in more detail the role of mental and non-mental state language input in the next chapter.

2.5 Chapter Summary

To summarise, social understanding in children consists of several components, typically assumed under the rubric of a 'theory of mind' and a variety of theories have been proposed to account for children's developing understanding of these components. In the next chapter, I focus on the role

language plays in facilitating children's social understanding, with particular focus on the role of maternal input. I consider how maternal input might relate to children's developing social understanding, specifically their use of mental state language and their understanding of emotion). I also propose a hypothesis for how maternal input and children's social understanding fits into the theoretical landscape described earlier and finally I present the goals of this thesis.

Neither can embellishments of language be found without arrangement and expression of thoughts, nor can thoughts be made to shine without the light of language.

Cicero

"Talking helps me think"

Gabrielle (aged 5) to Mia (aged 5)

Chapter 3 The Role of Language in the Development of Social Understanding

When one thinks about the mind, and refers to another's mind it seems impossible to do so without language. This has led many researchers to consider more deeply the influence language has on a child's developing conceptual understanding of the mind.

The overarching aim of this chapter is to present a theoretical framework for how maternal language of the mind assists in children's later social understanding. To this end, I present three aims: (1) to examine studies which address the relation between children's developing linguistic competence and theory of mind; (2) to examine language contexts which could account for individual variation in children's social understanding; (3) to identify social and cognitive mechanisms which may underlie this relation.

3.1 Is there a relationship between children's language ability and social understanding?

Converging evidence from a wide range of studies attests to a clear relation between a child's language ability and social understanding (see Astington & Baird, 2005 for summaries). Cross-sectional correlational studies indicate that general language ability, as indexed by a variety of measures such as the Test of Early Language Development (TELD), verbal subsection of the Stanford-Binet IQ test, the Peabody Picture Vocabulary Test (PPVT) and the Bus story, co-varies with false-belief task performance (Jenkins & Astington, 1996) as well as emotion understanding (Cutting & Dunn, 1999). Furthermore, certain longitudinal studies also suggest a causal role for language, in that measures of children's general and mental state language correlated with later measures of social understanding, including false-belief tasks and emotion understanding tasks (Astington & Jenkins, 1999; de Villiers & Pyers, 2002; Ruffman et al., 2002; Ruffman et al., 2003). Therefore, although it is clear that a child's linguistic competence relates to children's performance on social understanding tasks, researchers differ in their theoretical interpretation of the mechanism underlying this relation. To follow, I will consider in some detail theoretical explanations and corresponding empirical evidence for such a relation.

3.1.1 Linguistic determinism

There are two versions of the view that language plays a role in the development of social understanding. The first view is that syntactic competence in general assists in theory-of-mind development (Astington & Jenkins, 1999). They argue that the syntactic or structural components of language help the child to keep track of the conflicting perceptual reality (what the child knows to be true) and another's representation of reality (what another thinks to be true). Evidence for the relation between syntactic ability and children's false-belief understanding comes from a longitudinal study in which 3-year-old children were tested on measures of

language (TELD) and false belief (unexpected transfer and appearance reality). Children's syntactic (rather than semantic) ability as measured on the TELD contributed independently to children's later false-belief task performance. Yet Ruffman et al. (2003) argue that Astington and Jenkins did not really dissociate syntax from semantics in the test items. Therefore, their study leaves open the question of whether both types of language are influential for later false-belief understanding.

The second view is that children's ability to use syntax and semantics is important for understanding false belief. In English, mental state verbs such as *think* and *believe* are special in that they take a tensed complement, (e.g., she thinks that the flower is red) and mastery of these syntactic constructions occurs around 4 years. De Villers and Pyers (2002) and Hale and Tager-Flusberg (2003) argue for a causal relation between the acquisition of *object* and *sentential complements* and the development of false-belief understanding, such that the embedded proposition allows children to *represent* the different spatial arrangements found in a false belief test. Therefore, in using an object complement, children are maintaining the overall truth-value of the sentence while asserting a false proposition (Maxi thinks that the chocolate is in the box). de Villiers and Pyers claim that it is this ability to take prepositional attitudes which enables a child to represent states that are different from reality, (e.g., belief or desire about a proposition).

Evidence for this view comes from a longitudinal study (de Villiers & Pyers, 2002) in which children's memory for tensed complements was related to children's later theory of mind. Hale and Tager-Flusberg (2003) also provide evidence that training in sentential complements increased scores on false-belief tasks and not vice versa. However evidence against an exclusive role for sentential complements can be found in the German language, in which sentences containing 'want' must take (like belief) a 'that' complement (e.g., she wants that Andrew goes to bed). Perner, Sprung, Zauner and Haider (2003) have demonstrated that despite 'want'

taking the same complement structure to 'think', German-speaking children perform significantly better in tasks which require them to remember or infer something that a person *wanted* as opposed to something they *said* or *thought*. Furthermore, in a different training study, 4-year-old children improved in their false belief understanding not only when they were trained in the syntax of sentential complements but also when trained in non-mental state discourse which highlighted the deceptive nature of objects (Lohmann & Tomasello, 2003).

3.1.2 Both syntax and semantics assist theory of mind

Other researchers have argued that language in general (that is both syntactic and semantic competence) assists children's theory of mind by acting as a representational symbolic medium that enables them to make explicit, underlying implicit theories about the mind. In a critique of Astington and Jenkins (1999), who argued that syntax specifically assisted theory of mind (see above), Ruffman et al. (2003) found that both general measures of syntax and semantics rather than syntax specifically, related to children's theory of mind task performance, when children's syntax versus semantics was assessed more stringently. Children's general language skill evolves through conversations with their parents (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Snow & Ferguson, 1977; Weizman & Snow, 2001). Parent-child conversations facilitate child language (syntactic and semantic development) but also teach them directly about mental states when parents use mental state language (e.g., Ruffman et al., 2002). It isn't clear, therefore, whether it is the general language that helps theory of mind, or the equally developing mental state knowledge children acquire through conversation that helps their performance on theory of mind tasks.

3.2 The relation between language in the child's environment and the development of social understanding

The first two views described above - child syntax as a facilitator of theory of mind versus general language as a facilitator - take as their initial stand point the developing linguistic abilities of the child in relation to their developing social understanding. Another view emphasizes the mental and non-mental state language that children encounter in their social environment and how this might facilitate theory of mind.

Parents use internal state terms when speaking to their children from a very young age. Desire language such as 'want' is the most frequently used term (Smiley & Huttenlocher, 1989), with references to 'think' and 'know' increasing with age (Beeghly, Bretherton, & Mervis, 1986; Ruffman et al., 2002), although the proportion of desire terms to think and know terms may vary considerably for individual children (Bartsch & Wellman, 1995). References to pleasure and distress are the most frequently occurring emotion terms (Brown & Dunn, 1991; Dunn et al., 1987; Dunn et al., 1991; Smiley & Huttenlocher, 1989). Given that caregivers talk about mental states to their children from a very young age, the relation of this talk to the later acquisition of mental state language and social understanding is of interest. I first consider the relation between mother mental state talk and later social understanding in older children. In line with the general definition of social understanding, the studies reported examine a range of aspects of social understanding including false belief, emotion understanding, and mental state language.

3.2.1 Maternal input and theory of mind in older children

Dunn, Brown, Slomkowski, Tesla and Youngblade (1991) demonstrated a relation between caregiver use of feeling and emotion

language directed at 3-year-old children (in a naturalistic home context) and recognition of emotion in an affective-perspective taking task three years later. This relation was independent of children's initial language levels, as measured by mean length of utterance (MLU) and the frequency of overall mother talk. What this study does not report is the relation between caregiver use of emotion and feeling language and later child success on the emotion task after partialling out child feeling talk at Time 1. As child feeling state talk at Time 1 was found to be a correlate of later success on the emotion understanding task, it is plausible that the relation between mother emotion language and later child emotion understanding is not a unique relation (i.e., is mediated by children's Time 1 talk about feelings).

References to specific mental state terms have also predicted later child performance on theory of mind tasks (Ruffman, et al., 2002). In this study, mothers' use of 'think' and 'know', modulations of assertions, and desire terms directed at 3-year-olds, correlated with later performance on theory of mind tasks. Additionally, although this study showed that mother mental state language in general related to a child's later mental state language, the unique variance attributed to individual mental state terms on child mental state language was not reported.

Furthermore, the measure of children's mental state language was taken within the context of mother-child talk, and therefore it is difficult to remove the reciprocal influence of mother talk about the mind and a child's talk about the mind.

In much older children, de Rosnay, Pons, Harris, et al. (2004) found a relation between the proportion of mental attributes mothers used when describing their children (presumably reflecting a propensity to talk more about the mind) and children's ability to pass tasks tapping belief-based emotion understanding. Nevertheless, in this study measures of mother and child language were taken at the same time point so that the direction of cause could not be examined. This leaves open the possibility that other

aspects of the child's language abilities may affect the way mothers talk about their children. As Harris (2005) points out, however, examining mothers' tendency to talk about the mind outside of the communicative context in which children's mental state language is assessed, provides additional validating information about mothers' propensity to talk about the mind in general and children's later social understanding. In explaining the finding, Harris (2005, p.72) appeals to a pragmatic explanation in which "mothers disposed to talk about varying individual beliefs regarding a given situation will probably also articulate the feelings that flow from those individual beliefs".

3.2.2 Maternal input and theory of mind in younger children

Meins et al. (2003) examined maternal language directed to babies. They found that mothers' 'appropriate' (that is comments which accurately reflected the child's mental states) but not inappropriate mind-minded comments to 6-month-olds, predicted child performance on a false belief task at 45 to 48 months of age. Such a relation, however, may not be unique in that mothers' mind-minded comments in combination with non-mind-minded comments (which were not reported), could also be indicative of a mother's propensity to engage in conversation, which in turn may be facilitative in developing an awareness of others' minds (Harris, 1996).

Other research has examined the relation between mother mental state language to young children and later emotion understanding. Beeghly et al. (1986) found a positive relation between the frequency of mother internal state language (six categories including perception, physiology, affect, moral judgment/obligation, cognition, volition/ability) at 13 and 20 months, and child mental state language, child general language understanding (PPVT), and performance on the emotion language recognition test (ELRT) at 28 months. In light of the finding that

mother internal state language correlated with children's later *general* language ability, it is difficult to specify a unique relation between mother internal state language and later child *mental state* language. This thesis examines this issue more closely.

3.2.3 The role of siblings and theory of mind development

Further evidence that the input children receive is important for later social understanding comes from studies which show a relation between birth order and false-belief tasks (Brown, Donelan-McCall, & Dunn, 1996; Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994; Ruffman, Perner, Naito, Parkin, & Clements, 1998). Although there is some dispute over whether this effect is only found with older siblings or both older and young siblings (Peterson, 2000), what is clear is that irrespective of a child's language ability, siblings account for additional variance in false-belief understanding, although the effect appears stronger when children have poorer language (Jenkins & Astington, 1996). Thus, the important theoretical contribution these studies make is that sibling talk potentially assists in developing representational capacity by providing contexts such as conversation or pretend play in which the vast majority of mental state talk between peers and siblings occurs (Brown et al., 1996), which highlight the differences between thoughts, knowledge and desires. Maternal responses to children's arguments also provide opportunities to highlight differences in view and causes of disagreements underlying these attitudes (although see Cutting & Dunn, 1999 and Cole & Mitchell, 2000 for evidence that such tendencies may be specific to mothers in higher socio-economic groups).

3.2.4 Is there something special about mental state versus non-mental state language?

The studies described above provide persuasive evidence for a relation between the amount of mental state language mothers use and

children's social understanding. Given however, that parental input has been shown to relate closely to the order of acquisition of children's general vocabulary items (Huttenlocher et al., 1991), this begs the question of whether children's acquisition of mental state terms differs from that of their non-mental state vocabulary. Of particular interest, therefore, is the effect of other types of mother talk on a child's later social understanding. This is difficult to test since other measures of mother language linked to child false belief understanding have often likely contained references to mental states, e.g., causal talk and quantity of talk (Dunn et al., 1991).

Ruffman et al. (2002) did examine mothers' non-mental state language with 3-year-olds, such as causal talk, factual talk and linking talk (linking pictures to the child's own life). They found that these three types of mother talk did relate to later child theory of mind even after accounting for theory-of-mind performance at the earlier time point, but not after accounting for mother mental state talk at the earlier time point. In contrast, after accounting for early mother non-mental state talk, mothers' mental state talk was still highly correlated with children's later theory of mind.

3.2.5 The relation between mother theory of mind ability and children's theory of mind ability

3.2.6 Summary

Taken together, the studies described in section 3.2 suggest that although there is clearly some relation between mother talk about mental states to young children and a variety of measures of social understanding including, emotion understanding, false belief and mental state language, it is not always clear what mechanisms drive such a relation. Below I describe and evaluate in more detail various proposals in the literature, which attempt to elucidate the precise nature of the relation between mother use of mental state language and children's later social understanding.

3.3 Social and cognitive mechanisms underlying the relation between mother mental state input and later child social understanding

3.3.1 Mind-mindedness: Elizabeth Meins

The central focus to Meins' thesis is the concept that the development of intentionality in children is aided by mothers' 'proclivity to treat one's child as an individual with a mind' (Meins & Fernyhough, 1999 p.363). Termed *mind-mindedness,* this concept arose out of earlier findings that individual differences in mothers' propensity to treat their children's early vocalizations as meaningful or to describe their children in mentalistic terms, related to young children's early vocalizations and performance on a false belief and emotion task (Meins, 1998; Meins & Fernyhough, 1999). This concept of *mind-mindedness* has proved to be extremely helpful for conceptualizing ways in which early input from mothers can affect children's later social understanding. Indeed, as described above, studies with infants have shown a relation between mothers' appropriate mind-mindedness at 6 months (comments which accurately reflect the child's mind) and children's later false belief performance. Furthermore, in a pathway analysis of her findings, Meins et al. (2003), showed that the relation between mothers' mind-minded comments to infants and their theory of mind ability at 48 months was direct, that is, not mediated by mothers' later mind-minded comments about their child (at 48 months). Indeed, mother mind-minded comments used to describe their children at 48 months did not predict children's theory of mind ability.

Meins (2002) has suggested that the way in which mind-mindedness may affect later representational capacity is that it may reflect a 'scaffolding context' (p. 1724) in which infants' behaviour is connected to mental state comments which bootstrap infants' understanding of others in mentalistic ways. One important issue is to link Meins' findings of a relation between

mother appropriate mind-minded comments and later theory of mind, with the findings that mother mental state talk with 3-year-olds helps later theory of mind performance (described above). Examining this transition may help may yield clues to how mother input may scaffold a child's developing capacity to represent others' thoughts and beliefs. Thus, for example, individual differences in maternal mind-mindedness (at a time when children are not using language) may persist as the child becomes more linguistically able, but become manifested in other contexts such as mother-child conversations. Moreover, mothers' mind-minded and non-mind-minded comments might reflect a general tendency to talk and engage in conversations with their child. Such conversations have been highlighted by Harris (1996; 2005) as an avenue through which children can learn about the mind. I discuss these ideas in the next section.

3.3.2 Conversation and points-of-view: Paul Harris (1996)

The focus of Harris' thesis is that developing conversational skills enable the child to move from initially viewing people as 'agents with goals' to being 'epistemic subjects capable of exchanging information for the formation and updating of beliefs' (Harris, 1996, p. 209). Although this view is one in which the child is driving the course of change, it does highlight an important aspect of the input and that is conversation. Harris states: *"...conversational discourse can be a vehicle for conveying the fact that people differ in their point of view and in the information that they have available to them, irrespective of whether a particular party to the conversation makes any explicit lexical reference to any given mental state."* (Harris, 2005, page 75).

Harris' ideas developed in response to the observed lag in children understanding desire before belief (Bartsch & Wellman, 1995). Along similar lines, Lohmann and Tomasello (2003) demonstrated in a training study that children's performance on false belief tasks benefited from

exposure to perspective shifting discourse which did not include mental state verbs (e.g., What is this? What is it really? Right it is a Y).

How does one reconcile the importance of other points-of-view as afforded by conversation for the development of belief, with the findings of those such as Meins et al. (2002) that language directed at very young children assists in later false-belief understanding? Recall that Meins et al. (2002) found that mothers' comments to infants were made when infants were 6 months of age, at a time when they were not able to engage in conversation. Thus, appropriate mind-mindedness could be construed as comments, which reflect the child's point of view, that is through the eyes of their mother. This alternative construal of mind-mindedness, (i.e., that it involves comments reflecting the child's point of view), may provide an explanation for why Meins was unable to find a persisting relation between later maternal mind-mindedness and social understanding when she examined maternal mind-minded comments at 48 months of age. It may be that only focusing on the child's points of view is less helpful and that focusing on the perspective of others becomes increasingly important for deepening social understanding.

Below, I combine ideas from both Meins and Harris in proposing a theoretical framework in which I attempt to explain the development of maternal input as children grow older.

3.4 Mother input as scaffolding

In addressing the mechanism that underlies the relation between mother use of mental state language and children's later understanding of the mind, some researchers have referred to the scaffolding nature of mother talk about the mind (Fernyhough, 1996; Meins et al., 2002). Others have argued that mother talk about the mind introduces children to different perspectives on a single situation, which helps them to learn about mental states (Harris, 1996). Still others have argued that children

gradually acquire a social understanding through their experience of social interaction (Carpendale & Lewis, 2004).

The common thread in these ideas is their stress on the importance of social experience. I expand these ideas by proposing a theoretical framework that borrows from Vygotsky's zone of proximal development and builds on current social-constructivist theorising (Astington, 1996; Carpendale & Lewis, 2004; Symons, 2004). I will briefly summarise this position, then in the following sections I bring together the theoretical and empirical basis for these ideas.

The first component to my proposal is that the incremental and differential exposure to specific mental states, first desire and then belief, allows the child to build on and deepen existing knowledge of their own and others' minds. The second component is that talk about the *child's* mental states is a crucial first step in introducing language about the mind before talk about *others* becomes important. The successful interplay of these two components depends critically on the zone of proximal development in that the advantage obtained from exposure to certain mental state terms, such as desires versus beliefs, and to the self before other, depends on the timing with the child's current level of mental understanding and conversational competence (Harris, 1996, 2005). Specifically, for children to receive maximum benefit from mother talk, the talk must be appropriately timed to fit with the child's existing understanding. When mothers' talk of this nature is initially introduced at a level above (but not too far above) the child's current level of understanding, it is most beneficial to the child (and understood implicitly). As these concepts become internalized through increased exposure and through the child's use of such terms, the understanding becomes increasingly explicit.

As discussed earlier in section 2.2.4, understanding of false belief may initially be implicit. Three-year-olds look to the correct location when anticipating a story character's return, yet incorrectly predict the location

the story character will return to when explicitly asked (Clements & Perner, 1994; Garnham & Ruffman, 2001; Ruffman, Garnham, Import, & Connolly, 2001). Such researchers have argued that children's initial understanding of mind is implicit, and that language enables explicit understanding (e.g., Ruffman, 2000) and can make explicit the differences and similarities between self and other (Nelson, 1996). Similarly, researchers have argued that primates cannot have an explicit theory of mind because of their language deficit (Smith, 1996).

3.4.1 The zone of proximal development: Vygotsky

Vygotsky's zone of proximal development has generally been conceptualised as a learning tool within a problem-solving paradigm. Caregivers scaffold the child's learning by providing alternative perspectives on achieving a task, which the child can readily assimilate in the quest of achieving a goal. Such caregiver's collaboration allows the child to participate in problem solving which they later come to fully understand, that is, parents introduce concepts that are slightly above the child's ability (Rogoff & Wertsch, 1984; Vygotsky, 1978). A defining feature of Vygotsky's theoretical constructs in general is that the direction in which children develop higher order mental processes arises initially at a social (or *interpersonal*) level before being internalized at an individual (or *intrapersonal*) level. For this reason, it seems reasonable to consider how mother talk within a social context could facilitate children's own understanding of the social world in general.

With these ideas in mind, the zone of proximal development provides a basis for understanding how mothers' talk might help children learn about mental states. Caregivers scaffold the child's learning by introducing mental state concepts that are slightly above the child's ability. Thus, I suggest that mothers' responses to very young children's goal-directed actions (e.g., reaching for a rattle) must also correspond with the appropriate level at which the child is operating. Typically, explicitly

referring to desires that underlie such goals (e.g., "You want the rattle?") provides a more tangible reference to a common underlying mental state than would a reference to the child's knowledge or thinking in this instance (e.g., "You know about the rattle"). In addition, desires are often accompanied by facial expressions and actions making it easier to make inferences about others' desires than knowledge or beliefs (Bretherton & Beeghly, 1982). Furthermore, the infant's existence is mediated to a large extent by the ongoing fulfillment of desires, making desires highly salient to them. Therefore, although the mental state label which the mother provides may not necessarily assist the child at that moment in achieving the goal (e.g., reaching for a rattle), it establishes a bridge between the external world and the child's internal mental world such as their emotional responses (Meins et al., 2002; Vygotsky, 1978).

