

**Maternal Predictors of  
5- to 8-year-old Children's Understanding of  
Interpretation and Mixed Emotions**

by

**Sherri L. Frohlick**

M.A., Simon Fraser University, 2007

B.A., Carleton University, 2004

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# Approval

**Name:** Sherri L. Frohlick  
**Degree:** Doctor of Philosophy  
**Title:** *Maternal predictors of 5- to 8-year-old children's understanding of interpretation and mixed emotions*  
**Examining Committee:** Chair: Ralph Mistlberger  
Professor

**Jeremy I.M. Carpendale, PhD**  
Senior Supervisor  
Professor

---

**Tim Racine, PhD**  
Supervisor  
Associate Professor

---

**Arlene Young, PhD**  
Supervisor  
Adjunct Faculty

---

**Lucy Lemare, PhD**  
Internal Examiner  
Professor  
Department of Education

---

**Charlotte Johnston, PhD**  
External Examiner  
Professor  
Department of Psychology  
University of British Columbia

---

**Date Defended/Approved:** September 15, 2015

## Ethics Statement



The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

- a. human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

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## **Abstract**

The current study examined the concurrent relations between various maternal parenting variables and 5-to 8-year-old children's understanding of interpretation and mixed emotions. Mothers' self-reported parenting styles, use of mental state words, parent-interaction quality (engagement, responsiveness and sensitivity of control) and complexity of epistemological beliefs were assessed. Regression analyses were used to test the hypothesis that higher quality maternal parenting practices would explain significant variability in children's social understanding. Results found that the maternal variables were associated with each other in a theoretically consistent manner but did not explain significant variability in either children's understanding of interpretation or mixed emotions. The only significant predictor of children's social understanding was child age, such that older children performed better on both social cognitive tasks. Results are discussed in light of previous research linking various parenting practices and social understanding abilities in children.

**Keywords:** Parenting; Theory of Mind; Epistemology; Mental State; Mother-child interaction; Maternal Beliefs

## **Dedication**

For my grandfather, Aloysius Frohlick, and my son, Gabriel Halliburton.

And to the families that I have loved, who have loved me, and that have welcomed me into their lives. You have taught me so much.

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## List of Abbreviations

BS	Billy and Sarah Story
MMST	Maternal Mental State Terms
SL	Sam and Laurie Story

## Introduction

Two adults carry on a conversation, an infant shows his or her mother a toy, a adolescent laughs at a sarcastic joke told by a friend, a child picks up a toy dropped by a playmate – these are all examples of behaviours that involve various aspects of *social understanding*. Described simply as “learning to understand others” (Carpendale & Lewis, 2015, p. 382), social understanding encompasses a wide variety of complex abilities that involve the coordination of perspectives. These abilities are evident even in early infancy and continue to unfold throughout the lifespan. In infancy, elements of social understanding are inferred from such behaviours as gaze following, pointing (see Racine & Carpendale, 2007) and complex gestures like head nodding (Kettner & Carpendale, 2013). With the development of language, children’s understanding of their social world becomes more complex and in the preschool period social understanding is evident in the understanding of beliefs and emotions. At about school-age and beyond children begin to grasp more advanced forms of social understanding, for example, the understanding of desire, intention, mixed and complex emotions, sarcasm, interpretation, inference and recursive thinking (see Carpendale & Lewis, 2015 and Astington, 2001 for reviews and synthesis).

Even after a brief review of the literature, it is apparent that much of the research on social understanding has focused on children’s beliefs (i.e., false beliefs), desires, belief-dependent emotion and emotion understanding in the preschool period. This collection of abilities, with an emphasis on false-belief understanding, has been commonly referred to in the literature as “theory of mind” (or ToM) (Premack & Woodruff, 1978). ToM has been a major focus of developmental psychology research and carries with it an impressive and large theoretical and empirical literature. Wimmer and Perner’s *unexpected transfer task* (Wimmer & Perner, 1983) and its variants (i.e., *unexpected contents task*) have been most commonly used to empirically assess children’s ability to understand that beliefs can be false. The task involves a story about a character whose