Likewise, the idea that parents can assist learning by introducing concepts slightly above the child's ability would suggest that once talk about desires has been established, parents will identify that children will benefit more from talk about thoughts and knowledge. In line with these views, Brown and Dunn (1991) found that the nature of the conversational context in which children were exposed to desire terms (e.g., didactic/controlling, such as controlling the child's behaviour) was much more salient than the context for belief/knowledge terms (non-controlling/commentary, such as discussions or narratives). Without that added saliency of the pragmatic context, Brown and Dunn suggest this puts extra demands on the child's capacity to understand beliefs.

3.4.2 Early Social Understanding: Why might exposure to desire initially be more important than exposure to thoughts and knowledge

Many studies over the past 20 years attest to the young child's emerging understanding of the mind, for instance, as evidenced in their use of mental state language which reflects their own and others' genuine

mental states (Bartsch & Wellman, 1995; Shatz, Wellman, & Silber, 1983). A feature of this early mental understanding exemplified in various naturalistic and experimental conditions is the lag between a child's understanding of desire and belief. Not only is this evident in their use of desire and feeling language before think/know language (Bartsch & Wellman, 1995; Bretherton & Beeghly, 1982; Brown & Dunn, 1991), but also in their ability to predict how people will behave or feel based on their desires (Wellman & Woolley, 1990) and their ability to remember their own desires before their beliefs (Gopnik & Slaughter, 1991). Drawing on theoretical explanations for this phenomenon described in section 2.3, 'theory-theories' suggest that desire is understood before belief because children do not need to understand desires as representations (Perner, 1991; Wellman, 1990) and because children do not need to understand belief in order to successfully understand some desires (Wellman, 1990). In Perner's terminology, understanding others' desires requires a transition from a single updating model of reality in which only the current reality can be represented, to the ability to conceive of multiple models of reality (e.g., the child's desire versus someone else's desire). The earliest age group examined in this study (15 months) would purportedly be around the transition period between these two systems. My interest is thus in how mother talk about desires first, and then beliefs next, can potentially play an important part in facilitating this transition.

As outlined in the previous chapter, some of the earliest developing theory-of-mind insights include an understanding of intentions and goals, although it is not clear whether infants understand intentions/goals as relations to objects/behavior (Gergely, 2003; Perner & Ruffman, 2005; Phillips & Wellman, in press; Ruffman & Perner, 2005) or mentalistically (Meltzoff, 1995; Woodward, Sommerville, & Guajardo, 2001) (see section 2.2.1 for discussion). Two possible hypotheses emerge from these alternate views of infants' early understanding of intention. The first hypothesis is that if infants initially understand goals in terms of actions/behaviors as

they relate to a situation, rather than as they relate to others' intentions, then mother desire talk may provide infants with their first implicit introduction to mental states. Alternatively, if infants initially understand others' goals as relating to mental states such as desires, then mother talk about desires may help deepen this already underlying implicit understanding. Desire talk (e.g., "You want the rattle?") would help to provide a common underlying cause (wanting) for otherwise differing actions (e.g., *reaching* for a toy, *looking unhappy* when the toy is out of reach, *crying* when the toy falls from grasp, looking *happy* when obtaining a toy), which builds on an underlying appreciation of desire/intention.

Consistent with these ideas, previous research demonstrates that caregiver use of desire terms (specifically 'want') is much more frequent than other internal state terms (Smiley & Huttenlocher, 1989), and references to 'think' and 'know' increase with age (Beeghly et al., 1986; Ruffman et al., 2002) although the proportion of desire terms to think and know terms may vary considerably for individual children (Bartsch & Wellman, 1995). References to pleasure and distress are the most frequently occurring emotion terms (Dunn et al., 1987; Brown & Dunn, 1991; Dunn et al., 1991 Smiley & Huttenlocher, 1989). Furthermore, Bartsch and Wellman (1995) demonstrated that a mother's references to desire terms predicted a child's first references to belief. What I propose is critical is that the learning context that enables very young children to gain an implicit understanding of mental states occurs within children's very early action sequences. To follow, I expand on how operating within a zone of proximal development may assist in this transition between goal/action-directed behaviour and early appreciation of mental states.

3.4.3 Referring style of mothers: The child versus others

A potentially important feature of understanding the social world is the idea of self/other equivalence (Moore, 1996); that is, in understanding

the psychological relations that exist between people and objects, one also understands that the desires, thoughts and feelings someone experiences are equally applicable to oneself.

Most proponents of the theory-theory claim that young children are equally able to attribute mental states to themselves and to other people (Gopnik & Meltzoff, 1994). Evidence for this claim comes from the finding that children do equally well explaining or describing others' beliefs, desires or perceptions as they do their own such mental states (Wellman et al., 2001) An alternative view is that children understand the mind through simulation, that is, through imagining how they would feel if they were in another person's circumstances. One version of this view holds that children require privileged access to their own mental states before that knowledge can be used to predict others' mental states (Harris, 1991; Johnson, 1988). There are empirical precedents for these ideas in children's understanding of action verbs (Huttenlocher, Smiley, & Charney, 1983) and pretence (Mitchell & Neal, 2005) and in the relation between mirror self-recognition, personal pronoun use, and pretend play involving others as well as self (Lewis & Ramsay, 2004).

More recently, as described above, researchers have argued for some combination of simulation and theory in understanding others (Nichols & Stich, 2003). For these reasons, infants' insight into their own mental states might be particularly important, along with mothers' talk about the infants' (as opposed to others') mental states. There is another related reason for thinking that talk about the child's mental states will be particularly important in very early social understanding. As discussed above (section 3.4), children's initial understanding of mind seems to be implicit. When children are very young, and language abilities are very rudimentary, mother talk about mental states might provide the first opportunity to *begin* to think explicitly about mental states such as desires or emotions. Moreover, when language is first beginning, talk about the infant's own mental states might provide them with the first opportunity to think

explicitly about the internal experiences associated with their desires or emotions. Again, talk about someone else's desires or emotions will only provide a means of labeling the other's facial expression or actions, but not a means of understanding the underlying mental states if infants have never connected their own such states with mental state words. Such an infant would have no reference point with which to understand that internal states accompany the mental state word mothers have used in conjunction with another person's facial expressions or actions.

For these reasons, I propose that initially at least, before language has really become established, understanding the self (through mother talk about the child) is an important first step in understanding others' minds. Consistent with this idea is evidence that not only do young children talk more frequently about their own desires and emotions (Dunn et al., 1987; Smiley & Huttenlocher, 1989; Wellman, Harris, Banerjee, & Sinclair, 1995), but also that mother desire and emotion talk refers more frequently to the child's rather than others' mental states (Baldwin, 1991; Bates & Goodman, 1999; Beeghly et al., 1986; Smiley & Huttenlocher, 1989; Dunn et al., 1987, Meins et al., 2002). Therefore, at an early age mothers' mental state language which takes the child as its referent provides a context in which children can begin to make connections between their behaviour and underlying mental states (Meins et al., 2002; Harris, 1996).

3.4.4 Section Summary

To reiterate, in line with the zone of proximal development, I suggest that with very young children who are just beginning to talk, mothers who refer to the child's rather than their own desires, emotions and thoughts will likely better engage the child at a level in which they can understand and participate in the conversation. As conversation develops, mothers' language becomes a tool helping children to deepen their mental state understanding through exposure to others' mental states. Thus, I argue that as children establish greater self-awareness and knowledge of

their own mental states, referring to others' mental states becomes important. This idea is consistent with evidence that mother talk about others' thoughts, feelings and desires increases from 24 months of age (Booth, Hall, Robison, & Kim, 1997; Brown & Dunn, 1991). It is also consistent with evidence that the presence of siblings relates to children's later success on theory of mind tasks, because siblings provide opportunities for children to learn how others' desires, thoughts and feelings may differ from their own.

These ideas provide a framework for understanding why mothers and children talk more about the child initially, which until now has been unexplained or at least not linked to children's subsequent social understanding. They also help to flesh out social-constructivist views of how children might acquire a theory of mind (e.g., Carpendale & Lewis, 2004), and findings that most variance in false belief understanding is explained by environmental rather than genetic factors (Hughes et al., 2005). If children's theory of mind is not innate, but is constructed through social experience, then an important question is whether they have to discern all structure in the social input they receive, or whether the input is partly structured for them. Mothers might provide much of the structure by talking mainly about the child's rather than others' mental states, and by talking about desires which are typically more salient for children than thoughts or knowledge and typically have a more obvious external manifestation (i.e., facial expression). If so, the onus on the child is reduced and learning about mental states becomes a more tractable problem. Furthermore, in this way the development of social understanding would parallel the child's general language development. Mothers also structure their general language input in that initial language ("motherese") is higher in pitch, includes many gestures (e.g., pointing) when for instance labeling objects, includes exaggerated intonation contours, high affect, and greater articulation of vowels (e.g., see Snow & Ferguson, 1977).

3.5 Hypotheses

In summary, the overarching aim of this study was to examine two hypotheses related to the zone of proximal development. First, I argue that the incremental and differential exposure to mental state language - first desires, then knowledge and thinking - during a child's early years, may reflect a zone of proximal development in which maternal talk about one type of mental state (such as desires or emotions), which emerges early, may assist in the understanding of other types of mental states as well as mental life in general. Second, I argue that references to the child's mental states are initially more important than references to others' mental states.

3.6 Goals

There were three goals in this study. I examined how the proportion of specific mental state terms (such as desires, emotions, thinking/knowing) mothers used differed at each time point and changed between 15, 24 and 33 months. Consistent with Vygotsky's "zone of proximal development" construct and with previous research (see above), I hypothesized that mothers would talk more frequently about desires when children were younger and that this would change over time, with talk about beliefs (thoughts and knowledge) increasing. This would be likely because, as mentioned above, the infant's existence is mediated to a large extent by the ongoing fulfillment of desires making desires highly salient to them, because desire talk in early infancy is often accompanied by facial expressions and actions making it easier to make inferences about others' desires than knowledge or beliefs, because mother talk about desires is more frequent than other types of mother mental state talk, and because it might help scaffold already existing strengths in the child (see above).

Second, I examined the relation between mother mental state language at 15 and 24 months and two indices of child social understanding at 24 and 33 months (mental state language and emotion

task performance), partialling out several potentially confounding variables including all earlier child language, mother socio-economic status, mother's own emotion understanding, and other types of mother language such as non-mental state language (Cutting & Dunn, 1999). I examined children's emotion task performance in addition to their mental state language because theory of mind has been operationalized using both types of measures (Bartsch & Wellman, 1995), because emotion is one of the earliest developing aspects of children's social understanding (see section 2.2.3), and because I wanted to examine whether mother mental state language had a *general* relation to child language and task performance or a more specific relation to child mental state language. Furthermore, by partialling out mothers' own emotion task performance, I could examine whether it was truly the things mothers said that were related to child social understanding, or that mothers who used mental state language also had better social understanding themselves and passed this on to their children independently of the things they said.

Third, I considered how mother mental state talk that refers to the child versus another person relates to children's later acquisition of mental state concepts. As stated above, there are reasons for thinking that talk about the child's mental states will be particularly important, especially for children between 15 and 24 months of age. When language is first beginning, mother talk about the infant's *own* mental states provides them with the opportunity to explicitly connect the internal experiences associated with their desires or emotions, and provides a label for these mental states. Furthermore, there are reasons for thinking that a transition in the referring style of mothers occurs during the early preschool years and that this transition is mediated to a large extent by the zone of proximal development and the language abilities of the child. As mothers recognize that children understand their own mental states, talk about others' mental states deepens children's social understanding through highlighting the commonalities between the child's and others' behaviour.

For these reasons, I hypothesized that mother talk about *others'* mental states at 24 months of age would be more important for children's social understanding at 33 months of age.

Chapter 4 Methods

4.1 Introduction

The study employed a longitudinal design in which mothers and their children were tested at a university research laboratory at 15 months (Time 1), 24 months (Time 2) and 33 months of age (Time 3). At Times 1, 2 and 3 mothers described the same collection of pictures to their child and the child's general and mental state vocabulary was assessed via a checklist. In addition, at Times 2 and 3, children were administered two emotion tasks as well as a standardized language assessment (see Table 4.1 below). At Time 1, testing took place over two sessions while at Times 2 and 3 only one testing session was required.

Table 4.1. *Child and mother tasks given at Time 1, Time 2 and Time 3*

	Time 1	Time 2	Time 3
Mother and child	Picture book task	Picture book task	Picture book task
Child	MCDI: Words and gestures	MCDI: Words and sentences Emotion situation task Body emotion task	MCDI III: RDLS III Emotion situation task Body emotion task
Mother	Emotion face - emotion sound Emotion face - emotion written word		

Note. MCDI refers to the MacArthur Communicative Development Inventories. RDLS refers to the Reynell Developmental Language Scales.

4.2 Participants

Parents agreed at the birth of their child to participate in any Early Learning Project studies. Seventy-nine infants and their mothers or fathers

were recruited by phone to participate in this particular study. Three mothers did not return the MCDI reports, and two did not attend Time 2 testing. Of the remaining 74 children, there were 71 mother-infant pairs and three father-infant pairs (41 infant males and 33 females). At Time 3, a further two families left the area, reducing the sample to 72 (38 boys versus 34 girls). The mean age at Time 1 was 14.8 months (range = 14.3 - 15.8 months), at Time 2, 24.2 months (range = 23.3 - 26.8 months) and at Time 3, 32.8 months (range = 31.2 - 34.5). Infants were primarily of European descent (70 infants), and the mothers were of mixed socio-economic status (SES: see page 63 below). Mothers were reimbursed for their travel expenses, and the infants received a small gift.

4.3 Materials and procedure

4.3.1 Picture-book task.

Mothers were asked to engage in a short picture describing session with their children. In order to allow the task to take place over two sessions for the youngest age group, two books were created containing a total of 30 photographs. In total, the books contained 18 pictures depicting people and children expressing a range of emotions and 12 pictures depicting people and animals. Some examples of the pictures are as follows: a girl and mother feeding ducks at the park, a girl pushing a kitten in a toy shopping basket, a girl in a swimming pool with an angry expression on her face, a boy clapping his hands after building a tower of blocks (see Appendix A for a complete description of the pictures).

At Time 1, mothers described the books at separate sessions (no longer than 2 weeks apart), whereas at Times 2 and 3 mothers described both books during the same session. Once the mother and infant were seated in a comfortable chair, the experimenter said, "Describe the pictures to your child as if you were at home reading a story. I will leave the room while you describe the pictures. When you get to the end of the book I will come back". A small microphone was attached to the mother's collar and the audio recording of the

narrative was transcribed and scored later by two coders. Parents stopped reading when they reached the end of the book or the child refused to continue.

4.3.2 Child language: MCDI Time 1.

At Time 1, the mothers were asked to fill out the MacArthur Communicative Development Inventory (MCDI) (Fenson et al. 1993): Words and Gestures checklist. They were asked to indicate whether their child understood and/or produced any of the listed words. In addition, a supplementary checklist of internal state words adapted from Bretherton and Beeghly (1982), Ridgeway et al. (1985) and Ruffman et al. (2002) was included as part of the general MCDI checklist . For Time 1 this included an extra 58 terms, referring to mental states, physical states, emotions and the senses (see Appendix B for a complete list).

4.3.3 Child language: MCDI Time 2.

Similarly, at Time 2, mothers were asked to indicate on the MCDI: Words and Sentences checklist and the mental state checklist the words their child produced. In addition, a further 25 supplementary mental state terms including cognitive and modulation of assertion terms were also included (see Appendix C for a complete list).

4.3.4 Child language: MCDI Time 3.

At Time 3, mothers filled out the CDI Developmental Inventory Level III (Dale, 2001). In addition, mothers also filled out the same supplementary checklist of mental state verbs given at Time 2 (see Appendix C for a complete list).

4.3.5 Child language: Reynell Developmental Language Scales (RDLS), Times 2 and 3.

At Times 2 and 3 children were administered the Reynell Developmental Language Scales as a further test of their language. These scales consisted of an expressive and a receptive subscale. The children were administered the RDLS according to the published testing protocol. In order to reduce testing length

and to retain the children's attention at Time 3, they were not administered the single word comprehension section of the test (first 10 items).

4.3.6 Child emotion - situation task: Time 2.

Children were tested at the second time point on their ability to discern how a person felt. In the training phase children were seated on their mother's lap approximately 30 cm away from a 36 cm computer screen. The children were first presented with five sets of training pictures in order to familiarize them with the procedure for pointing (e.g., "Point to the teddy, is it this one or this one?"). The child's attention was first drawn to the picture by the experimenter (e.g., "Oh look, there's a teddy"). The experimenter then activated the next screen, depicting the original picture at the top of the screen and directly below, two other pictures (e.g., a teddy and a distracter item), vertically positioned. The child was then asked to point to one of the lower pictures that matched the original picture. The experimenter directed the child by saying "point to the teddy, is it this one or this one", and then pointing to both choices.

In the test phase, children were then presented with a series of eight cartoon-style vignettes designed to elicit a specific emotional reaction from the protagonist (e.g., a boy being chased by a lion). The protagonist's face was blanked out and the only clues to how the protagonist was feeling were from situational clues. The experimenter said to the child: "Oh, look, we can't see his face. I wonder how he feels?" The children were then presented with another screen, showing the original picture of the person-situation at the top of the screen and two other pictures of a person's head expressing a choice of two emotions positioned vertically below the original picture (see Appendix D for a list of situations and emotion choices). The experimenter then asked the child twice: "Can you find his face, does he feel like this or like this?" The positioning of the correct face was randomly assigned to the top or bottom position and the position to which the experimenter initially pointed was counterbalanced between the top and bottom pictures.

4.3.7 Child body - emotion task: Time 2.

Children were also tested on their ability to discern how a person was feeling from their body position. The children were presented with eight pictures on a 36 cm computer screen of a person (four male and four female) experiencing either happiness or sadness (four of each). The person's face was not visible and the only clues were through body position (e.g., head in hands) (see Appendix E for a complete list of pictures). The experimenter instructed children to "Look at that lady/man/girl. We can't see her face. I wonder how she feels". The child was then required to point to the face that best depicted how the person was feeling. The happy and sad faces were selected from the MacBrain Face Stimulus Set[1]. Validity ratings of the faces in a previous study ranged from 80% to 97% agreement (Tottenham, Barscheid, Ellertsen, Marcus, & Nelson, April, 2002). The administration of the task was identical to the emotion-situation task.

4.3.8 Child emotion - situation task and body emotion task: Time 3.

Children were also tested at Time 3 on their ability to discern how a person felt. Both tasks were reduced versions of the emotion situation and body emotion tasks at Time 2 (see Appendices D & E). These shorter tasks were created in order to assist concentration on the tasks at Time 3 because the children were also administered a lengthy language assessment. The task was administered the same way as at Time 2, except that rather than being presented on a computer screen, the children were seated at a small table and presented with pictures (20 cm by 15 cm).

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[1] Development of the MacBrain face stimulus set was overseen by Nim Tottenham and supported by the John D & Catherine T MacArthur Foundation Research Network on Early Experience and Brain Development. Please contact Nim Tottenham at tott0006@tc.umn.edu for more information concerning the stimulus set

4.3.9 Mother emotion recognition task I: Time 1.

At Time 1, the mothers were administered two emotion recognition tasks, presented on a 38 cm computer screen. The first task, taken from Sullivan and Ruffman (2004), tested their ability to match a verbal emotional expression with a corresponding picture. Verbal emotional expressions consisted of grunts and groans or a sentence emoting one of the six basic emotions (happiness, sadness, fear, disgust, anger, surprise). Mothers were presented with 24 trials, each of which presented the same male figure (JJ) expressing happiness, sadness, fear, disgust, anger and surprise (Ekman & Freisen, 1976). Of the 24 trials, six depicted 100% pure emotional expressions, and 18 were emotion "morphs" (i.e., mixtures of two expressions with one emotion predominating). On each trial the six facial expressions were paired with an auditory expression of emotion (one of the six expressions above) and the task required mothers to point to the facial expression that matched the auditory expression.

4.3.10 Mother emotion recognition task II: Time 1.

The second task examined mothers' ability to match a picture of an emotional expression with a corresponding emotion word. Mothers were administered 24 trials in which they were presented with a choice of four pictures depicting the same male (JJ) and an emotion word presented in the center of the screen. Mothers examined the pictures for four seconds after which time the screen went blank for three seconds while they wrote down their answer. Similar to the first task, the pictures in 18 out of the 24 trials were morphed with another emotion.

4.4 Scoring

4.4.1 Child language: MCDI, Times 1, 2 and 3.

The MCDI questionnaires were scored for several measures:

Mental state language: At all three time points separate raw scores were calculated for the total number of desire, emotion, total mental state (including

desire, emotion and think/know) terms that the mothers reported their child to know.

Non-mental state language: In addition, a separate raw score was also calculated for the number of non-mental state terms.

Syntax: At Times 2 and 3 separate raw syntax scores were also calculated.

Pronouns: At Times 1 and 2 a dichotomous scoring system was used to calculate the percentage of children who were reported to use or understand pronouns. At Time 1, children who were reported to use or understand 1st, 2nd or 3rd person pronouns were awarded a score of 1 (those who had no personal pronouns were given a 0). I chose not to separate out production from comprehension because there were such small numbers of both. Similarly, at Time 2, children were awarded a 1 or 0 depending on whether they were reported to produce any pronouns. Only their production was assessed because the MCDI: Words and sentences only requested mothers to report the words children produced. As the MCDI at Time 3 did not require mothers to report on pronoun use, therefore I was not able to assess this.

4.4.2 Child language: Reynell Developmental Language Scales, Times 2 and 3.

Raw scores were calculated for the number correct in the comprehension and production sections as well as a composite score.

4.4.3 Mother mental and non-mental State Language (Picture task).

The picture task was used to measure mother (but not child) mental state utterances. In order to control for mother verbosity, I examined each category of mental state terms as a percentage of total utterances (Meins et al., 2003). I coded each type of mental state term separately because I was interested in the differences over time. The general criteria for coding were taken from Bartsch and Wellman (1995) as well as Ruffman et al. (2002) (see Table 4.2 for examples and reliability ratings). Any exactly repeated mental

state utterances and "I don't know" utterances were not counted as mother mental state utterances.

Bartsch and Wellman (1995) reported that parents' genuine use of 'think' and 'know' terms far exceeded conversational and uncodeable references (see also Booth et al., 1997). For this reason, and because mothers' use of all types of mental terms could potentially teach children, the main interest was in mother use of all mental terms, not just "genuine" terms (see also Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003 and Cutting & Dunn, 1999 who argue for a more inclusive coding criteria). However, as a comparison, I did examine genuine references to thinking and knowledge in some analyses. In these analyses I excluded conversational references to 'know' and 'think' such as "Know what? She's crying", "She might be tired, do you think?" (Bartsch & Wellman, 1995; Shatz et al., 1983).

4.4.4 Mother mental state talk

Emotion

Mental state terms included all references to emotion such as "happy", "pleased", "sad", "not happy", including all affective references which were not purely sad but could be interpreted as dissatisfaction or anger such as, "unhappy", "not happy", "not very happy" and "not pleased', "cross", "grumpy", "scared", "afraid", "disappointed", "worried", "upset", "surprised", "enjoy", "excited", "fun", "interested", "frustrated", "missed", "annoyed", "hurtful", "bored", "fed up".

Desire

A second category of mental state terms was general references to desire, including "want", "like", "love", "don't like", "hope", "prefer", and "keen on".

Think and Know

A third category of mental state terms was cognitive terms, including "think" and "know" but not "don't know" as an isolated utterance (e.g., I don't know).

Modulations of Assertion

A fourth category was 'modulations of assertion', terms that modulated the certainty of a proposition, including "might", "must", "maybe", "perhaps", "possibly", "probably", "could be", "certainly", "definitely", "sure", "guess", "figure", "reckon", "certain", "suppose", "guess", "figure", "suppose", "wonder", "expect", "curious", and "bet".

Other

The final mental state category, 'other', included terms which referred to some kind of mental activity but were not included in one of the above categories: "remember", "understand'", "forget", "remind", "realize", "idea", "consider", "have in mind", "daydream", "dream" (when asleep), "mean", "imagine", "wonder", and "expect".

4.4.5 Mother non-mental state talk

Descriptions

I also coded for non-mental state utterances (see Ruffman et al., 2002 and Table 2 for examples). The first category "descriptions", referred to utterances that were simple descriptions of the pictures (e.g., The girl is playing).

Body Parts

'Body parts' referred to either a depicted character's facial or body features or to the child's facial or body features.

Links

'Links' were utterances which linked something the mother talked about in the pictures to things in the child's own life (e.g., "Do we tell Daddy he's naughty if he's angry?"; "But we have a goat don't we?").

Physical State

Other categories included 'physical state', which referred to any physiological sensations either the characters or the children were experiencing including, "tired", "hungry", "thirsty", "smiling", "laughing", "giggling", "hurt", "in pain".

Animals

Because the pictures frequently depicted animals, I also separately coded mothers' references to animals and animal sounds.

Orienting

In addition, mothers made frequent attempts to engage their children's attention and I referred to such attempts as orienting utterances. There were two types of orienting utterances: linguistic ("Look, there's a girl"; "What's that?") and non-linguistic attempts such as a sharp inhalation of breath (e.g., "Oh") designed to draw the child's attention to a picture.

4.4.6 Inter-reliability coding

One person coded all transcripts and 25% percent of the transcripts were coded by another coder as a reliability check (see Table 4.2 for reliability ratings for each mental and non-mental state category). Discrepancies were resolved through discussion between both coders.

Table 4.2. *Inter-rater Reliabilities for Mother Utterances in the Picture Task*

Category	Examples	Cohen's kappa
Mental state utterances		
Emotion	Grumpy, surprised, frightened, sad, pleased, happy	.94
Desire	Love, want, like, hope, wish, dream, prefer, keen on	.94
Think/know	Yes, I think he is in the meadow, isn't he?; What color are the flowers, do you know?	.95
Genuine Think/know	I think it's a girl	.98
Modulations of assertion	Might, maybe, perhaps, possibly, probably, could be	.74
Other mental state	Remember that last time we cut onions and they made your eyes water too, didn't they	.91
Non-mental state utterances		
Descriptions	The boys are playing with their swords	.94
Body parts	Face, eyes, nose, hair, mouth, ears, hands, feet, leg, body	.94
Links	"You like your medicine"; "Does that look like Spot?"	.79
Physical state	Hungry, sick, crying, tickled, laughing, smiling, giggle, thirsty, ill, hurt, sore, sleepy	.95
Self-repetition	Mother repeats own utterance exactly without any intervening codeable utterance	.83
Animals	Cat, lamb, sheep, dog, cow	.98

Child emotion tasks: Times 2 and 3.

The percentage correct on both emotion tasks was calculated.

Maternal education level (Maternal SES).

As a measure of SES, mothers' education was coded on a 6-point scale: 0 = no high school qualification (left school at 15), 1 = high school qualification, 2 = some university or polytechnic papers, 3 = polytechnic diploma, 4 = undergraduate degree, 5 = postgraduate degree.

Chapter 5 Results I: Maternal Mental State Language and Child Social Understanding Between the Ages of 15, 24 and 33 Months

5.1 Introduction

The aim of this chapter is to present the results pertaining to the first two goals of this study: (1) To examine how the proportion of specific mental state terms (such as desires, emotions and thinking/knowing) mothers used differed at each time point and changed between 15, 24 and 33 months and (2) to examine the relation between mother mental and non-mental state language at 15 and 24 months and two indices of child social understanding at 24 and 33 months (mental state language and emotion task performance), partialling out several potentially confounding variables including all earlier child language, mother socio-economic status (SES) and mother's own emotion understanding.

5.2 Descriptive statistics

Table 5.1 provides descriptive statistics for mother mental and non-mental state language and child mental state language at Times 1, 2 and 3. Any scores outside three standard deviations from the mean were identified as outliers. These outlier scores were re-assigned as the maximum score plus one (Tabachnick & Fidell, 1989). The mean number of mother utterances at Time 1 was 131.88 (*SD* = 51.81), Time 2 was 154.95 (*SD* = 54.17) and Time 3 was 159.20 (*SD* = 60.76). At all time points the mental and non-mental state utterances included in the analysis accounted for approximately 50% of the range of

utterances mothers used. The remaining 50% consisted of orienting type utterances (e.g., "What's that?" and "What can you see?"). In line with Bretherton et al. (1986) and Ruffman et al. (2002) orienting utterances were not included in any further analysis as they were shown by Ruffman et al. (2002) to bear no relation to child mental state language. In the present study there were no correlations between orienting utterances and later child mental state talk after the child's language had been accounted for. Additionally, as no differences were found in mother input directed at boys versus girls all analyses were conducted collapsing across gender.

Table 5.1. *Descriptive statistics of key measures*

	Time 1 (N = 74)		Time 2 (N=74)		Time 3 (N=72)	
	M (*SD*)	Range	*M* (*SD*)	Range	*M* (*SD*)	Range
Mother mental state utterances						
Emotion	5.26 (3.84)	0 - 18.75	4.91 (3.25)	0 - 15.00	5.31 (3.25)	0 - 7.14
Desire	3.18 (2.28)	0 - 11.76	2.33 (1.98)	0 - 7.00	2.87 (1.95)	0 - 11.00
Think and know	1.50 (2.04)	0 - 8.33	3.21 (2.99)	0 - 11.00	8.16 (4.90)	0 - 19.65
Modulations of assertion	0.30 (.94)	0 - 6.03	0.93 (1.46)	0 - 10.00	2.72 (3.05)	0 - 14.18
Other mental state	0.56 (1.01)	0 - 4.74	0.10 (.28)	0 - 1.00	0.32 (.61)	0 - 3.60
Mother non-mental state utterances						
Descriptions	20.80 (8.06)	1.30 - 36.00	21.87 (6.89)	8.33 - 37.22	24.03 (6.69)	6.20 - 41.57
Links	1.53 (1.50)	0 - 7.22	2.89 (2.84)	0 - 12.50	3.02 (3.04)	0 - 16.59
Body parts	6.17 (5.46)	0 - 21.00	3.91 (3.35)	0 - 17.00	3.94 (2.91)	0 - 11.80
Physical state	4.16 (3.27)	0 - 14.94	3.93 (2.47)	0 - 10.53	4.51 (2.92)	0 - 13.48
Mother exact self-repetitions	1.87 (1.83)	0 - 7.00	0.92 (1.16)	0 - 4.40	0.33 (.55)	0 - 3.09
Animals	11.75 (5.15)	0 - 27.08	8.50 (5.24)	1.00 - 33.00	3.33 (2.31)	0 - 11.11
Child social understanding						
MCDI emotion terms	1.36 (2.24)	0 - 7.00	2.39 (3.36)	0 - 13.00	9.49 (5.98)	0 - 28
MCDI desire terms	0.80 (1.19)	0 - 5.00	1.04 (1.48)	0 - 6.00	4.68 (1.96)	0 - 10
MCDI belief terms	0	0	0.08 (0.39)	0- 2.00	1.49 (1.34)	0 - 7.00
MCDI total mental state	2.35 (3.64)	0 - 14.00	3.51 (4.69)	0 - 16.00	21.36 (12.98)	2 - 61

RDLS	-	-	25.47 (10.37)	8 – 50	38.36 (11.46)	13 - 64
Emotion situation task (T2: *N*=54), (T3: *N*=69)	_	_	57.20* (14.66)	25.00 - 88.00	56.76* (22.56)	25.00-100
Body emotion task (T2: *N*=44), (T3: *N*=69)	_	_	56.52* (17.42)	25.00- 100.00	59.67** (21.03)	25.00-100

Other mother measures

Maternal SES	2.66 (1.50)	0 - 5.00	_	_
Emotion picture – emotional expression task	15.97 (3.99)	5.00 - 24.00	_	_
Emotion picture – written word task	18.41 (2.83)	9.00 - 23.00	_	_

Note. * p <.05, ** p <.01. All mother mental state variables are calculated as percentages of overall utterances. MCDI refers to the MacArthur Communicative Development Inventory.

5.3 Changes across time in the percentage of mother and child mental state language

First I was interested in the extent to which the percentage of mothers' mental state language changed over time (see Figure 5-1). Because different pictures could elicit different types of mental state language, I was not interested in whether mothers used more of one type of language (e.g., emotion) relative to another (e.g., think/know). Instead, I was interested in whether a particular type of mother language increased or decreased over time given identical pictures at the three time points. To explore these data, I conducted a 3 (Time: Time 1, Time 2, Time 3) x 5 (Mental state: emotion, desire, belief, modulations of assertion, other mental states) analysis of variance. The results yielded main effects for time, $F(2, 68) = 20.66$, $p < .001$, and mental state term, $F(4, 66) = 90.83$, $p < .001$, and a significant interaction, $F(8, 62) = 40.05$, $p < .001$. This interaction is explored further below.

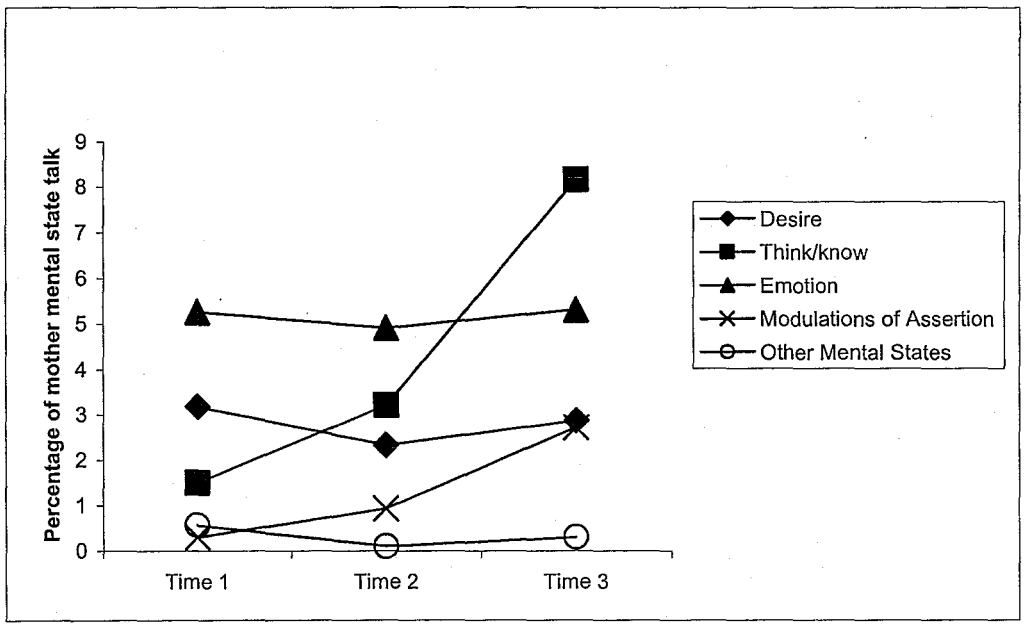

Figure 5-1. Changes across time in the percentage of mother mental state language

I first examined the changes between Times 1 and 2. I conducted five one-way analyses of variance after applying Holm's correction to ensure the family-wise error rate was less than .05. Mothers' desire language at Time 2 decreased significantly, $F(1,73) = 6.25$, $p < .05$, $\eta^2 = .08$, as did other mental state language, $F(1,73) = 13.47$, $p < .001$, $\eta^2 = .16$, whereas references to think and know increased over time, $F(1,73) = 27.11$, $p < .001$, $\eta^2 = .27$. There were no differences over time in emotion language or modulations of assertion.

5.3.1 Changes in mother mental state language between Times 2 and 3

To explore the changes between Times 2 and 3, I conducted five one-way analyses of variance, applying Holm's correction to ensure the family-wise error was less than .05. Mother use of think/know, $F(1, 70) = 107.29$, $p < .001$, $\eta^2 = .60$, modulations of assertion, $F(1, 70) = 28.36$, $p < .001$, $\eta^2 = .29$, increased between Times 2 and 3. There were no changes in the use of mother emotion language, $F(1, 70) = .76$, *n.s.*, or mother desire language, $F(1, 70) = 2.25$, *n.s.* Mother talk about other mental states increased between Times 2 and 3, $F(1, 70) = -9.01$, $p < .001$, $\eta^2 = .11$, although given the very small proportional use of other mental state terms these trends should be interpreted with some caution.

5.3.2 Changes in mother mental state language between Times 1 and 3

To obtain a picture of overall changes in mothers' language between Times 1 and 3, I conducted five more one-way analyses of variance (again applying Holms correction). Between Times 1 and 3, there were significant increases in mother think/know language, $F(1,69) = 126.30$, $p < .001$, $\eta^2 = .65$ and modulations of assertions, $F(1, 69) = 43.47$, $p < .001$, $\eta^2 = .39$. There was no change in mother use of emotion language, $F(1,69) = .45$, *n.s.*, desire language, $F(1,69) = .96$, *n.s.*, or other mental state language, $F(1,69) = 3.52$, *n.s.* In short, whereas mother desire talk decreased slightly (though not significantly from Times 1 to 3), think/know talk increased more than four times, and modulations of assertion increased nine times.

As a check, I also conducted analyses of changes in mother mental state talk at all time points using *raw* numbers (rather than percentages). All the trends were replicated with raw data except for a decrease in mother desire talk between Time 1 and Time 2, which was approaching significance.

5.3.3 Changes in child mental state language between Times 1, 2 and 3

I then considered how *children's* mental state language changed over time. To recall, at Time 1, in keeping with the MacArthur Communicative Development Inventory protocol, mothers reported on both their child's receptive and productive mental state talk, whereas at Times 2 and 3 they reported only their child's productive mental state talk. To ensure consistency across time points, I examined the change in children's *productive* mental state language over all three time points (see Figure 5-2). Figure 5-2 illustrates the amount of productive mental state language reported by mothers.

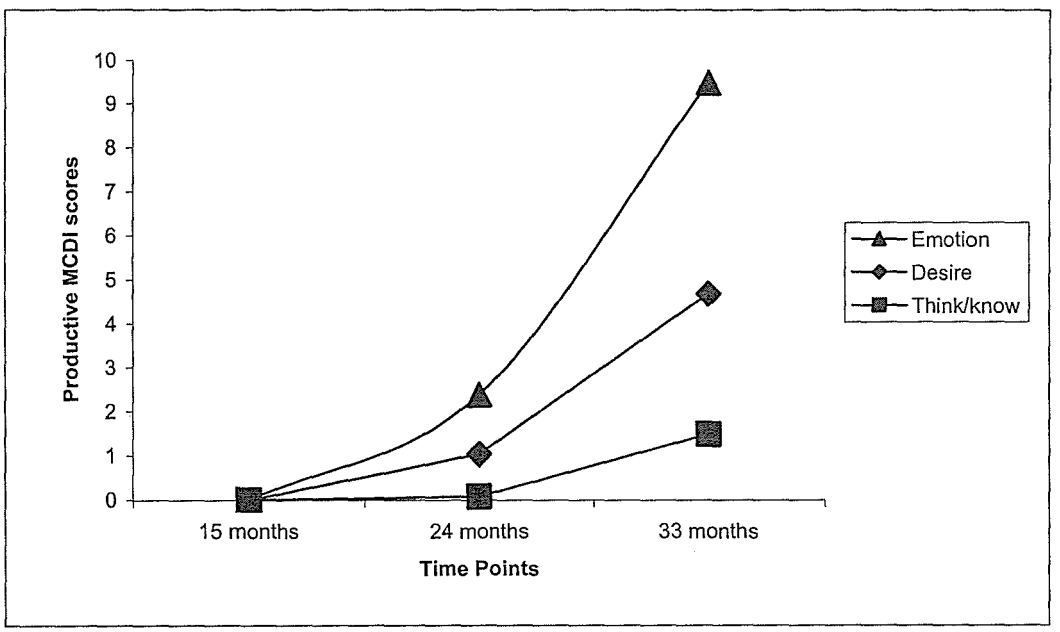

Figure 5-2. Number of different emotion, desire and think/know terms used by children as reported by mothers (MCDI) over all time points

I first examined the change in children's use of mental state terms, conducting a 3 (Time: Time 1, Time 2, Time 3) x 3 (Mental state term: emotion, desire, belief) repeated measures analysis of variance. The results yielded main effects of time, $F(2, 69) = 204.85$, $p < .001$, $\eta^2 = .75$, and mental state term, $F(2, 69) = 115.13$, $p < .001$, $\eta^2 = .62$ and an interaction between time and mental state, $F(2, 69) = 93.86$, $p < .001$, $\eta^2 = .57$. To explore this interaction I conducted two sets of three one-way analyses of variance (Time 1 - Time 2 and Time 2 - Time 3). There was a significant increase in children's reported emotion terms, $F(1,73) = 37.52$, $p < .001$, $\eta^2 = .34$, and their use of desire terms, $F(1, 73) = 36.35$, $p < .001$, $\eta^2 = .33$, between Times 1 and 2. In contrast there was no significant difference in their use of think/know language between Times 2 and 3, $F(1, 73) = 3.09$, $p < .001$, $\eta^2 = .04$. There was a significant increase in the number of emotion terms, $F(1,70) = 138.01$, $p < .001$, $\eta^2 = .66$, desire terms, $F(1, 70) = 275.07$, $p < .001$, $\eta^2 = .80$, and think/know terms, $F(1, 70) = 79.89$, $p < .001$, $\eta^2 = .53$, between Times 2 and 3.

In order to compare the development of mental state terms over time, Figure 5-3 depicts the percentage of children at each time point who were reported to use at least *some* of each type of mental state term (i.e., used some desire terms versus used no desire terms). At Time 1, no children were reported to use these terms in their productive language. At Time 2, around half the children were reported to use at least one type of desire and emotion term, with this rising to almost 100% at Time 3. In contrast, only 4% of children were reported to use any think/know terms at Time 2. The picture changes dramatically however at Time 3, when 72% were reported to use at least one think/know term.