beliefs about a location of an object become false after the object is moved without his knowledge. If children can demonstrate that the character will not know the new location of the object they are thought to possess an understanding of false-belief. There are ongoing theoretical debates regarding what passing false-belief tasks really demonstrates about children's social understanding (Chandler, 1988; Carpendale & Chandler, 1996), and according to Chandler (1988, 1992) there has been an overemphasis in the literature on false-belief attainment as the one major step in children's "theory of mind" development (see Perner & Davies, 1991). Chandler calls this the "one miracle" view of children's epistemic development (Chandler, 1988, 1992). According to Chandler and colleagues, the focus of research on false-belief understanding resulted in the neglect of other social understanding skills, such as comprehending the interpretive nature of knowledge, which appears later in development, and has been described as a qualitatively different form of social understanding (Lalonde & Chandler, 2002). In fact, several studies have found the children false-belief task performance is not correlated with tasks involving the understanding ambiguous figures, which involves a basic grasp of the interpretive nature of knowledge (Gopnik & Rosati, 2001; Doherty & Wimmer, 2005). Regardless, the empirical study of false-beliefs and other early indicators of social understanding has been extremely fruitful and has greatly informed our understanding of children's social-cognitive development, generally.

Variation in, and correlates of, the emergence of the ability to understand that it is possible to hold beliefs that are false has been a major focus of the research literature. For instance, the age at which children can pass the unexpected transfer and unexpected contents tasks varies widely. Some children pass such tests during the preschool years (i.e., age 3), others not until age 5 (see Milligan, Astington, & Dack, 2007; Wellman, Cross & Watson, 2001 for a review). However, meta-analyses have demonstrated that passing false-belief tasks is statistically most likely around the age of 4 years (Milligan, Astington, & Dack, 2007; Wellman, Cross, & Watson, 2001). The study of this variability has led to the identification of a variety of factors within the child and the social environment that have predicted or are correlated with false belief understanding and other related abilities, such as emotion understanding. Age and verbal ability have typically been found to be robust predictors, while other aspects of the family environment, including socioeconomic status (Holmes, Black, & Miller, 1996), maternal

education (Cutting & Dunn, 1999), parenting style (e.g., Hughes, Deater-Deckard, & Cutting, 1999; Pears & Moses, 2003), family composition (e.g., Perner, Ruffman, & Leekham, 1994; Ruffman, Perner, Naito, Parkin, & Clements, 1998), maternal mind-related language (e.g., Ruffman, Slade, & Crowe, 2002), children's language skills (Cutting & Dunn, 1999; deVilliers, 2000; Jenkins & Astington, 1996), and mothers' ability to view their child as a mental agent (e.g., Fonagy, Redfern, & Charman, 1997; Meins et al., 2002) have been described in the literature as playing a role as well.

Parents and parent-child interaction in particular have long been considered an important social-environmental contributor to children's social-cognitive development. This research was precipitated by several studies that identified the "sibling effect" (Perner et al., 1994; Jenkins & Astington, 1996), that children with siblings, particularly older siblings, performed better on false-belief tasks than children without siblings or with same-age or younger siblings (Lewis, Freeman, Kyriakidou, Maridaki-Kassotaki, & Berridge, 1996; Ruffman et al., 1998). Some studies did not find this effect (Cutting & Dunn, 1999) or found that it was accounted for by the presence of siblings aged 1 – 12 years (Peterson, 2000) rather than just older siblings. Having older generations nearby also resulted in advanced false belief skills (Lewis et al., 1996). Other research teams found that parental education and occupational status predicted advanced false-belief performance in pre-schoolers (Cutting & Dunn, 1999) and that low socio-economic status was associated with delayed false-belief performance (Holmes, Black, & Miller, 1996). This led to a focus on the nature of family relationships rather than the study of sibling relationships exclusively (Hughes et al., 1999). It was suggested that there is something about the parent-child relationship or family interactional style that could explain these differences. For example, in one study, Jenkins, Turrell, Kogushi, Lollis, and Ross (2003) found that children with older siblings were exposed to more language with cognitive terms (e.g., thoughts, desires, memories, knowledge).