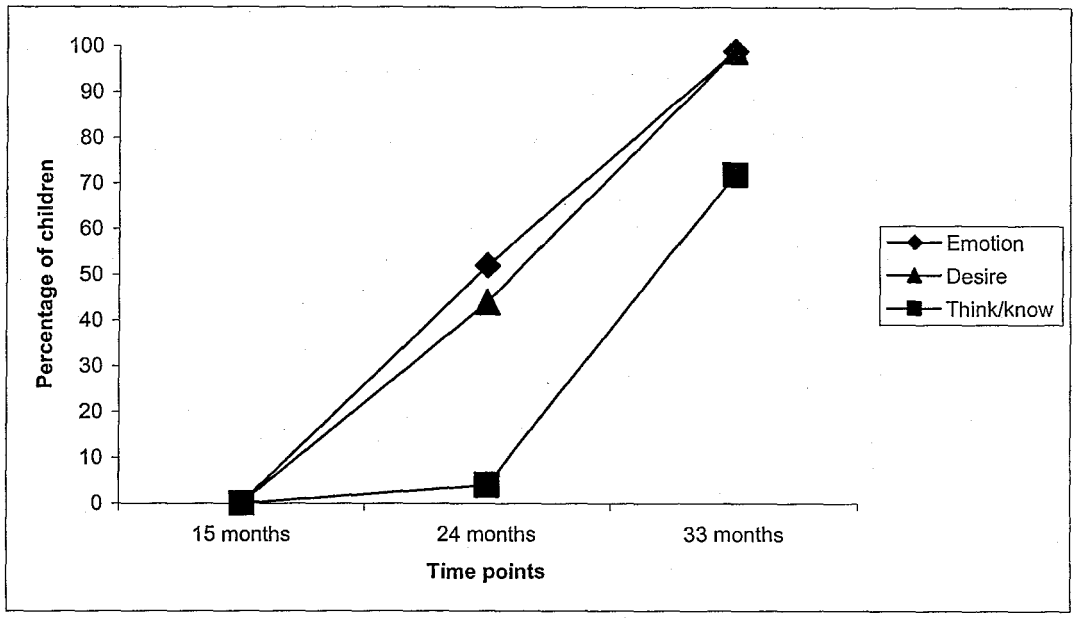

Figure 5-3. Changes in the percentage of children who were reported by mothers to use at least some desire, emotion or think/know terms over all time points

Using McNemar's Test, I examined the changes in children's use of desire, emotion and think/know mental state terms across the time points. The percentage of children using desire terms between Time 1 and Time 2 significantly increased, χ^2 (1, N = 74) = 31.03, p < .001, as did the percentage of children using emotion terms, χ^2 (1, N = 74) = 37.03, p < .001 . There was no significant change in the percentage of children using think/know terms between Times 1 and 2. The percentage of children using desire terms significantly increased between Times 2 and 3, χ^2 (1, N = 71) = 35.02, p < .001, as did the percentage of children using emotion terms, χ^2 (1, N = 71) = 30.03, p < .001, and think/know terms, χ^2 (1, N = 71) = 46.02, p < .001. Between Times 1 and 3, the percentage of children using desire terms, χ^2 (1, N = 71) = 68.01, p < .001, emotion terms, χ^2 (1, N = 71) = 68.01, p < .001, and think/know terms, ,(1, N = 71) = 49.02, p < .001 all significantly increased.

5.3.4 Summary

The data suggest an interrelated pattern of change between mothers' use of mental state terms and their children's subsequent increased use of mental

state terms. Mothers initially use a lot of desire and emotion terms, which remains relatively stable across the three time points but very little use of think/know terms. Similarly, children go from using no mental state terms at Time 1 to using some desire and emotion terms at Time 2, but still relatively few think/know terms at Time 2. Mothers significantly increased their use of think/know terms between Times 2 and 3, which corresponds with children's dramatic increase in their use of think/know terms at Time 3. Thus, the children's lower use of think/know terms at time 2 parallels the mothers' lower use of think/know terms at earlier time points.

5.4 Child performance on emotion tasks

At Time 2 only 54 children completed the emotion situation task and 44 completed the body emotion task. At Time 3, 69 children completed each task. At Time 2, children performed better than chance in the emotion situation task, $t(53) = 3.61$, $p < .001$, as well as the body emotion task, $t(43) = 2.48$, $p < .05$. Likewise, at Time 3, children performed better than chance in both the emotion situation task, $t(68) = 2.49$, $p < .05$, and the body emotion task, $t(68) = 3.82$, $p < .001$. At Time 2 due to fatigue, some children did not complete all 8 trials and therefore their score was taken as a percentage of their completed trials. Chance was calculated as 50% correct. Children who completed at least 5 trials were included in the analyses. At Time 3 all children who completed the tasks were able to sustain their attention for the duration of the emotion situation and body emotion tasks.

5.5 Correlations between mother mental state language and child mental state language within time points

Table 5.2, Table 5.3 and Table 5.4 list the within time point correlations. At Time 1, there were no significant correlations between mother mental state language and child mental state language (see Table 5.2), whereas at Time 2,

mother desire language and think/know talk were significant correlates of some types of child language (see Table 5.3). At Time 3, mothers' think/know talk was a consistent correlate of child language at this time point.

Table 5.2. *Zero-order correlations between Time 1 mother mental state talk and Time 1 child language*

Time 1	1	2	3	4	5	6	7	8
1. Child MCDI emotion	-							
2. Child MCDI desire	.60**	-						
3. Child MCDI mental state total	.95**	.76**	-					
4. Mother desire	.19	.11	.18	-				
5. Mother emotion	.12	.04	.09	.00	-			
6. Mother think/know	.04	.06	.04	.04	.24*	-		
7. Mother modulations of assertion	.10	.06	.05	.03	.16	.62**	-	
8. Mother other mental state	.02	.06	.06	.11	.00	.13	.13	

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). MCDI refers to the McArthur Communicative Development Inventory.

Table 5.3. *Zero-order correlations between Time 2 mother mental state talk and Time 2 child language*

Time 2	1	2	3	4	5	6	7	8
1. Child MCDI emotion	-							
2. Child MCDI desire	.68**	-						
3. Child MCDI mental state total	.96**	.85**	-					
4. Mother desire	.20*	.07	.16	-				
5. Mother emotion	.13	.05	.07	.35**	-			
6. Mother think/know	.17	.28*	.21	.46**	.30*	-		
7. Mother modulations of assertion	.17	.30**	.23*	.12	.10	.44**	-	
8. Mother other mental state	.03	.17	.09	.18	.08	.20	.07	

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). MCDI refers to the McArthur Communicative Development Inventory.

Table 5.4. *Zero-order correlations between Time 3 mother mental state talk and Time 3 child mental state language*

Time 3	1	2	3	4	5	6	7	8
1. Child MCDI emotion	-							
2. Child MCDI desire	.76**	-						
3. Child MCDI belief	.51**	.56**	-					
4. Child MCDI total mental state	.95**	.85**	.68**	-				
5. Mother desire	.17	.05	.06	.12	-			
6. Mother emotion	.05	.14	.11	.03	.13	-		
7. Mother think/know	.36**	.26*	.35**	.38**	.31**	.26*	-	
8. Mother other mental state	.03	-.02	.02	.01	.27*	-.08	.13	-
9. Mother modulations of assertion	.14	.14	.16	.19	.36**	.14	.55**	.31**

Note. $p < .05$, ** $p < .01$ (all significance tests are one tailed). MCDI refers to the MacArthur Communicative Development Inventory.

5.6 Relation between child language ability and child mental state language and performance on emotion tasks between Times 1, 2 and 3

As children's language ability has been closely related to their performance on theory of mind tasks, I was next interested in the relation between their general language ability (as indexed by the MCDI and RDLS) and mental state language and performance on the emotion tasks.

Table 5.5 depicts the zero-order correlations between children's general language (as indexed by the MCDI) at Time 1 and their later mental state language and emotion task performance at Time 2.

Similarly Table 5.6 depicts the zero-order correlations between the children's general language at Time 1 and their Time 3 mental state language and performance on the emotion tasks. All language measures at 15 months correlated with children's later total mental state language at times 2 and 3 but not with the emotion task.

Table 5.7 depicts the correlations between children's performance on the RDLS and MCDI language at Time 2, and their performance on the emotion tasks and reported mental state language at Time 3. Assessed general language ability (RDLS) at Time 2 was highly correlated with all reported mental state language (both reported and observed) as well as one out of the two emotion tasks at Time 3. Reported general language (MCDI) correlated with all reported mental state language at Time 3.

These findings suggest that any analyses that examine the relation between children's social understanding and mother input, should take into account any variance attributable to children's general language abilities. By partialling out early child language, one can be more confident that any observed relation between early mothers' language and later children's mental state language is not due to the mediating influence of correlations between children's general language and mothers' mental state language, as well as children's early general language and later mental state language.

Table 5.5. *Relation between child general and mental state language at Time 1 and their mental state language and task performance at Time 2*

	Time 1 measures		
	MCDI productive	MCDI receptive	MCDI total
Time 2 measures			
MCDI emotion	.32**	.34**	.40**
MCDI desire	.51**	.20	.31**
MCDI belief	.31**	.15	.21
MCDI total mental state	.42**	.32**	.41**
Emotion situation	-.24	-.25	-.30*
Body emotion	-.21	-.01	-.06

Note. * p <.05; ** p <.01. MCDI refers to the MacArthur Communicative Development Inventory.

Table 5.6. *Relation between child general and mental state language at Time 1 and their mental state language and task performance at Time 3*

	Time 1 measures		
	MCDI productive	MCDI receptive	Total MCDI
Time 3 measures			
MCDI emotion	.32**	.32**	.40**
MCDI desire	.34**	.38**	.44**
MCDI belief	.17	.32**	.34**
MCDI total mental state	.32**	.39**	.45**
Emotion situation	-.14	.08	.04
Body emotion	-.01	.16	.15

Note. $p < .05$; ** $p < .01$. MCDI refers to the MacArthur Communicative Development Inventory.

Table 5.7. *Relation between children's language ability at Time 2 and performance on emotion tasks at Time 3*

	Time 2 measures		
Time 3 measures	RDLS total	MCDI words	MCDI syntax
MCDI emotion	.35**	.57**	.51**
MCDI desire	.41**	.65**	.61**
MCDI belief	.28*	.46**	.37**
MCDI total mental state	.37**	.60**	.55**
Emotion situation	.07	-.02	.13
Body emotion	.27*	.08	.16

Note. $p < .05$; ** $p < .01$. MCDI refers to the MacArthur Communicative Development Inventory.

5.7 Relation between mother mental and non-mental state talk at Time 1 and child mental state language and emotion task performance at Time 2

To address my second goal, I examined whether mother talk about mental states to children could predict children's later use of these terms as well as their understanding of emotions. I was interested in the predictive power of mother language in general and therefore I was interested in the relation between both mother *mental* and *non-mental* state language and later

social understanding. In this section, I examined whether mother use of mental and non-mental state language at Time 1 related to a child's later acquisition of these terms and success on the emotion tasks at Time 2. Table 5.8 contains the partial correlations for Time 1 mother mental and non-mental state language with Time 2: (a) child mental state language as reported on the MCDI, and (b) child performance on both emotion tasks. The correlations with children's Time 2 emotion, desire, and total mental state language and the emotion tasks, are shown having partialled out all Time 1 child productive and receptive language on the MCDI, mother SES, and mother performance on the emotion tasks.

Time 1 mother desire terms correlated with all three categories of child mental state language at Time 2 as well as the emotion-situation task. No other type of mother mental state language correlated with later child language or emotion task performance. Of the types of mother non-mental state language, references to body parts correlated with later child desire language, and mothers' references to animals correlated with later child emotion talk and total mental state talk. Mother references to animals also correlated with children's reported use of animal terms.

Table 5.8. *Partial correlations between mothers' mental and non-mental state utterances at Time 1 and child mental state language (MCDI) and emotion task performance at Time 2*

Category	Time 2 child MCDI language				Time 2 child emotion task performance	
	Emotion[a]	Desire[a]	Total mental state[a]	Animals[a]	Emotion situation[a] n = 54	Body emotion[a] n = 44
Mother Time 1 mental state talk						
Desire	.40*	.34*	.42*	.07	.30*	-.00
Emotion	-.11	-.23	-.16	-.05	-.05	-.29
Think/know	.06	-.01	.03	-.00	.03	.10
Modulations of assertion	.11	.01	.00	-.01	-.09	.18
Other mental state	-.10	.02	-.07	.21*	-.05	-.11
Mother Time 1 non-mental state talk						
Descriptions	.07	.00	.04	-.02	.07	.05
Links	-.07	-.01	-.05	-.04	.03	.25
Body parts	.17	.28*	.24*	.18	.11	.11
Physical state	.03	-.00	.02	-.08	.19	.01
Animals	.25*	.17	.25*	.22*	.05	.11
Mother self-repetitions	-.32*	-.24*	-.34*	-.18	.14	-.08

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [a]Partialling out SES, mother performance on emotion recognition tasks and child's MCDI receptive and productive language including all mental state language at Time 1.

Table 5.9. *Partial correlations between earlier mother mental and non-mental state language and later child mental state language*

	Time 1-2
Early mother desire talk and later child MCDI total mental state language[a]	.34**
Early mother talk about body parts and later child MCDI total mental state language[b]	.14
Early mother talk about animals and later child MCDI total mental state language[b]	.13
Early mother animal talk and later child MCDI animal talk[c]	.21*
Early mother mental state other talk and later child MCDI animal talk[d]	.16
Early child mental state language and later mother desire language[e]	-.01
Early mother desire talk and later child performance on emotion situation task[f]	.30*

Note. *p < .05 **p < .01 (all significance tests are one-tailed). [a]Partialling out earlier child MCDI total language, mother talk about body parts; SES, mother performance on emotion tasks; [b]Partialling out earlier child MCDI total language and mother talk about desire; SES, mother performance on emotion tasks; [c]Partialling out earlier child MCDI total language; SES, and mother other mental state talk, a shared correlate; [d]Partialling out earlier child MCDI total language; SES, and mother animal talk, a shared correlate; [e]Partialling out earlier mother desire talk; [f]Partialling out earlier child MCDI total language; SES, mother performance on emotion tasks.

Using similar analyses as above, and based on the significant correlations in Table 5.8, I also examined whether mother mental state language was a unique correlate of child non-mental state language (see Table 5.9). Only mother animal talk (and not mental state talk) correlated with later child animal language. In sum, mother desire talk was a unique correlate of later child mental state talk (and emotion task performance), and mother non-mental state talk was a unique correlate of later child non-mental state talk.

Based on the significant correlations in Table 5.8, I next used linear regression to examine which of the significant mother mental state language variables accounted for the most variance in later child mental state language and emotion-situation task performance (see Table 5.10). I entered in the first step all potentially confounding variables (e.g., SES, mother emotion task performance, total Time 1 child language, other significant correlates from Table 5.8), with the targeted predictor variable entered in the second step. Only mother desire talk at Time 1 remained a significant correlate and predictor of both later child total mental state language and emotion situation task performance.

Table 5.10. *Summary of hierarchical regression statistics predicting child mental and non-mental state language at Time 2, child performance on the emotion situation task, and mother use of desire language at Time 2*

Variable	β	*t*	R^2 and ΔR^2
Dependent variable = Child total mental state talk at Time 2			
Step 1: Time 1 child MCDI language, mother body parts talk, mother animal talk, mother performance on emotion tasks, and SES			.34
Step 2:			
SES	.04	.37	
Time 1 mother animal talk	.12	1.11	
Time 1 mother body parts talk	.12	1.12	
Mother emotion/sound task	-.18	-1.56	
Mother emotion/word task	.13	1.26	

Variable	β	*t*	R^2 and ΔR^2
Time 1 child MCDI productive language	.39	3.90[c]	
Time 1 child MCDI receptive language	.22	2.19[b]	
Time 1 mother desire talk	.30	2.82[b]	.08
Dependent variable = Child total mental state talk at Time 2			
Step 1: Time 1 child MCDI language, mother desire talk, mother animal talk, mother performance on emotion tasks, and SES			.40
Step 2:			
SES	.04	.34	
Time 1 mother animal talk	.11	1.01	
Time 1 mother desire talk	.30	2.79[b]	
Mother emotion/sound task	.13	1.23	
Mother emotion/word task	-.17	-1.55	
Time 1 child MCDI productive language	.38	3.86[b]	
Time 1 child MCDI receptive language	.22	2.19[a]	
Time 1 mother body parts talk	.12	1.08	.01
Dependent variable = Child total mental state talk at Time 2			
Step 1: Time 1 child MCDI language, mother desire talk, mother body parts talk, mother performance on emotion tasks, and SES			.41
Step 2:			
SES	.04	.34	
Time 1 mother body parts talk	.12	1.08	
Mother emotion/sound task	-.17	-.16	
Mother emotion/word task	.13	1.23	
Time 1 child MCDI productive language	.38	3.86[c]	
Time 1 child MCDI receptive language	.22	2.19[a]	
Time 1 mother desire talk	.30	2.79[b]	
Mother animal talk	.11	1.01	.01
Dependent variable = Child total mental state talk at Time 2			
Step 1: Mother animal talk, mother desire talk, mother body parts talk, mother performance on emotion tasks, and SES			.19

Variable	β	*t*	R^2 and ΔR^2
Step 2:			
SES	.01	.08	
Time 1 mother animal talk	.09	.78	
Time 1 mother desire talk	.29	2.58[a]	
Mother emotion/sound task	-.15	-1.23	
Mother emotion/word task	.15	1.39	
Time 1 mother body parts talk	.13	1.14	
Time 1 child MCDI language	.37	3.56[c]	.14
Dependent variable = Child total mental state talk at Time 2			
Step 1: Time 1 child MCDI language, mother animal talk, mother desire talk, mother body parts talk, and SES			.38
Step 2:			
SES	-.03	-.32	
Time 1 mother body parts talk	.09	.79	
Time 1 child MCDI productive language	.39	3.84[c]	
Time 1 child MCDI receptive language	.23	2.20[a]	
Time 1 mother desire talk	.29	2.67[a]	
Mother performance on emotion tasks	.04	-.42	.00
Dependent variable = Child total mental state talk at Time 2			
Step 1: Time 1 child MCDI language, mother animal talk, mother desire talk, mother body parts talk, and mother performance on emotion tasks			.41
Step 2:	.		
Time 1 mother body parts talk	.12	1.08	
Mother emotion/sound task	-.17	-1.55	
Mother emotion/word task	.13	1.23	
Time 1 child MCDI productive language	.38	3.86[c]	
Time 1 child MCDI receptive language	.22	2.19[a]	
Time 1 mother desire talk	.30	2.79[b]	
Mother animal talk	.11	1.01	
SES	04	.34	.00
Dependent variable = Child animal language at Time 2			
Step 1: Time 1 child MCDI language, mother mental state			

Variable	β	*t*	R^2 and ΔR^2
other talk, and SES			.25
Step 2:			
Time 1 mother mental state other talk	.15	1.40	
Time 1 child MCDI productive language	.37	3.54[b]	
Time 1 child MCDI receptive language	.18	1.67[a]	
SES	.11	1.06	
Time 1 mother animal talk	.18	1.73[a]	.03
Dependent variable = Child animal language at Time 2			
Step 1: Time 1 mother animal talk, mother mental state other talk, and SES			.09
Step 2:			
Time 1 mother animal talk	.16	1.45	
Time 1 mother mental state other talk	.20	1.80[a]	
SES	.10	.94	
Time 1 child MCDI language	.33	2.97[b]	.10
Dependent variable = Child animal language at Time 2			
Step 1: Time 1 child MCDI language, mother animal talk, and SES			.26
Step 2:			
Time 1 child MCDI productive language	.37	3.54[c]	
Time 1 child MCDI receptive language	.18	1.68[a]	
Time 1 mother animal talk	.18	1.73[a]	
SES	.11	1.06	
Time 1 mother mental state other talk	.15	1.40	.02
Dependent variable = Mother desire language at Time 2			
Step 1: Time 1 mother desire talk			.003
Step 2:			
Time 1 mother desire talk	.06	.52	
Time 1 child MCDI total mental state language	.04	.38	.02
Dependent variable = Child performance on emotion - situation task at Time 2			
Step 1: Time 1 child MCDI language, mother performance on			

Variable	β	*t*	R^2 and ΔR^2
emotion tasks and SES			.16
Step 2:			
Mother emotion/sound task	.06	.39	
Mother emotion/word task	.20	1.45	
Time 1 child MCDI productive language	-.23	-1.70	
Time 1 child MCDI receptive language	-.19	-1.41	
SES	.05	.35	
Time 1 mother desire talk	.28	2.08[a]	.08

Note. β = standardized regression coefficient. R^2 = proportion of variance explained by variable. ΔR^2 = change in proportion of variance explained by a variable (i.e., additional variance explained by a variable). MCDI refers to the MacArthur Communicative Development Inventory. [a]$p < .05$, [b]$p < .01$, [c]$p < .001$ (all significance tests are one-tailed).

5.8 Is there a reciprocal relation between child talk about mental states and later mother talk about mental states?

Due to the cross-lagged nature of the design, I was able to examine the inverse relation that is, whether Time 1 child mental state language influenced the extent to which mothers used mental state language at Time 2 (see Table 5.9). In other words, does child talk about mental states influence the extent to which mothers talk about mental states at a later time point? At Time 1 the only mental state term that predicted child use of mental state language and emotion task performance was mother desire language. Therefore, I examined whether child total mental state language at Time 1 influenced the extent to which mothers used desire language at Time 2 (see Table 5.9). Having accounted for potentially confounding variables (mother desire language at Time 1, SES and mother performance on emotion tasks), there was no relation between child total mental state language and later mother desire language, *pr* = -.01, indicating a unidirectional relation between early mother desire language at 15 months and child mental state language at 24 months. Using hierachical regression, accounting for potentially confounding variables such as mother desire talk at time 1, child talk about mental states did not significantly

account for any further variance in mother talk about desires at Time 2 (see Table 5.10).

I also conducted a similar analysis in which I examined the extent to which child talk about mental states at Time 2 predicted mother talk about thoughts and knowledge at Time 3 (the most consistent predictor of later child mental state talk and emotion understanding) (see Table 5.13). After accounting for shared variance with mother think/know talk at Time 2 (accounting for 35% of the variance), child talk about mental states was not a significant predictor of later mother talk about thoughts and knowledge.

5.8.1 Summary

Between 15 and 24 months, mothers' tendency to use desire language rather than any other type of mental state language was predictive of a child's later mental state talk and performance on the emotion situation task. When pitted against mother non-mental state talk, mother talk about mental states (desire talk) rather than a non-mental state talk variable accounted for unique variance in a child's later mental state talk and performance on the emotion situation task, over and above mothers' SES, mothers' performance on the emotion task, and the child's language levels (see Table 5.9 and Table 5.10).

5.9 Relation between mother mental and non-mental state talk at Time 1 and child mental state language and emotion task performance at Time 3

I now examine the partial correlations between mother language at 15 months (Time 1) and child mental state language and task performance at 33 months (Time 3). Table 5.11 contains the partial correlations for mother mental and non-mental state language at Time 1 with Time 3 (a) child mental state language (MCDI) and (b) child performance on the two emotion tasks. These correlations are shown having partialled out all Time 1 child productive and

receptive language on the MCDI, mother SES and mother performance on the emotion tasks. There was a relation between mothers' use of think/know language at Time 1 and children's performance on the emotion situation task. There was also a negative correlation between mothers' tendency to repeat her own utterances and children's later use of think/know language.

Table 5.11. *Partial correlations between mothers' mental and non-mental state utterances at Time 1 and child mental state language (MCDI) at Time 3*

	Child MCDI language at Time 3[a]				Child task performance at Time 3[a]	
	Emotion	Desire	Think/know	Total mental state	Emotion situation	Body emotion
Time 1						
Desire	.09	.07	.14	.11	.11	.04
Emotion	-.08	.11	.00	.07	.14	.09
Think/know	-.07	.10	-.02	.00	.23*	.06
Modulations of assertion	-.01	.14	-.02	.05	.21	.11
Other mental state	.07	.00	.10	.05	.16	.10
Descriptions	.06	.06	.09	.06	.04	-.04
Links	.12	.13	-.05	.09	.11	-.04
Body parts	.15	.20	.06	.18	.14	.01
Physical state	.04	.03	-.05	.00	.07	.03
Animals	.07	.12	.17	.08	.15	-.08
Mother self-repetition	-.14	.09	-.21*	.17	.14	-.09

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [a]Partialling out SES, mother performance on emotion recognition tasks and child's MCDI receptive and productive language including all mental state language at Time 1.

5.10 Relation between mother mental and non-mental state talk at Time 2 and child mental state language and emotion task performance at Time 3

Finally, I examined the relation between mothers' mental and non-mental state talk when the children were 24 months and their later talk about mental

states and understanding of emotion at 33 months. Similar to above, the partial correlations in Table 5.12 are shown having partialled out all Time 2 child language (MCDI words and syntax and RDLS total score), mother SES and mother performance on the emotion tasks. Mother talk about desires and emotions at Time 2 correlated with two of the four child mental state language measures at Time 3, but neither emotion task (total = 2/6). On the other hand, mother talk about thoughts/knowledge at Time 2 correlated with three of four child language measures at Time 3 as well as one of two emotion tasks at Time 3 (total = 4/6). In contrast, no mother non-mental state language at Time 2 correlated with child mental state language or task performance at Time 3, with the exception of links which correlated with child desire talk at Time 3, and descriptions which correlated negatively with child desire talk at Time 3. Unlike between Times 1 and 2, I was unable to examine the relation between mother non-mental state talk (such as animals) and later child non-mental state talk (such as animals) because the CDI-III was a short form which did not allow for widespread categorization of terms. Furthermore, children at 33 months already have extensive animal vocabularies and consequently there would have been very little variance, potentially resulting in a misleading analysis.

Table 5.12. *Partial correlations between mothers' mental state utterances at Time 2 and child mental state language (MCDI) and emotion task performance at Time 3*

	Child MCDI language at Time 3				Child task performance at Time 3	
	Emotion	Desire	Think/know	Total mental state	Emotion situation	Body emotion
Time 2						
Desire	.30*	.18	.16	.29**	.02	.15
Emotion	.18	.17	.23*	.23*	.02	.07
Think/know	.34**	.25*	-.03	.31*	.37**	.11
Modulation of assertion	.02	.00	.07	.07	.05	.01
Other mental state	.00	.07	-.09	-.01	-.05	.11
Descriptions	-.13	.28*	-.05	-.14	.14	.15

Links	.03	.29*	.11	.11	.15	22
Body parts	-.13	.15	-.01	-.13	.01	.10
Physical state	-.01	.06	.02	.00	.05	.12
Animals	-.10	.17	.03	-.11	-.13	.01
Mother self-repetition	-.04	.10	-.15	-.07	.08	.11

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [1]Partialling out SES, mother performance on emotion recognition tasks and child's MCDI receptive and productive language including all mental state language at Time 2. [2]Partialling out SES, mother performance on emotion recognition tasks and all child's language including MCDI and RDLS scores at Time 2.

Again, similar to the analysis conducted between Times 1 and 2, based on the significant correlations in Table 5.12, I used hierarchical linear regression to examine which of the significant mother mental state language variables (emotion, desire or belief) accounted for the most variance in later child mental state language (see Table 5.13). I entered in the first step all potentially confounding variables (e.g., SES, mother emotion task performance, total Time 2 child language, other significant correlates from Table 5.12), with the targeted predictor variable entered in the second step. The first dependent variable I examined was child total mental state talk at Time 3. Together, emotion, desire and think/know talk accounted for 10% of the variance over and above the variance attributed to child language at Time 2, SES and mother performance on the emotion tasks, although no individual mental state variable remained a significant correlate of later child total mental state language, after accounting for shared variance due to the other variables.

As think/know talk at Time 2 was the only predictor of performance on the emotion situation task at Time 3, I was also interested in how much unique variance could be attributed to this variable. Mother talk about thinking and knowing accounted for 11% of the variance, over and above child language at Time 2, mother performance on the emotion tasks and SES (see Table 5.13).

Table 5.13. *Summary of hierarchical regression statistics predicting child mental and non-mental state language at Time 3, child performance on the emotion situation task, and mother use of mental state language at Time 3*

Variable	β	*t*	R^2 and ΔR^2
Dependent variable = Child total mental state talk at Time 3			
Step 1: All Time 2 child language, mother performance on emotion tasks, SES.			.38
Step 2: Time 2 mother desire talk, mother emotion talk, mother think/know talk			.10[a]
Dependent variable = Child total mental state talk at Time 3			
Step 1: All Time 2 child language, mother performance on emotion tasks, SES, Time 2 mother emotion talk, Time 2 mother think/know talk			.45
Step 2:			
Time 2 RDLS total	.04	.30	
Time 2 MCDI words	.29	1.43	
Time MCDI syntax	.23	1.16	
Mother performance on emotion tasks	.23	.20	
SES	-.11	-.95	
Time 2 mother emotion talk	.07	1.31	
Time 2 mother think/know talk	.16	1.32	
Time 2 mother desire talk	.19	1.67	.03
Dependent variable = Child total mental state talk at Time 3			
Step 1: All Time 2 child language, Time 2 mother desire talk, Time 2 mother think/know talk, mother performance on emotion tasks, and SES			.47
Step 2:			
Time 2 RDLS total	.04	.34	
Time 2 MCDI words	.30	1.48	
Time MCDI syntax	.21	1.10	
Mother performance on emotion tasks	.02	.16	
SES	-.12	-1.04	
Time 2 mother desire talk	.25	2.13	
Time 2 mother think/know talk	.18	1.49	

Variable	β	*t*	R^2 and ΔR^2
Time 2 mother emotion talk	.09	.87	.01
Dependent variable = Child total mental state talk at Time 3			
Step 1: All Time 2 child language, Time 2 mother desire talk, Time 2 mother emotion talk, mother performance on emotion tasks, and SES			.47
Step 2:			
Time 2 RDLS total	.04	.30	
Time 2 MCDI words	.29	1.43	
Time MCDI syntax	.23	1.58	
Mother performance on emotion tasks	.02	.21	
SES	-.11	-.95	
Time 2 mother emotion talk	.07	.66	
Time 2 mother desire talk	.22	1.89	
Time 2 mother think/know talk	.20	1.67	.02
Dependent variable = Child performance on emotion situation task at Time 3			
Step 1: All Time 2 child language, mother performance on emotion task, Time 2 child performance on emotion situation task and SES			.20
Step 2:			
Time 2 total RDLS	.15	.84	
Time 2 MCDI words	-.71	-2.79[b]	
Time 2 MCDI syntax	.60	2.59[a]	
Mother performance on emotion task	-.33	-2.30[a]	
Time 2 child performance on emotion situation task	.19	1.38	
SES	.06	.41	
Time 2 think/know talk	.38	2.98	.11[a]
Dependent variable = Mother think/know talk at Time 3			
Step 1: Time 2 mother think/know talk			.35
Step 2: Time 2 child MCDI total mental state language	.07	.71	.01

Note. β = standardized regression coefficient. R^2 = proportion of variance explained by variable. ΔR^2 = change in proportion of variance explained by a variable (i.e., additional variance explained by a variable). MCDI refers to the MacArthur Communicative Development Inventory. [a] $p < .05$ (all significance tests are one-tailed).

5.10.1 Summary

To summarize, at 24 months mother think/know talk was the more consistent predictor of later child mental state talk and performance on the emotion task (correlating with 4/6 variables). Nevertheless, mother think/know talk did not account for unique variance of later child mental state talk after accounting for the variance in child mental state talk due to earlier mother desire and emotion talk (see Table 5.10). However, think/know talk at Time 2 did account for unique variance in child performance on the emotion situation task at Time 3. Thus, it seems that several types of mother mental state talk are important at Time 2. I also examined mother non-mental state talk. Mother talk about 'links' correlated with 1/6 later child variables and was not a unique predictor when mother think/know talk was accounted for. Finally, there was no evidence for a bi-directionality effect, in that the extent to which children used mental state talk did not predict how much mental state talk mothers used.

5.11 Chapter summary of results

To summarize across all the time points, at 15 months mother talk about desires was the more consistent correlate of child talk about mental states and emotion understanding nine months later (see Table 5.14), contributing unique variance (see Table 5.10). At 24 months however, the pattern changes and mother talk about thoughts and knowledge was a more consistent predictor of a child's later talk about mental states and emotion understanding (see Table 5.14). Talk about thoughts and knowledge accounted for unique variance in children's performance on the emotion situation task (see Table 5.13). Mothers' talk about desires and emotions were still important, however, contributing along with talk about thoughts and knowledge to variance in later child talk about mental states (see Table 5.14).

Table 5.14. *Number of significant partial correlations between mother mental state language, the referent of mental state language and later child mental state language and emotion understanding.*

	15 - 24 months[1]	15 - 33 months[2]	24 - 33 months[2]
Mother language			
Emotion	0	0	2
Desire	4	0	2
Think/know	0	1	4

Note. [1]Total of five child mental state language and emotion task measures. [2]Total of six child mental state language and emotion task measures.

Chapter 6 Results II: The relation between maternal references to the child versus others and children's later mental state language and emotion understanding

6.1 Introduction

The aim of this chapter is to present the results pertaining to the final goal of this thesis: To consider the importance of the referent of mental state talk, in other words, how does mother mental state talk that refers to the child versus another person relate to children's later acquisition of mental state concepts and emotion understanding? As stated in section 3.5, I hypothesized that: (1) talk about the child's mental states will be particularly important, especially for children between 15 and 24 months of age and that (2) there are reasons for thinking that a transition in the referring style of mothers occurs during the early preschool years and that this transition is mediated to a large extent by the zone of proximal development and the language abilities of the child. For these reasons, I hypothesized that mother talk about *others'* mental states at 24 months of age would be more important for children's social understanding at 33 months of age.

6.2 Descriptive statistics

In the following analyses, I considered whether mothers referred to their own, the child's or the depicted character's mental states (see Table 6.1). References to emotion were not analyzed into separate referent categories as the vast majority of emotion terms referred to the emotions depicted in the picture books. Composite scores for other, self and child categories at both time points were created collapsing across desire, know/think and other mental state (see Table 6.1).

Table 6.1. *Descriptive statistics for mother mental state references to other, self and child at Times 1, 2 and 3*

	Time 1 N=74		Time 2 N=74		Time 3 N=72	
	M (SD)	Range	M (SD)	Range	M (SD)	Range
Total other	1.34(1.56)	0 - 6.00	1.34 (1.52)	0 - 6.67	2.07(1.86)	0 - 6.67
Total mother	0.78(1.11)	0 - 5.00	1.28 (1.44)	0 - 6.43	2.24(2.20)	0 - 7.25
Total child	3.05(2.14)	0 - 10.00	2.99 (2.58)	0 - 11.56	7.09(4.44)	0 - 22.52
Desire other	1.00(1.19)	0 - 5.47	1.16 (1.34)	0 - 5.56	1.69(1.55)	0 - 6.41
Desire mother	0.03(0.15)	0 - 0.97	0.01 (0.07)	0 - 0.63	0.09(0.27)	0 - 1.22
Desire child	2.15(1.91)	0 - 8.82	1.16 (1.63)	0 - 10.68	1.10(1.34)	0 - 5.10
Think/know other	0.14(0.47)	0 - 2.72	0.18 (0.47)	0 - 2.86	0.36 (.86)	0 - 4.65
Think/know mother	0.73(1.07)	0 - 5.00	1.22 (1.40)	0 - 6.43	2.29(2.15)	0 - 7.25
Think/know child	0.63(1.04)	0 - 5.37	1.81 (2.11)	0 - 9.52	5.51(3.78)	0 - 13.48
Other mental state other	0.26(0.66)	0 - 4.08	0.004 (0.03)	0 - 0.29	0.02(.09)	0 - 0.52
Other mental state mother	0.01(0.09)	0 - 0.76	0.06 (0.20)	0 - 0.59	0.06(.23)	0 - 1.48
Other mental state child	0.27(0.73)	0 - 4.76	0.02 (0.09)	0 - 1.06	0.24(.56)	0 - 3.30

6.3 Changes across time in mother mental state references to child

My first analysis was to examine how the relative proportion of maternal references to the child's, another's and the mother's own mental states changed over time. I analyzed the individual mental state terms separately by referent over time using a 3 (Time: Time 1, Time 2, Time 3) x 3 (Referent: Child, Self,

Other) x 2 (Mental state type: desire, think/know[2]) repeated measures analysis of variance. There were four significant effects: a main effect of time, $F(2,68) = 59.84$, $p < .001$, $\eta^2 = .46$, referent type, $F(2,68) = 108.38$, $p < .001$, $\eta^2 = .61$, mental state type, $F(1,69) = 20.23$, $p < .001$, $\eta^2 = .23$, and a three-way interaction between mental state type, referent, and time, $F(4,66) = 56.86$, $p < .001$, $\eta^2 = .45$. In order to explore the three-way interaction, I conducted separate analyses of variance, between Times 1 and 2, Times 1 and 3 and Times 2 and 3. These analyses are reported in the following three sections. The trends across all three time points are illustrated in Figure 6-1.

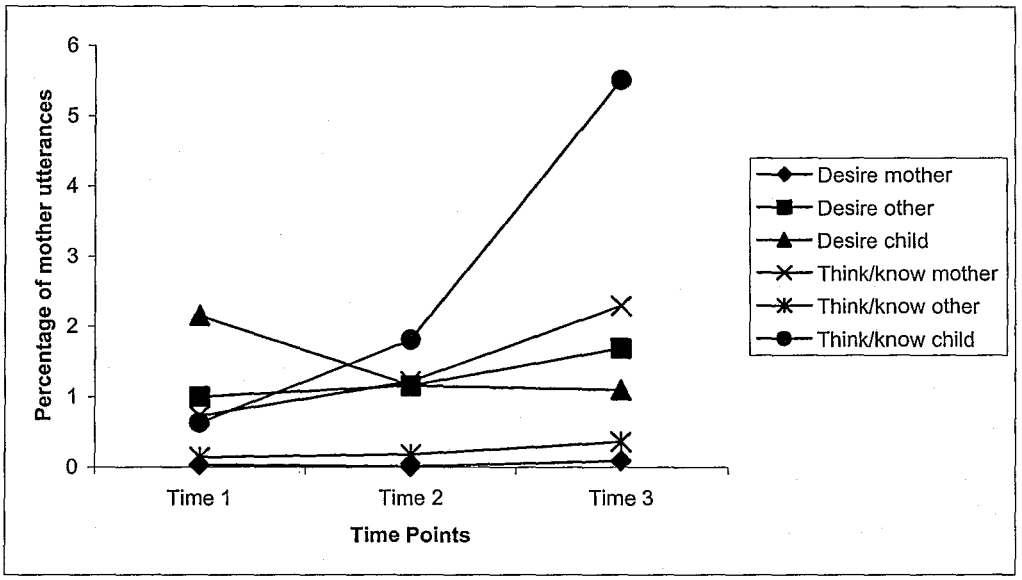

Figure 6-1. Changes across time in mother talk about the child's, her own and others' mental states

6.3.1 Changes across time in mother mental state references to child versus other within individual mental states, between Time 1 - Time 2

In this analysis I explored the interaction between Times 1 and 2 mother mental state referents with six one-way analyses of variance (applying Holm's correction). There were three significant effects. Mothers significantly

[2] Given the very small numbers of other mental states (see Table 6.1), I did not include them in the analysis, but rather concentrated on the main mental states of desire and belief.

decreased their references to the *child's desires* at the second time point, $F(1,73) = 11.86$, $p = .001$, $\eta^2 = .14$, but increased their references to the *child's knowledge and thinking* threefold from Time 1 to Time 2, $F(1,73) = 24.67$, $p < .001$, $\eta^2 = .25$, and increased references to their *own knowledge and thinking* at the second time point, $F(1,73) = 8.69$, $p < .01$, $\eta^2 = .11$.

6.3.2 Changes across time in mother mental state references to child versus other within individual mental states, between Time 1 – Time 3

I next conducted six one-way analyses of variance to explore the interaction between Time 1 and 3 mother mental state talk again applying Holms correction to ensure family-wise error was less than .05. Between time points 1 and 3, there was a significant decrease in references to the child's desires $F(1, 68) = 16.04$, $p < .001$, $\eta^2 = .19$, whereas references to others' desires increased significantly, $F(1, 68) = 11.15$, $p < .001$, $\eta^2 = .14$. References to the mothers' beliefs increased significantly, $F(1, 68) = 30.73$, $p < .001$, $\eta^2 = .31$, as well as references to the child's thoughts and knowledge, $F(1, 68) = 123.47$, $p < .001$, $\eta^2 = .65$.

6.3.3 Changes across time in mother mental state references to child versus other within individual mental states, between Time 2 – Time 3

Finally, I conducted another six analyses of variance to explore the interaction between Time 2 and 3 mother mental state talk. After applying Holms correction, only references to the mother's thoughts and knowledge, $F(1, 70) = 22.23$, $p < .001$, $\eta^2 = .25$, and the child's thoughts and knowledge, $F(1, 70) = 88.07$, $p < .001$, $\eta^2 = .56$, increased significantly.

6.3.4 Summary

To summarize, at 15 months mothers talked most about their *child's desires.* By the time children reached 24 months, mothers talked significantly less about their *child's* desires and talked significantly more about their *own* and

their *child's thoughts and knowledge.* Between 24 and 33 months, mothers' references to the child's, others' and her own desires did not significantly change whereas her talk about the child's and the mothers' thoughts and knowledge significantly increased (see Figure 6-1).

6.4 Consistency in mother mental state references to child versus other across time

I also examined consistencies between mother mental state use across time (see Table 6.2). Of particular interest was whether mothers were consistent across time in their use of specific kinds of talk. In general there were many consistencies: Mother talk about another's desires at Time 1 correlated with mother talk about another's desires at Time 2. Mother talk about the child's thoughts and knowledge correlated over Times 2 and 3 as did their talk about their own thoughts and knowledge over Times 2 and 3. There were no correlations between mothers' mental state talk at Times 1 and 3.

Mother references to others' desires at Time 2 also correlated with others' desires at Time 3. Mother talk about the child's thoughts and knowledge correlated between Times 2 and 3, as did mother talk about others' thoughts and knowledge between Times 2 and 3 and references to her own thoughts and knowledge correlated between Times 2 and 3.

Table 6.2. *Inter-correlations between mother mental state language (separated by referent) at Times 1, 2 and 3*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. T1 desire child	-																
2. T1 desire other	.01	-															
3. T1 desire mother	.02	.16	-														
4. T1 think/know child	-.19	.17	.19	-													
5. T1 think/know other	-.11	.35**	.42**	.23*	-												
6. T1 think/know mother	-.05	.20	.08	.42**	.24*	-											
7. T2 desire child	.03	-.04	-.02	.06	-.10	-.10	-										
8. T2 desire other	-.08	.27*	.00	.13	.15	.24*	-.11	-									
9. T2 desire mother	.06	-.10	-.03	-.07	-.04	-.08	-.04	-.05	-								
10. T2 think/know child	.01	.09	-.02	.31**	.02	.14	-.07	.47**	-.10	-							
11. T2 think/know other	.04	.08	.12	.22	.20	.10	-.12	.23*	-.05	.073	-						
12. T2 think/know mother	.04	.08	.28*	.39**	.12	.38**	-.12	.26*	-.05	.29*	.30*	-					
13. T3 desire child	.09	.02	.00	-.05	.10	-.02	-.00	.17	-.09	-.01	-.04	.18	-				
14. T3 desire other	-.04	.36**	-.01	.08	-.11	-.00	-.05	.29*	-.13	.26*	.11	.13	-.11	-			
15. T3 desire mother	-.01	-.16	-.01	.11	-.01	-.08	.00	-.14	-.04	.06	-.10	.05	.20	-.12	-		
16. T3 think/know child	-.25*	.13	-.05	.18	.00	.04	-.03	.26*	-.14	.48**	.14	.12	.05	.21	.09	-	
17. T3 think/know other	-.00	-.08	-.06	.13	.01	.06	.02	.29*	-.05	.26*	.51**	.19	-.08	.14	-.08	.38**	-
18. T3 think/know mother	-.11	.11	.19	.23	.10	.15	.07	.34**	-.13	.34**	.13	.54**	.21	.37**	-.03	.11	.12

Note. $p < .05$, ** $p < .01$. .

6.5 Relation between the referent of mother talk about the child's and others' mental states, across all mental states and later child mental state language and emotion understanding at Times 1, 2, 3

The following analyses address the question of the predictive role of the referent of mother talk and children's later mental state talk and emotion understanding.

Table 6.3 includes zero-order correlations and Table 6.4 includes partial correlation analyses between maternal references to the child's, another's and her own references to mental states (collapsed across all mental states) and later child mental state language and emotion task performance. The partial correlational analyses account for any shared variance with SES, total child language, mother performance on emotion tasks, and any shared correlates from Table 6.3 (see Table 6.4 note). The trends were very similar for the raw and the partial correlations. For this reason, the summaries below report on the partial correlations, the more stringent analyses.

Table 6.3. *Zero-order correlations between mother mental state references to other, self and child at Times 1 and 2 and later child mental state language and emotion task performance*

	MCDI child mental state language at Times 2 and 3							Emotion tasks at Times 2 and 3			
	Emotion		Desire		Think/ know	Total mental state		Emotion situation		Body emotion	
Mother Language[1]	T2	T3	T2	T3	T3	T2	T3	T2	T3	T2	T3
T1 total other	.11	.04	.02	-.05	.06	.09	.04	.08	.06	-.14	.11
T1 total self	.07	.00	-.01	.16	.10	.04	.08	.10	.14	.02	.07
T1 total self + other	.09	.03	-.00	.03	.09	.06	.06	.07	.10	-.13	.13
T1 total child	.25*	.07	.31**	.11	.08	.29*	.08	.30*	.28*	.10	.03
T2 total other	-	.24*	-	.14	.08	-	.22	-	.32**	-	.24*
T2 total self	-	.27*	-	.25*	.04	-	.26*	-	.07	-	.11
T2 total self + other	-	.30**	-	.23	.07	-	.29*	-	.24*	-	.22
T2 total child	-	.28*	-	.17	.09	-	.24*	-	.25*	-	.07

Note. $*p < .05$; $**p < .01$ (all significance tests are one-tailed). [1] Not including emotion terms as these referred only to others' emotions.

Table 6.4. *Partial correlations between mother references to others, self and child at Times 1 and 2 and later child mental state language and emotion task performance*

	MCDI child mental state language at Times 2 and 3							Emotion tasks at Times 2 and 3			
	Emotion		Desire		Belief	Total mental state		Emotion situation		Body emotion	
T1 mother talk[1]	T2	T3	T2	T3	T3	T2	T3	T2	T3	T2	T3
Others	.20*	.06	.03	.02	.12	.16	.08	.03	.01	.20	.06
Mother	.04	-.08	.07	.15	.07	.01	.01	.09	.14	.03	.06
Other + mother	.15	.02	-.02	.09	.11	.10	.07	-.01	.11	-.17	.11
Child	.23*	.04	.29**	.07	.07	.26*	.05	.36**	.30**	.18	.01
T2 mother talk[2]											
Other		.25[a]*		.16	.08		.28*		.29[a]*		.24*
Mother		.36[a]**		.39[a]**	.09		.39[a]**		.12		.09
Other + mother		.38[a]**		.34**	.11		.41[a]**		.23[a]*		.22
Child		.17[b]		.08	-.03		.08		.16[b]		.01

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [1]Partialling all child talk at Time 1, SES and mother performance on emotion recognition tasks. [2]Partialling out all child talk at Time 2, SES and mother performance on emotion tasks. [a]Also accounting for shared correlate of references to child. [b]Also accounting for shared correlate of references to self/other.

6.5.1 Time 1 -Time 2 and Time 3

At Time 1, mother talk about the *child's* rather than others' mental states was the more consistent correlate of Time 2 child mental state language and emotion task performance, correlating with 4 out of 5 measures (see Table 6.4). This was also broadly true for the relation between Time 1 and Time 3 in which mother talk about the child's mental states rather than others' mental states correlated with emotion situation task performance at Time 3 (see Table 6.4).

6.5.2 Time 2 - Time 3

In contrast to Time 1, at Time 2 mother talk about the *child's* mental states did not correlate with the child's Time 3 total mental state talk or performance on the emotion tasks. Rather, mother references to *others* (including herself and the characters in the book) were the more consistent correlates of later child mental state language and emotion task performance, correlating with 4 out of 6 measures (see Table 6.4).

6.5.3 Summary

Table 6.5 contains a summary of the number of unique significant partial correlations. So far, the predictive analyses have shown that initially, at 15 months, referring to the child's mental states is more consistently predictive of a child's Time 2 social understanding than referring to others' mental states. The reverse situation was observed however at 24 months, when referring to others' (other + mother) mental states was a more consistent predictor of children's social understanding than referring to the child.

Table 6.6. *Zero-order correlations between mother mental state references to other, self and child at Times 1 and 2 and later child mental state language and emotion task performance*

	MCDI child mental state language at Times 2 and 3							Emotion tasks at Times 2 and 3			
	Emotion		Desire		Think/ know	Total mental state		Emotion situation		Body emotion	
Mother Language[1]	T2	T3	T2	T3	T3	T2	T3	T2	T3	T2	T3
T1 desire other	.23*	.05	.10	.03	.03	.20	.05	.08	.01	-.09	.06
T1 desire mother	.07	-.00	.21	.01	.14	.12	.05	.00	-.05	-.19	.13
T1 desire mother + other	.23*	.05	.12	-.05	.05	.21	.05	.08	.00	-.11	.07
T1 desire child	.26*	.08	.26*	.11	.10	.29*	.08	.27*	.12	-.01	.00
T1 think/know other	-.14	-.11	-.11	-.14	-.02	-.14	-.10	.04	.18	-.14	.07
T1 think/know mother	.07	.01	-.03	.18	.09	.04	.08	.12	.15	.19	.06
T1 think/know mother+ other	.01	-.03	-.07	.10	.07	-.02	.03	.11	.19	.01	.07
T1 think/know child	.05	.02	.05	.06	-.04	.04	.05	.11	.18	.08	.07
T2 desire other	-	.25*	-	.17	.14	-	.23*	-	.38**	-	.15
T2 desire mother	-	.01	-	-.01	-.06	-	.04	-	.02	-	.24*
T2 desire mother + other	-	.25*	-	.17	.13	-	.24*	-	.38**	-	.17
T2 desire child	-	-.01	-	-.04	-.01	-	-.01	-	-.14	-	.04
T2 think/know other	-	.06	-	-.02	-.09	-	.05	-	-.00	-	.29*
T2 think/know mother	-	.27*	-	.25*	.06	-	.26*	-	.06	-	.11
T2 think/know mother + other	-	.24*	-	.20	.02	-	.24*	-	.05	-	.19
T2 think/know child	-	.35*	-	.24*	.12	-	.30**	-	.43**	-	.06

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [1] Not including emotion terms as these referred only to others' emotions.

6.6.1 Time 1 –Times 2 and 3

The partial correlations in Table 6.7 and Table 6.8 indicate whether one type of mother talk - for instance, talk about others' thoughts and knowledge - is still related to later child mental state language and emotion task performance, even after accounting for other types of mother talk (see Table 6.6 above for shared correlates).

I first consider the partial correlations between the referent of mother mental state talk, at Time 1 and children's social understanding at Time 2 and Time 3, (see Table 6.7). To recall from the previous chapter, mother talk about desires (at Time 1) was the only correlate of a child's later mental state talk and emotion understanding at Time 2. In fact, mother talk about the *child's* desires was the most consistent correlate of later child mental state talk and emotion task performance (4 of 5 correlations significant), whereas mother talk about others' desires correlated 2 out of 5 times (see Table 6.7).

There was no relation between mother references to others' or the child's desires and thoughts/knowledge at Time 1 and later mental state talk and task performance at Time 3.

I next conducted a similar analysis, but one examining the partial correlations between the referent of mothers' mental state talk and children's social understanding between Time 2 and Time 3.

Table 6.7 . *Partial correlations between mother references to child's versus others' desires and beliefs at Time 1 and child MCDI mental state language and performance on emotion task at Times 2 and 3*[1].

	Child MCDI mental state talk and performance on emotion tasks at Times 2 and 3										
	Emotion		Desire		Belief	Total mental state		Emotion situation		Body emotion	
T1 mother talk$_1$	T2	T3	T2	T3	T3	T2	T3	T2	T3	T2	T3
Other desires	.31*[a]	.06	.05[1]	.00	.06	.25*[a]	.06	.03	-.01	-.11	.06
Mother desires	.00	-.09	.16	-.02	.10	.05	-.05	-.01	-.12	-.21	.09
Other + mother desires	.31*[a]	.04	.11	-.00	.07	.27*[a]	.05	-.01	-.02	-.17	.07
Child desires	.28*[b]	.09	.36**[b]	.09	.12	.35**[b]	.10	.34*	.15	.09	.01
Other think/know	-.19	-.08	-.10	-.08	.02	-.18	-.06	-.08	.21	-.16	.06
Mother think/know	.02	-.06	-.09	.17	.06	-.02	.03	.10	.16	.08	.05
Other + mother think/know	-.05	-.08	-.12	.12	.06	-.08	.01	.06	.21	.01	.06
Child think/know	.03	-.04	.04	.04	-.10	.03	-.01	.13	.17	.17	.03

Note. *$p < .05$; **$p < .01$ (all significance tests are one-tailed). [1]All partial correlations account for all child talk at Time 1, SES and mother performance on emotion tasks. [a]Accounting for shared correlate of child's desires. [b]Accounting for shared correlate of others' desires.

6.6.2 Time 2 –Time 3

Table 6.8 includes partial correlations between the referent of mothers' mental state language and children's later social understanding at Time 3 (accounting for shared correlates and potentially confounding variables - see Table 6.8 note).

The most consistent correlate was mother talk about *her own or another's thoughts and knowledge* (mother + other) at Time 2, correlating with 3/6 measures at Time 3. In contrast, mother talk about the *child's thoughts and knowledge* at Time 2 only correlated with 1/6 measures at Time 3. Mother talk about the child's desires at Time 2 correlated *negatively* with performance on the emotion situation task at Time 3.

Table 6.8 . *Partial correlations between mother references to child versus others desires and thoughts/knowledge at Time 2 and child MCDI mental state language and performance on emotion tasks at Time 3*[1]

	Child mental state language and emotion understanding at Time 3					
Time 2 mother talk	Emotion	Desire	Think/ know	Total mental state	Emotion situation	Body emotion
Others' desires	.16[2,3]	.10[2,3]	.13	.20[2,3]	.21[2]	.11[4]
Mother desires	.13[2,3,5]	.07[2,3]	.05	.19[2,3]	-.04	.15[4]
Other + mother desires	.19[2,3]	.12[2,3]	.13	.22[2,3,5]	.20[2,5]	.13[4]
Child's desires	.19[2,3]	.15[2,3]	.08	.18[2,3]	-.27*[2,5]	.05[4]
Other think/know	.03[2,3,5]	.11[2,3]	-.04	.19[2,]	-.00[2,5]	.27*
Mother think/know	.33*[2,5]	.39**[2]	.10	.39**[2,5]	-.03	.02[4]
Other + mother think/know	.28*[2,5]	.33**[2]	.07	.31**[2,5]	.05[2,5]	.13[4]
Child think/know	.13[3,5]	-.03[3]	-.11	.04[3,5]	.39[5]**	-.00[4]

Note. $*p < .05$; $**p < .01$ (all significance tests are one-tailed). [1]All partial correlations account for all child talk at Time 2, SES and mother performance on emotion tasks. [2]Also accounting for child think/know talk. [3]Also accounting for mother think/know talk. [4]Also accounting for other think/know talk. [5]Also accounting for other desire talk. MCDI refers to the McArthur Communicative Development Inventories.

6.6.3 Summary

Table 6.9 contains a summary of the number of significant partial correlations between the referent (self, other, mother) of mother talk about desires and thoughts/knowledge, and children's later social understanding. The predictive analyses have shown that between 15 and 24 months, referring

to the child's desires was a more consistent correlate than referring to others' desires. When children were older, that is between 24 and 33 months, referring to others' thoughts and knowledge became the more consistent correlate of children's later social understanding.

Table 6.9. *Number of significant partial correlations between mother mental state language, the referent of mother mental state language and later child mental state language and emotion understanding.*

	15 - 24 months[1]	15 - 33 months[2]	24 - 33 months[2]
Desire			
Child	4	0	1*
Other	2	0	0
Mother	0	0	0
Mother +other	2	0	0
Think/know			
Child	0	0	1
Other	0	0	1
Mother	0	0	3
Mother + other	0	0	3

Note. [1] Total of five child mental state language and emotion task measures. [2]Total of six child mental state language and emotion task measures. * indicates a negative correlation.

6.7 Children's pronoun use as a mediating factor in mothers' mental state referring style

In the previous chapter, the results indicated that mothers' tendency to refer to mental states was not driven by children's mental state usage or their ability on the emotion situation task. In other words, the relation between mothers' use of mental state language and children's later mental state language and emotion understanding was unidirectional.

Below, I examine one factor - children's use of pronouns - which could potentially influence mothers', tendency to refer to their own, others' or the child's mental states. I explore this by examining the relation between children's reported personal pronoun use at Time 1 and Time 2 and mothers' tendency to refer to the child's, her own and others' mental states at Time 2 and Time 3. Recall that pronoun competence (i.e., greater use of pronouns as rated by mothers on questionnaires) has also been related to the development of visual self-recognition and pretend play involving others as well as self (Lewis

& Ramsay, 2004). These findings suggest that pronoun use may act as a marker of a nascent understanding of the self-other distinction

I first consider the changes in children's understanding and production of personal pronouns between Times 1 and 2 (Time 3 cannot be examined since mothers were not ask to report on pronoun use on the CDI III).

Figure 6-2 depicts the increase in the percentage of children who were reported to understand and/or produce at least one pronoun (e.g., 1st "I" , 2nd "you" or 3rd "she") at Time 1 and those reported to produce pronouns (1st, 2nd, 3rd) at Time 2. Very few children at Time 1 were reported to be producing pronouns; however, the data suggest that some children at least are reported to understand pronouns at Time 1. Comparisons, cannot be made however, between Times 1 and Times 2 because the variables are not exactly the same (comprehension versus production). The graph is intended only to give an indication of the increase in children's understanding and use of 1st person pronouns.

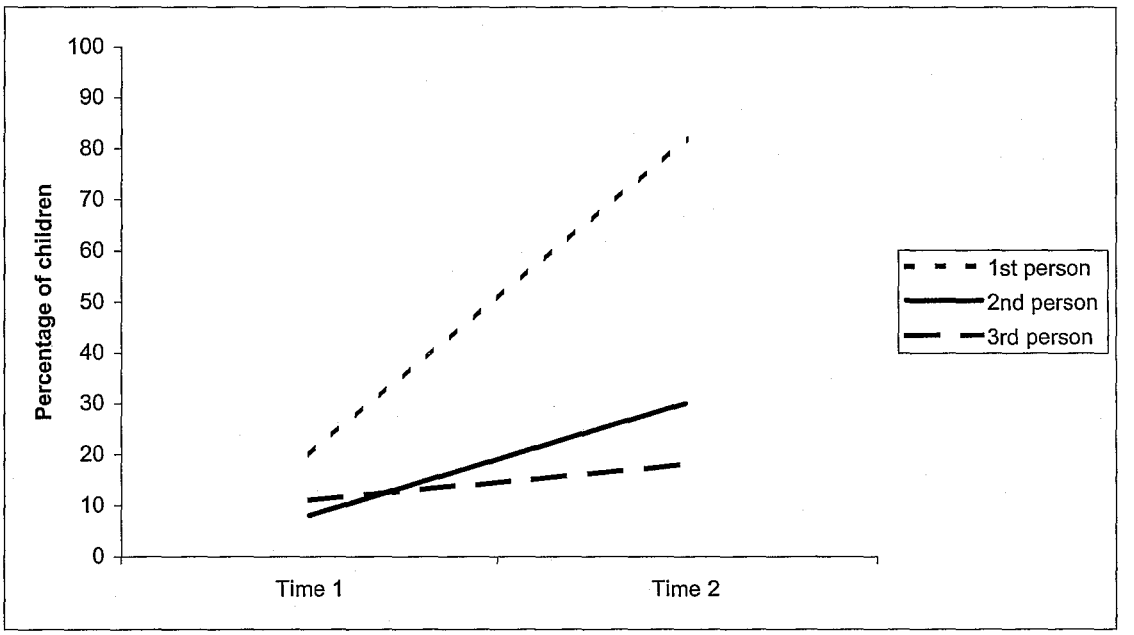

Figure 6-2. Percentage of children reported to use and or understand at least one 1st, 2nd or 3rd person pronoun at Time 1, and percentage of children reported to use at least one 1st, 2nd or 3rd person pronoun at Time 2.

The first analysis examined whether children's tendency to understand or use pronouns at 15 and 24 months influenced the extent to which mothers referred to her own, others' or the child's mental states in general.

Table 6.10 shows that children's use of 1st person pronouns (I, me) at Time 2 correlated with mothers' references to others' mental states, both within the time point and later at time point 3. There were no correlations between children's reported understanding and/or use of pronouns at Time 1 and mothers' referring pattern for mental states at Time 2 or Time 3.

Table 6.10. *Zero-order correlations between children's pronouns at Times 1 and 2*

	Time 1 MCDI pronouns[1]			Time 2 MCDI pronouns[2]		
Mother Talk	1st person	2nd person	3rd person	1st person	2nd person	3rd person
Time 2						
Child	-.02	-.08	-.12	.19	.20*	-.05
Other	-.04	-.07	-.06	.29*	-.08	-.15
Mother	.04	-.05	-.09	.17	-.07	-.09
Mother + other	-.00	-.07	-.09	.28*	-.09	-.15
Time 3						
Child	-.26*	-.10	-.24*	.15	-.17	.01
Other	-.08	.04	-.03	.21*	.01	-.05
Mother	.10	.04	.01	.33**	.12	-.07
Mother + other	.05	.09	-.01	.34**	.09	-.07

Note. $p^* < .05$; $p^{**} < .01$. All significance tests are one-tailed. [1]Children understand or understand and also produce pronouns. [2]Children's ability to produce pronouns. MCDI refers to the MacArthur Child Development Inventories

Given that children's general language use is related to mothers' language use, and also that mother language is related over time, I conducted further analyses which accounted for these potentially confounding variables (see Table 6.11) . Using linear regression, I examined the significant longitudinal correlations by entering in the first step children's general language (excluding their use of pronouns) at Time 2 *and* mothers' references to others' or her own mental states at Time 2 (depending on the criterion), followed by children's 1st person pronouns in the second step. Table 6.11

shows that a large bulk of the variance in mothers' tendency to refer to *her own* mental states at Time 3 is attributable to her own referring style at Time 2 and to the child's general language abilities at Time 2. Children's use of personal pronouns at Time 2, however, accounts for a small, but significant portion of the variance. Children's personal pronoun use did not contribute any further variance in mothers' tendency to refer to *others'* mental states at Time 3, after taking in to account other potential confounding variables (mothers' tendency to refer to others' mental states at Time 2 and children's language at Time 2).

Table 6.11. *Summary of hierarchical regression statistics predicting mothers' mental state referent at Times 2 and 3*

Variable	β	*t*	R^2 and ΔR^2
Dependent variable = Mother references to others' mental states at Time 3			
Step 1: All Time 2 child language, mother references to others' mental states at Time 2			.27
Step 2:			
All Time 2 child language (excluding pronouns)	.35	2.92 [b]	
Mother references to others' mental states at Time 2	.37	3.38[b]	
Children's 1st person pronouns at Time 2	-.04	-.35	.00
Dependent variable = Mother references to her own' mental states at Time 3			
Step 1: All Time 2 child language (excluding pronouns) Mother references to her own mental states at Time 2			.40
Step 2:			
All Time 2 child language,	.16	1.56	
Mother references to her own mental states at Time 2	.54	5.72[c]	
Children's 1st person pronouns at Time 2	.19	1.82[a]	.03

Note. β = standardized regression coefficient. R^2 = proportion of variance explained by variable. ΔR^2 = change in proportion of variance explained by a variable (i.e., additional variance explained by a variable). MCDI refers to the MacArthur Communicative Development Inventory. [a]$p < .05$, [b]$p < .01$, [c]$p < .01$ (all significance tests are one-tailed).

6.7.1 Is there a reciprocal relation between mothers' referring style and children's pronoun production?

I next examined the reciprocal relation, that is, is it the case that mothers' tendency to refer to others' and her own mental states relates to children's production of 1st person pronouns. As children's pronoun use was not assessed at Time 3, I was only able to examine the predictive relation between mothers'

talk about others at Time 1 and children's pronoun use at Time 2. Table 6.12 contains the hierarchical regression statistics. The results indicate that mothers' referring style at Time 1 did not influence children's pronoun production at Time 2. Furthermore, children's language abilities or their tendency to understand or use pronouns at Time 1 does not influence their 1st person pronoun production at Time 2.

Table 6.12. *Summary of hierarchical regression statistics predicting children's 1st person pronoun production at Time 2*

Variable	β	*t*	R^2 and ΔR^2
Dependent variable = Children's pronoun production at Time 2			
Step 1: All child language at Time 1, children's 1st person pronoun understanding/use at Time 1			.09
Step 2:			
Child MCDI productive language at Time 1	.29	1.82[a]	
Child MCDI observed language at Time 1	-.05	-.31	
Child MCDI receptive language at Time 1	.17	1.31	
Children's 1st person pronoun understanding/use at Time 1	-.19	-1.44	
Time 1 mother references to *her own* mental states (across all mental states)	.09	.69	.01
Dependent variable = Children's pronoun production at Time 2			
Step 1: All child language at Time 1, children's 1st person pronoun understanding/use at Time 1			.09
Step 2:			
Child MCDI productive language at Time 1	.30	1.87[a]	
Child MCDI observed language at Time 1	-.06	-.40	
Child MCDI receptive language at Time 1	.18	1.35	
Children's 1st person pronoun understanding/use at Time 1	-.19	-1.41	
Time 1 mother references to *others'* mental states (across all mental states)	.18	1.50	.03
Dependent variable = Children's pronoun production at Time 2			
Step 1: All child language at Time 1, children's 1st person pronoun understanding/use at Time 1			.09
Step 2:			
Child MCDI productive language at Time 1	.29	1.79[a]	
Child MCDI observed language at Time 1	-.06	.39	
Child MCDI receptive language at Time 1	.22	1.67	
Children's 1st person pronoun understanding/use at Time 1	-.20	-1.50	
Time 1 mother references to the *child's* mental states (across all mental states)	.00	-.00	.00

Note. β = standardized regression coefficient. R^2 = proportion of variance explained by variable. ΔR^2 = change in proportion of variance explained by a variable (i.e., additional variance explained by a variable). MCDI refers to the MacArthur Communicative Development Inventory. [a]$p < .05$ (all significance tests are one-tailed).

6.8 Results I and Results II Summary

The primary focus of the first results chapter was to examine how the different types of mother mental state talk (emotion, desire, think/know) were related to later child mental state talk and emotion task performance. A summary of the numbers of significant correlations for all three pairs of time points is presented in Table 6.13. The main finding was that between 15 and 24 months, mothers' references to the child's desires were the primary correlates (accounting for unique variance) of children's later social understanding. Between 24 and 33 months, desire still remained a significant predictor, and talk about emotions was also now a significant predictor. However, thoughts and knowledge was the most consistent predictor of children's later social understanding.

In order to explore in more detail, the mechanism by which mental state talk facilitates children's social understanding, the second Results chapter examined the relation between the referent (child, other, mother) of mothers' mental state talk and later child mental state talk and emotion task performance.

Table 6.13 contains the numbers of significant partial correlations between children's later social understanding and the referring style across all mental states as well as the referring style for individual mental states. Across all mental states, mothers' tendency to refer to the *child's* rather than *others'* mental states at 15 months was a more consistent correlate of children's social understanding nine months later. When I examined the individual mental states, referring to the *child's* desires, rather than their thoughts/knowledge was predictive of social understanding at 24 months. At 24 months, a different pattern emerged. In this case, referring to *others'* mental states (mothers + others) was a unique correlate of children's later social understanding. Referring to children's mental states (across all mental states) was no longer predictive. When I examined the individual mental states, the more consistent predictor of children's social understanding at 33 months, was mothers'

tendency to refer to others' (including her own) thoughts and knowledge. Referring to the child's thoughts and knowledge was less consistent a predictor, accounting for only one significant correlation.

Finally, I examined whether children's use of pronouns were predictive of mothers' referring style. I was interested in the period between 24 months and 33 months as this is a time when children are reported to be using pronouns consistently in their speech. After accounting for potentially confounding variables such as children's general language abilities and mothers' tendency to refer to her own, others' or the child's mental states, there was a relation between children who were reported to use 1st person pronouns at 24 months and mothers' tendency to refer to her own mental states nine months later. Moreover, this relation was unidirectional in that mothers' referring style at an earlier time point (Time 1) did not predict children's later use of 1st person pronouns.

Table 6.13. *Number of significant partial correlations between mother mental state language, the referent of mental state language and later child mental state language and emotion task understanding.*

Mother mental state language	15 – 24 months[1]	15 – 33 months[2]	24 – 33 months[2]
Emotion	0	0	2
Desire	4	0	2
Think/know	0	1	4
Reference across all mental states			
Total child	4	1	0
Total other	1	0	4
Total mother	0	0	3
Total mother +other	0	0	4
Desire			
Child	4	0	1*
Other	2	0	0
Mother	0	0	0
Mother +other	2	0	0
Think/know			
Child	0	0	1
Other	0	0	1
Mother	0	0	3
Mother + other	0	0	3

Note. [1] Total of five child mental state language and emotion task measures. [2]Total of six child mental state language and emotion task measures. * refers to a negative correlation.

"the words are sitting in our ear, when they get a bit hot, it comes out of your ear, in your head, down a little slide and out of your mouth and words come out"

Helen (aged 4) explaining how language works.

Chapter 7 Discussion

7.1 Introduction

The purpose of this study was to address the question of how maternal input facilitates a child's developing social understanding within an explicit theoretical framework: Vygotsky's zone of proximal development. Vygotsky's principle thesis is that individual functioning (in this case mind understanding) is facilitated by social processes. Specifically applied, this general construct underlies the principle components of the zone of proximal development: (1) the child's level of actual functioning and (2) the child's potential functioning. The transition from the first component to the next occurs within a supported social environment, which has come to be known as scaffolding.

7.2 Summary of hypotheses

The theory that social understanding or early 'theory of mind' could be mediated by maternal input within a zone of proximal development generated two principle hypotheses in this study. First, I argued that the incremental and differential exposure to mental state language - first desires, then knowledge and thinking - during a child's early years, may reflect a zone of proximal development in which maternal talk about one

type of mental state (such as desires or emotions), which emerges early, may assist in the understanding of other types of mental states as well as mental life in general.

Second, I argued that (a) maternal mental state talk that takes as its referent the child, is initially more important than references to others' mental states, and (b) referring to the child would scaffold increasingly more complex mental state concepts before broadening the referent to include others' mental states.

In addressing these two broad hypotheses there were three main goals to the study:

Goal 1. To chart the changes in mother mental and non-mental state language across time.

Goal 2. To examine the relation between mother references to different types of mental states (e.g., desires versus thoughts/knowledge) and later child mental state language and emotion understanding.

Goal 3. To investigate the relation between the referent of mothers' mental state language and children's learning about mental states.

7.3 Goal 1: Changes in mothers' mental state talk over time

Consistent with the 'zone of proximal' development hypotheses, and with the empirical findings of Beeghly et al. (1986) and Ruffman et al. (2002), I predicted that talk about desires would initially be more plentiful than talk about thoughts and knowledge, with talk about thoughts and knowledge increasing with age relative to desire talk.

As predicted the first main finding was that mothers talked most about desire when children were 15 months of age, whereas mother talk about thoughts and knowledge increased more than four times between 15 months and 33 months. Similarly, there was a significant increase in talk about thoughts and knowledge between 24 and 33 months. On the other

hand, mother talk about desires and emotions remained relatively stable between 15 and 33 months.

These results extend those of Beeghly et al. (1986) in three ways. First I demonstrated this pattern in a much larger sample size (74 as opposed to 28). Second I examined mother talk within a picture description context, thus demonstrating that such findings were not restricted to a specific communicative context. Third and perhaps most importantly, I examined the changes in mother desire talk and think/know talk specifically, whereas Beeghly et al. did not isolate desire and think/know talk. This study also extends the Ruffman et al. study by providing evidence within a similar language context (i.e., picture describing) for this pattern of mother talk one and a half years earlier. Furthermore, these findings are also consistent with a study conducted by Brown and Dunn (1991) who found that mother talk about desire and emotions was also stable between 24 and 36 months. Again consistent with my study, Brown and Dunn found that mother talk about 'mental states' which included thoughts and knowledge, modulations of assertion and other mental states all increased significantly between 24 and 33 months. My study extends Brown and Dunn's findings by examining 74 participants (as opposed to just six), by extending the analysis of the trend in mother mental state talk to incorporate a younger group of children (15 as opposed to 24 months), and by providing evidence within a different parent-child context (picture description).

7.3.1 What governs the incremental exposure to desires versus thoughts/knowledge?

I highlighted in Chapter 3 several reasons why mother talk about desires would be more plentiful when children were younger. The first reason I proposed was that tell-tale facial expressions and actions make infants' desires salient and thus easier for mothers to infer than infants' knowledge or beliefs (Bretherton & Beeghly, 1982).

Bretherton and Beeghly (1982) suggest that the late appearance of cognitive terms is due to the lack of direct contextual information accompanying these terms. They suggest that desire talk is acquired earlier because it is easier to make inferences about others' desires than about people's thoughts (i.e., parents can point to what they want and what they think the child wants, whereas they can't point to "thinking"). In addition, desires are likely to be highly salient to children in that their daily existence will be marked by attempts to change the world to fit their desires. This also makes mothers more likely to comment on children's desires than they would children's thinking or knowing.

Evidence for such salience in talk about desires was reported by Brown and Dunn (1991). They found that the saliency of desires was enhanced by particular pragmatic features of mothers' conversation; for example, desires tended to be used in a controlling context (e.g., such as directing the child's behavior) and were also the subject of more causal references. I then extended this line of reasoning further, positing a second reason for why desire talk is plentiful, by hypothesizing that mothers may attempt to make desires more salient because they detect that children understand goals on some level. Goal understanding is hypothesized to be one of the first steps towards understanding mental states (see section 2.2.1) and thus could be an important indicator of the child's 'mental state' zone of proximal development. Therefore, mother talk about desires initially might be very goal- and action-oriented, (e.g., "you want to look at the doggie?"), as well as relating directly to the child, (e.g., "you like ice cream, don't you?"). Alternatively, one can speculate that as children grow older mothers may reason that they are increasingly able to understand knowledge and beliefs, and others as mental agents, and so talk more about thoughts and knowledge. In this vein, mothers may be sensitive to changes in the child's conversational ability. In turn, mothers' conversation with the child might result in a *successful* exchange of information and ideas, and the conversation might help children to conceptualise their conversational

partner's belief and knowledge states by highlighting differences in perspectives (Harris, 1996).

The way in which these mental states fit with the world is also of interest. Searle (1983) identified two different directions of fit for mental states. For desires, children must fit or change the world to their mental state (desiring), whereas for thoughts, children must change their mental states to fit the world. Gopnik and Slaughter (1991) have suggested that this difference in fit is one reason why understanding desire is easier than understanding belief. Therefore, incorporating these ideas, mothers may introduce children more to desires when they are younger because children do not need to change their mental state to understanding the relation of this mental state to the world. Furthermore, mothers might talk more about thoughts and knowledge when children are older, recognising that changing mental states to fit the world is more difficult. Drawing these two ideas together and in line with the principle of scaffolding, one could say that mothers structure the input/environment in ways that help children learn about mental states and that this lessens infants' reliance on innate knowledge of mental states.

Regarding children's mental state talk, I found that between 15 and 33 months, the percentage of children who were reported to use at least one type of mental state word steadily increased. In the case of think/know talk, however, there was a very dramatic increase in the percentage of children who were reported to use these terms at 33 months in relation to their use at 24 months. These findings are consistent with most studies which have documented that children first talk about desires between 18 and 24 months and that typically they talk first about desires before they talk about thoughts and knowledge (see above). Furthermore, they initially refer to their own desires, thoughts and knowledge before they talk about others' mental states (Bretherton & Beeghly, 1982; Bartsch & Wellman, 1995).

Thus, mother talk mirrored a similar lag in children's use of desire and emotion talk before think/know talk. However, mothers talked about mental states even when children were not reported to be using these terms. I will discuss the implications of this lag in mother talk relative to child talk.

7.4 Goal 2: The predictive relation between mother talk about mental states and children's later understanding of mental states

There were two main findings with respect to this second goal. The first finding was that within the context of describing pictures, mothers' use of *desire* terms at 15 months was predictive nine months later not only of child mental state language, but also performance on the emotion-situation task. This predictive relation was unique, having accounted for the child's language ability at 15 months, the mothers' socio-economic status, and the mothers' performance on two emotion recognition tasks. Significantly, no other mother mental or non-mental state language demonstrated a similar predictive relation.

The second finding was that at 24 months a different predictive relation emerged. I found that as a whole, all types of mental state talk (i.e., mother talk about emotions, desires and thoughts/knowledge) were predictors of the first index of social understanding, a child's later mental state language at 33 months as reported on the MCDI. What also emerged however was that mother think/know talk was a more consistent predictor (3 of 4 correlations) than emotion talk (2 of 4 correlations) or desire talk (2 of 4 correlations). These correlations held even after accounting for variance due to earlier child language, mother SES, mother's own emotion understanding, and other types of mother language such as non-mental state language. Regarding the second index of social understanding, - the emotion tasks - I found that only mother think/know talk at 24 months was a predictor of later emotion understanding, again after accounting for

any shared variance due to earlier child language, SES, and mother emotion understanding. In contrast, mother non-mental state talk was generally unrelated to later child mental state language or emotion task performance.

The lack of a correlation between mother talk about desire at 15 months and children's mental state talk 18 months later at 33 months, reflects how desire is more important with younger children. This concurs with the finding that desire talk at 24 months was a less consistent correlate of social understanding at 33 months than mother think/know talk.

In the next three sections I consider the findings within the context of the zone of proximal development and consider in more detail the significance of these findings in the light of other theoretical explanations for a child's understanding of mind.

7.4.1 Directionality of effect

First and importantly, the child's language ability including their talk about mental states did not correlate with later mother talk about mental states. In other words, the extent to which children talked about mental states had no long-term influence on mothers' mental state talk. Therefore, the findings suggest a unidirectional effect such that it is what mothers say which drives children's understanding of emotion and their later use of mental state language. In the next section I examine mothers' early desire language.

7.4.2 Why is desire language important?

One question concerns why mother references to desire at 15 months relate to the development of later child desire and emotion understanding? Part of the explanation can be accounted for by general word learning, such that children will learn words that they most consistently hear in their environment (Huttenlocher et al., 1991). That is, children likely learn about mental state terms in the same way that they learn about ordinary language, perhaps even without (initially at least) appealing to any

conceptual advances in their ability to understand these words as referring to *mental* states.

The finding that mother talk about desires related uniquely to later child talk about desires and emotions (but not later talk about animals), and that mother talk about animals related uniquely to later child talk about animals (but not mental state talk), is consistent with this explanation. The findings thus extend the work by Beeghly et al. (1986) in that not only did I remove the effects of early child general vocabulary development on later desire and emotion understanding, but also I identified which mental state terms predict later desire and emotion understanding.

The findings also suggest however, that mother talk about mental states does more than simply facilitate children's mental state language. It facilitates children's social understanding generally, specifically, their performance on the emotion-situation task. Although I cannot be sure that child mental state talk refers to *mental states*, my finding that mother mental state talk correlated with child mental state talk *and* emotion task performance is consistent with this idea. Likewise, Bartsch and Wellman's (1995) finding that children's early genuine desire talk correctly describes both their own and others' desires is consistent with the idea that this talk indexes a genuine understanding of the social world.

Dunn et al. (1991) suggest that the effect of emotion and feeling state language is to "encourage reflection and understanding of such states" (p.454). Along the same lines Wellman et al. (1995) suggest that the development of a subjective-experiential understanding of emotion facilitates early understanding of the mind. Indeed, not only do children as young as 2 years succeed on tasks which require an understanding of the emotional consequences of desires (Wellman et al., 2000; Wellman & Woolley, 1990), but also Wellman et al. showed that 2-year-olds will comment on the links between desires and emotions in their everyday talk. The common thread in each of these views, and consistent with my

findings, is that discussion of one type of mental state such as desire, is likely to facilitate understanding of mental life generally.

Thus, in very young children who are not yet able to engage in conversations about mental states, mother input about desire may be a mechanism by which children's emerging *implicit* understanding about mental life is made *explicit*. This mechanism can be conceptualized within the zone of proximal development such that mothers' use of specific types of mental state language at critical points in the child's development bootstraps the child's social understanding. Thus the timing of mental state input and the fit with the child's developmental level becomes critical. The prediction which follows from the Vygotskian framework is that as a child's desire understanding develops, mother references to thinking and knowing become important for continued evolution of mental state understanding. I discuss these ideas further in section 7.4.4.

7.4.3 The role of 'links'

Between 15 and 24 months there was no relation between non-mental state language and later social understanding. At 24 months however, 'links' emerged as weakly related to one aspect of later social understanding: desire language. A reason why 'links' may emerge at this time as a predictor of later desire language is that they tend to refer to past events, that is, they take the child outside the current frame of reference to a past or separate event (see Fivush & Haden, 2002; Harley & Reese, 1999 for an indepth discussion of these ideas). The ability to conceive of these two events, present and past, coincides with the time children are said to acquire multiple models (Perner, 1991). As discussed earlier in 2.3.1 being able to conceive of two realities is an important representational advancement. That is, the ability to hold two models is important for advancing desire understanding e.g., understanding others as having different desires or in understanding that people who share the same desire may behave in different ways to fulfill that desire. Mothers who

introduce more links at this time may be facilitating the development of these two models of reality (past and present) or picking up on the development of these skills in children. The finding that children's talk about desires did not relate to mothers' later propensity to introduce links in her talk suggests again that this is a unidirectional effect. Unlike the findings in which mother desire and think/know talk correlated with several types of mental state language and emotion understanding, the relation between links was only related to a single aspect of mental state language and therefore it is necessary to interpret these results with some caution.

7.4.4 Why does talk about thoughts and knowledge become increasingly important?

As reported above, between the ages of 15 and 33 months, *mothers* exhibited a lag in their use of mental state language (first desires, then think/knowing), similar to the lag in *children's* use of these terms. This lag fits nicely into a zone of proximal development framework. Desires are introduced first because of their salience in actions and expressions, whereas references to thinking and knowing are introduced when children begin to refer more frequently to their own desires and have a more sophisticated understanding of desire. Indeed at 18 months of age children are beginning to understand that others can have different desires (Repacholi & Gopnik, 1997). The finding that at 24 months, mother talk about thoughts and knowledge emerged as the strongest predictor of later child mental state language and emotion understanding is consistent with these ideas.

One reason why the incremental exposure to mother mental state terms such as thinking and knowing might have a later impact on child mental state language and emotion understanding, may be that such exposure introduces children to a less goal-oriented and more information-oriented mode of communication. Harris (1996, 2005) argued that children

initially conceive of others as agents who want to achieve certain goals. Later, around age 2, they begin to engage in conversation solely for the purpose of exchanging information and become aware of people as differing in knowledge and beliefs. Through the very process of information exchange, conversation affords immediate insight into how others' attitudes towards a state of affairs sometimes differ from one's own. Harris (1996) proposed that a child's growing competence as a conversationalist helped them to understand thoughts and knowledge. As Harris emphasizes, the transition from desire talk to think/know talk occurs in conversation where there is no 'immediate plan of action'. Thus, moving away from talk about desires to thoughts/knowledge, forces the child to engage in a different type of talk, which not only extends their skills as conversationalists, but also introduces them to attitudes towards concepts which are not necessarily the same as their own and which are not linked to objects and goals. It is also plausible however, that despite Harris' proposal, the context in which mothers talk about desires may reflect an alternate perspective on a current reality. Future research would be informative in establishing whether the introduction of different perspectives through mental state talk assists children's understanding of others' mental states and emotion understanding.

7.5 Goal 3: The importance of talk about the child versus talk about others

This study was the first to consider the predictive effect of mothers' talk about the child's mental states versus her talk about others' mental states and children's later social understanding. There were two main findings. First, I found that across all mothers' mental state language, reference to the *child's* mental states at 15 months was a predictor of the child's later mental state language and emotion understanding at 24 months. In contrast, at 24 months, mother talk about *others'* mental states

was a predictor of child mental state language as well as child performance on the emotion tasks, nine months later.

The second finding concerned individual mental state terms. Mothers' early talk about the *child's desires* was the most consistent correlate of children's later desire and emotion language between 15 and 24 months whereas talk about *others' thoughts and knowledge* was the principle correlate between 24 and 33 months.

I first discuss why the general tendency for mother talk about the *child's* mental states may be more important initially for predicting later child mental state language and emotion understanding. Once again, these findings can be situated within the 'zone of proximal development', such that talk about the child may initially be best for scaffolding a conceptual understanding of mental states and emotions.

One idea is that mothers who refer to their child's mental states could be construed as more mind-minded (Meins et al., 2002). To recall, Meins et al. (2003) found that early maternal mind-minded comments (at 6 months) facilitated later false belief understanding (at 4 years). That is, mothers represent their child's mental states through appropriate mind-minded comments, specifically, comments that accurately reflect how the child feels and acts. Meins et al. (2003) theorized that mothers who tended to refer to their children's minds appropriately at 6 months would continue to do so when children begin to acquire language. Thus, the finding in my study that child mental state comments were also important predictors at 15 months (a time at which children are starting to talk), provides tentative evidence for Meins' proposal. What appears to be critical during the early time points (15 - 24 months) is that child-centered comments about the mind and not other child-centered comments such as "links" were predictors of later child mental state language and emotion task performance.

Subsequently, as Meins (2002) further proposes, the stage at which children begin to use language more consistently is the ideal time at which

'linguistic and conceptual scaffolding' may occur. Thus, my finding that comments about others' mental states were important predictors between 24 and 33 months is again consistent with Meins' findings that early but not later (48 months) mind-minded comments facilitated subsequent false-belief understanding.

Some caution is in order, however, when making these analogous explanations. There are two differences between Meins' study and the present one. First, I did not explicitly code for the appropriateness of mothers' comments. Nevertheless, the context of the picture task constrained mothers' comments such that it would be difficult to misinterpret a child's mental states (e.g., to look at a particular picture). The second difference between Meins' studies (1999-2003) and the present study was that I examined how mother talk related to different indices of children's social understanding (mental state language and emotion understanding versus false belief).

These cautions aside, the present findings also extend current research such as that of Brown and Dunn (1991) and Beeghly, Bretherton and Mervis (1986), by demonstrating that not only do mothers increase their references to others' mental states between 24 and 36 months, but also that reference to others' mental states become a predictive factor in the child's later understanding of emotion and mental state language, over and above the child's language levels, SES and mother emotion understanding. When children start engaging in conversation, they now have a tool to express their own mental states and to learn about others' mental states. It seems plausible, therefore, that given this representational tool, mothers who begin to refer more to mental states other than the child's may assist in developing a child's capacity to represent mental states. I next consider other concurrent cognitive changes that may also help explain why talk about others becomes increasingly important.

In order to understand the referent of the mental state, children need to understand the personal pronouns that signal whose mental state is

being referred to. The comprehension and production of pronouns requires children to have some grasp of the deictic nature of these words, that is, that the referent of the word differs depending on who is uttering the word and that within a communicative context, the same pronoun may apply to several different people (e.g., 'you'). Children typically acquire the 1st person pronoun (e.g., 'I', 'me') before the 2nd person pronoun (e.g., 'you', Chiat, 1986). In considering the cognitive pre-requisites for understanding pronouns, one study has identified a relation between the understanding of Level I visual perspective tasks (judging what others can or can't see) and the acquisition of personal pronouns (Ricard, Girouard, & Decarie, 1999). Ricard et al. found that children's success on two Level I perspective taking tasks tended to precede their full mastery (comprehension and production) of 1st and 2nd person pronouns. In other studies, personal pronoun competence (i.e., greater use of pronouns as rated by mothers on questionnaires) has also been related to the development of visual self-recognition (Lewis & Ramsay, 2004). Against this background, children's developing understanding of visual perspective and their corresponding conceptualization of self (as indexed by pronoun use) coincides with developing conversational abilities. In other words, understanding the subjective nature of thoughts and knowledge may correspond with an understanding of mental or psychological points of view or perspective (Harris, 1996, 2005). Such an understanding may be facilitated by conversational ability, which provides a context in which these points of view may be presented.

The ability to understand different perspectives also corresponds to Perner's (1991) multiple models stage in which children develop the capacity to conceive of at least two models of reality. Thus children at the second time point (24 months) likely benefited from mother talk about others because their understanding was supported by a whole host of simultaneously developing cognitive abilities, which assist in developing points of view and together converge towards a greater understanding of

self and other. Moreover, the finding in this thesis that mothers' later referring style (self, child, other) was related to children's earlier pronoun competence suggests a potential avenue by which mothers may detect that children understand others' perspectives. These findings are interesting when considered within the overarching uni-directional finding that it was *mothers'* input that facilitated later child mental state language and emotion understanding rather than the other way around. It may be that mothers monitor children's developing concept of self versus other through pronoun use and that this determines the extent to which they will begin to refer more to others' mental states.

Also in need of explanation is the way in which mothers' referring styles (self, child, other) interacted with individual mental state types (desire, think/know). To recall, mothers' early talk (15 months) about the *child's desires* (rather than *others' desires*) was the more consistent correlate of children's later desire and emotion language between 15 and 24 months whereas talk about *others' thoughts and knowledge* rather than the *child's thoughts and knowledge* (at 24 months) was the principle correlate between 24 and 33 months.

I first discuss the significance of talk about the child's versus others' desires. One way in which mothers can highlight or make salient desire understanding is to situate it within the child's frame of reference. In line with the zone of proximal development, maternal references to the child's (rather than others') desires could represent a scaffolding mechanism by which the child's implicit understanding of desire (at 15 months) is made explicit. This seems to be particularly pertinent to understanding desire. Mental state terms might help infants to understand their own internal experiences as "wanting" or "not liking", whereas a label applied initially only to others might describe their external expression of desire but not their internal experience (unless infants had had the experience of connecting their own internal experiences with particular mental state terms). I could thus postulate a specific pattern in which mothers introduce

mental states by first situating them within the child's experiential frame of reference (talk about the child), before extending the frame of reference to include others. Indeed mothers referred initially more frequently to the child's desires before referring more to others' desires. Between 24 - 33 months, mothers referred more frequently to children's thoughts and knowledge. Booth, Hall, Robison and Kim's (1997) findings suggest that parents begin to talk more about others' rather than the child's cognitive mental states (specifically, 'know') at about 45 months. Given, however, that my study stops at 33 months, I cannot address the issue of whether mothers increase their talk about others' thoughts and knowledge.

Such a model has also been proposed for the development of action verbs, whereby an understanding of persons as intentional agents of action cannot emerge until the child understands the similarities between self and other. In order to do this, a child must first conceptualize the action as it relates to the self, before it can be extended to others (Huttenlocher et al., 1983). Such a bias exists in parent input, in that action categories that refer to the child are more frequent than those that refer to others (Huttenlocher, Smiley, & Ratner, 1983).

In addition, the finding that mother references to others' desires were also related to children's later mental state understanding, (though less consistently so than referring to the child's desires) suggests again, that the timing with which mothers introduce the referent of mental state words may depend on the extent to which children have "internalized" these mental state terms as they relate to themselves. Along similar lines, and in keeping with Booth et al. (1997), I predicted that as children "internalize" the notion of thoughts and knowledge as they relate to themselves, mothers would increase references to others.

Contrary to my prediction, however, at 24 months, mother talk about *others'* thinking and knowing (rather than the child's thoughts and knowledge) was a more consistent predictor of later child mental state language and emotion understanding. One possible explanation for this

finding is that the distance between the assessment at time point 2 and time point 3 was too large. It may be that at an earlier age (e.g., 28-30 months) reference to the *child's thoughts/knowledge* would be more frequent and would be a more consistent predictor of later child social understanding.

Yet, there are other reasons why mothers' talk about thoughts and knowledge might operate in a different way to desires explaining why the self-other pattern did not emerge for thoughts and knowledge as predicted. One reason is that thoughts and knowledge cannot be made salient in the way desires can be. Indeed Brown and Dunn (1991) suggest that this lack of salience is what prevents children's use of such terms. In addition, I propose that mother talk about thoughts and knowledge might be most effective for the child when they understand mental states as referring to others. Therefore, initially, talking about the child's desires is more important because children have yet to master the self-other distinction at 15 months. By the time they are 24 months of age, they have a better understanding of the self-other distinction in desire, as evidenced in their success on the Repacholi and Gopnik (1997) broccoli task, their relative mastery of personal pronouns and their purported ability to represent multiple models (Perner, 1991). Therefore, at 24 months, talk about the child's mental states (e.g., their thoughts and knowledge) is no longer so important. Indeed, talk about others' thoughts and knowledge is more important because children might now be relatively good at understanding their own mental states.

Theoretically, these findings might attest to the initial importance of the zone of proximal development as a mechanism for bootstrapping children's early understanding of others' minds via simulation. In particular, by initially focusing on the child's mental states, mothers are consolidating a child's understanding of mental states as they relate to themselves, before they use these insights to understand others' mental states. This focus is most important when children are young (e.g., 15 months of age) because they have relatively little insight into the self-other

distinction. This scaffolding pattern mirrors the process necessary for simulation in that Harris's (1991) version of simulation theory argues that a successful simulation requires children to imagine how they would feel in another person's circumstances, making self-knowledge paramount.

7.6 Summary

The zone of proximal development provides a conceptual framework for understanding the relation between the incremental exposure of mother mental state talk and children's later mental state language and emotion understanding. I propose that more knowledgeable conversational partners such as parents manage children's exposure to mental state language, both in the type of mental state language and the referent, and that this managed exposure facilitates a child's developing social understanding.

First, mothers talk about desires because children have an early-developing appreciation of goals. By focusing initially on desire language mothers bootstrap a child's social understanding in general by making explicit a child's implicit understanding of desire. This initial boost to children's general mental state understanding provides subsequent opportunities for mothers to talk beyond desires and to focus on thoughts and knowledge. Consequently, mothers who talked more about thoughts and knowledge rather than desires at the second time point assisted later mental state understanding.

Another dimension to the zone of proximal development and integral to the success of this incremental exposure, is the relative tendency for mothers to talk about the child's versus others' mental states. Initially, mothers focus on the child's mental states by providing a label for the child's own experiences of desire. As children internalize their understanding of desire as it relates to themselves, they are able to further appreciate others' desires. These ideas are in line with notions that children's understanding of others' mental states is based at least partially

on the process of simulation. Simulation accounts typically stipulate the importance of initially forming self-representations before this self-understanding can be used to understand the actions or behaviour of others. This developmental stage also coincides with the idea that children develop multiple models of reality evidenced through their increase in pronoun use, pretend play and understanding of others' versus their own desires. Once children achieve this developmental level, mothers focus more on others' mental states, especially thoughts and knowledge.

Although my study was not designed to adjudicate between the various theoretical explanations for the lag between desire and belief understanding in children, the zone of proximal development does provide a way of linking mother input with theoretical explanations for children's developing social understanding.

In conclusion, this is the first study to examine in such young children, the effects of mental state language (and the referent of such language), beginning before children use any desire, emotion or other mental state language themselves. The initial finding was that mother talk about desires was predictive of later mental state talk and emotion understanding. This study is also the first to consider the predictive relation between referring to the child's versus others' mental states and later mental state language and emotion understanding. My finding that references to the child's desires initially, and others' thoughts and knowledge subsequently, were unique predictors of later desire and emotion understanding highlights the importance of identifying the referent in future research of this type. Further, this is the first study to examine the effect of mothers' desire, emotion and belief language on children, having accounted for *mothers' own mental state understanding* (emotion recognition). As such, it provides the clearest evidence possible short of intervention studies that the things mothers *say* facilitate children's knowledge about mental states. This result is consistent with recent findings that most of the variance in preschool children's false belief

understanding is determined by environmental rather than genetic factors (Hughes et al., 2005; Ronald, Happe, Hughes, & Plomin, 2005)

7.7 Future research directions

A limitation of this study is that I only examined a partial index of child social understanding (desire and emotion understanding). Future research might examine how mother talk relates to other aspects of children's social understanding.

Given the purported importance of children's conversational ability and the relation to developing points of view (Harris, 2005), an interesting adaptation of the study would be to assess children's abilities on Level I perspective-taking tasks between 18 months and 24 months of age when children are beginning to use 1st person pronouns. One prediction would be that mothers begin to introduce more mental state language that refers to others' mental states when children are aware of others being able to take a different visual perspective on concrete objects. This would provide further evidence for the interrelated role of perspective taking, the understanding of mental states as referring to others and conversational development. In addition, it would provide support for the finding that children's pronoun use may influence the referring style of mothers (see above).

A feature of this study was that mothers' tendency to use mental state language was not influenced by the children's mental state language at an earlier time point. There remains the possibility that child influence on parents takes place on a micro-level time scale (maternal adjustments in each context) but there is no long-term effect of child language on mother language. Furthermore, research could be directed at examining the cues parents use to modify their scaffolding of mental state language. This could be examined in two separate contexts. First, it would be interesting to examine the paralinguistic features of the younger age group's conversation (15 months) to assess how children convey understanding of

parents' speech, especially their responses to parents' mental state talk. Parents may respond to specific contingencies between children's non-verbal behaviour (indicating understanding or lack of understanding) and their references to mental states. These initial cues may provide the starting point for the zone of proximal development (e.g., children who show responsiveness to mothers' initial references to desire terms within the context of goal understanding, may encourage mothers to continue introducing and using mental state talk). From this initial analysis it may be possible to develop a training study that directly assesses the influence of children's non-verbal responding and mother use of mental state language. As has been well documented, at this age, children are developing and consolidating their joint attention skills. Mothers' responsiveness to children's joint attention skills may form the parameters of the zone of proximal development. One hypothesis would be that mothers structure the zone of proximal development on the basis of their infant or child's non-verbal responding (e.g., their joint attention skills).

To further explore the incremental nature of mother mental state speech and its relation to social understanding, one could examine how mothers describe deceptive objects to children (e.g., perspective shifting + sentential complements, versus perspective shifting only, versus sentential complements only). To recall, a variety of studies (de Villiers & Pyers, 2002; Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003) have shown that the use of sentential complements is correlated or assists (through training) children's false-belief performance. In addition, discourse that presents different perspectives on a situation is also facilitative of later false-belief understanding (Lohmann & Tomasello, 2003). Given, that I have found that mothers scaffold children's exposure to mental state language, an interesting question would be how mothers deal with a situation, which could potentially teach children about mental states that is, talking about a deceptive object. Mothers may operate at three potential levels: they may not expose the deceptive nature of objects; they may refer

to the deceptive nature of the object using simple perspective shifting discourse (e.g., What, a rock? Never, it's a sponge, I see that), or they may do so using mental state language in sentential complements as well (e.g., she thinks that it's a sponge). These styles could be ranked according to representational difficulty and a further question would be to consider if there was any relation between the children's level of language, their mothers' style of talk and children's later performance on false-belief task.

A second but related strand of research could examine in more detail the range of speech acts that children use over the 15 - 33 month time period. As was demonstrated in this study, children's language ability as reported by parents was not predictive of mental state use, suggesting a unidirectional effect of maternal talk on later child social understanding. An interesting measure would be to extend the analysis of children's language by examining their pragmatic competence as indexed by their range of speech acts (Dore, 1986). It may be that mothers are sensitive to children's speech act use and use these as an indicator of their zone of proximal development. A study by Ziatas, Durkin and Pratt (2003) demonstrated differences in the speech acts of autistic children compared to specific language impairment and normal children. Children on the autistic spectrum referred less to internal states and causal explanations for behaviour. Also, autistic and Aspergers individuals referred more to desires than thoughts and knowledge compared to matched SLI and normal children. Employing a longitudinal design (similar to this present study) would be informative in revealing whether mothers' mental state language was sensitive to the range of speech acts in normal, autistic and SLI children and whether this sensitivity influenced children's later social understanding.

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Appendices

APPENDIX A: DESCRIPTIONS AND ORDER OF PRESENTATION OF PHOTOGRAPHS IN BOOK 1 OF PICTURE-BOOK TASK.

1. Girl and mother feeding ducks at the park
2. Girl holding a kitten
3. Girl pushing a kitten in a toy shopping basket
4. Boy crying (no context)
5. Boy poking out his tongue in disgust (no context)
6. Woman milking a cow
7. Boy throwing a stick to a dog
8. Man feeding seagulls off the side of a boat
9. A girl in a swimming pool with an angry expression on her face
10. A girl being given an injection at the doctors
11. A baby crying while being fed food
12. A girl lying in bed ill while playing a puzzle
13. A boy clapping his hands after building a tower of blocks
14. A very young baby screaming
15. A girl and a dog asleep together
16. A boy hugging a lamb
17. A boy screwing his face up in disgust while being handed a spoon of medicine

DESCRIPTIONS AND ORDER OF PRESENTATION OF PHOTOGRAPHS IN BOOK 2 OF PICTURE-BOOK TASK.

1. An angry boy (no context)

2. A woman and child laughing at each other
3. A group of three children playing sword fighting
4. A surprised looking boy
5. A girl looking at a frog while imitating its expression
6. A frightened boy
7. Two baby boys crying while surrounded by toys
8. An adult holding a baby who is crying
9. A grandmother and baby laughing
10. A small boy holding a frog
11. A fireman carrying a boy
12. A father smiling while holding a crying boy
13. A girl holding her nose in front of some onions.

APPENDIX B: SUPPLEMENTARY TERMS IN MCDI (WORDS AND GESTURES) AT TIME 1

Mental state

Want, hope, wish, care (about), afraid (that), like, love, dream, prefer, keen on, think, know, believe, expect, wonder

Emotion

Annoyed, hurtful, bored, unhappy, feel bad, sad, upset, fed up, miserable, cross, grumpy, angry, mad, scared, frightened, afraid, worried, shocked, shy, surprised, pleased, happy, enjoy, excited, fun, interested, frustrated, missed, disgusted, o.k. [feel o.k.], good [feel good], better

Physical state

Cry, smile, laugh, giggle, hurt, in pain, ill

The senses

Look, listen, cold [body feeling cold], hot [body feeling hot]

APPENDIX C: SUPPLEMENTARY TERMS TO MCDI (WORDS AND SENTENCES) AT TIME 2

Cognitive

Hard [difficult], remember, guess, dream, forget, mean [I mean that], real

Modulations of assertion

Might, bet, curious, expect, sure, definitely, possibly, maybe wonder, suppose, certain, certainly, could be, perhaps, reckon, figure, guess, must, probably

APPENDIX D: EMOTION SITUATION TASK VIGNETTES (CORRECT ANSWER IN PARENTHESES AND ASTERISK DENOTES TRIAL WAS GIVEN AT TIME 3)

Situation illustrated (Correct Answer)	Facial expressions offered
1. *Santa giving a child a present (Happiness)	happiness, anger
2. *A girl cuddling a puppy (Happiness)	happiness, surprise
3. *Lion chasing boy (Fear)	happiness, fear
4. *A boy and his teddy bear with a broken leg (Sadness)	sadness, happiness
5. Child with leg wound (Sadness)	sadness, disgust
6. Child watching a baby's diaper being changed (Disgust)	disgust, fear
7. Child breaking plate in front of mother (Anger)	anger, disgust
8. A boy playing peek-a-boo with a girl round the corner (Surprise)	surprise, anger

APPENDIX E: BODY EMOTION TASK VIGNETTES (CORRECT ANSWER IN PARENTHESES AND ASTERISK DENOTES TRIAL WAS GIVEN AT TIME 3[3]

Situation illustrated (Correct Answer)

1. *Girl sitting on wall with head in hands (sad)
2. Girl sitting on chair hugging her legs (sad)
3. *Man holding woman's handing and jumping at beach (happiness)
4. *Man with head in his hands (sad)
5. *Woman with hands in the air splashing the sea with man (happiness)
6. Boy with grandfather at beach pretending to be aeroplanes (happiness)
7. Little girl jumping (happiness)
8. Football player kneeling on the ground with head in hands (sadness)

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[3] For this task, children were only given a forced choice of happiness and sadness. * denotes items used at Time 3.