Unfortunately, one of the effects of the overemphasis on false-beliefs in the literature is that insights into the social-environmental influences on children's social understanding are almost solely based on children's performance on false-belief and basic emotion understanding tasks (Carpendale & Chandler, 1996; for exceptions see Ruffman, Slade, Devitt & Crowe, 2006; Susswein, 2007). As such, researchers have

overlooked the potential knowledge about parental contributions to social understanding that could be gained by studying its more complex forms. The purpose of the current study is not to add to the existing theoretical debates, but rather to respond to lack of research on later forms of social understanding by examining the relations between various maternal variables and 5- to 8-year-old children's understanding of interpretation and mixed emotions.

Although there are a variety of maternal variables that have been associated with children's social understanding, there are a few that have received the most attention in the literature. These include parent-child interaction, parenting styles, and maternal language. Given that false-belief understanding is a different form of social understanding than understanding the interpretive nature of knowledge (Lalonde & Chandler, 2002), it is possible that the maternal predictors may also be different. In the review below I summarize the research literature linking these variables to children's social understanding and discuss another aspect of parenting that might be helpful in understanding two specific types of social understanding, that two people given the same ambiguous information can come to different conclusions and that one person can experience multiple emotions simultaneously. This will be followed by a description and discussion of the current study.

## **Families, Parent-Child Interaction and Parenting Styles**

Dunn and colleagues are most famous for their longitudinal study of the effect of family context on children's social understanding (Dunn, Brown, Slomkowski, Tesla & Youngblade, 1991). They found that mothers' discussion of feelings and the causes underlying individual behaviour when children were 33 months was associated with performance on an unexpected contents false belief task at 40 months of age. In the same study, mothers were observed and rated on their responsiveness, attention, control/intrusion, and affection during an interaction task with their child and a sibling. No effect of observed parenting practices was found for target children's performance on various social understanding tasks (i.e., false belief, affective labelling, affective perspective-taking). However, they did find that maternal responsiveness and attention toward the sibling correlated with the target children's performance on the affective

understanding tasks. Mothers' control/intrusion toward the sibling was positively associated with children's correct explanation of the false belief scenario as well. Later, I will discuss how Dunn's investigations also shed light on different aspects of language within the parent-child system that may influence children's social-cognitive skills.

Dunn et al. (1991) established a clear effect of discussion of psychological concepts within parent-child interaction for children's social understanding and an indirect effect of parenting. Following this, several investigations examined other aspects of maternal behaviour. In one study, Ruffman, Perner and Parkin (1999) looked at mothers' self-reported disciplinary strategies and their association with children's false-belief performance. Mothers were presented with several disciplinary situations and asked to report how they would discipline their child in each scenario. They found that mothers who reported that they would focus on the feelings of the other child in the conflict had children who performed better on false-belief tasks. Although not directly tested, it was thought that disciplinary strategies where parents engaged their child in a discussion about the situation, which might have included orienting their child to the consequences of their actions for others, rather than reprimanding them, was more beneficial for children's false-belief understanding because it might have facilitated better understanding of the reasons underlying actions or because it required children to consider other children's perspectives.

A similar study using observation ratings and self-reports of parenting found an overall relation between observer-rated parental warmth, control and strict discipline and performance on false belief and deception tasks even after controlling for child verbal IQ, family SES and sex (Hughes et al., 1999). Interestingly, Hughes et al. also reported a benefit of parental warmth for young girls, and strict parenting for boys, in predicting performance on false belief tasks. The authors suggested that strict disciplinary practices might have resulted in better performance because the boys in their sample might have had more practice at trying to avoid such punishment by being more deceptive.

A subsequent study found a significant negative association between authoritarian parenting practices, such as spanking and yelling, and 3- to 5-year-old

children's belief understanding (Pears & Moses, 2003). Mothers' use of these power assertive parenting strategies were related to poorer false belief understanding, and mothers' use of consequences (e.g., time-out) was linked with children's poor emotion understanding. These relations remained when age was controlled. It was suggested by the authors that authoritarian parenting and harsh disciplinary practices might have been used by parents of children with poorer social cognitive abilities. However, age (and hence, social maturity) was not correlated with more positive parenting practices, which suggests that this was not the case for this particular sample of children.

These last two studies (Hughes et al., 1999; Pears & Moses, 2003) highlight the complexity of the relationship between parenting and children's social understanding, particularly that the intent of certain parenting behaviours is important. The consideration of culture has added to this debate. Vinden (2001) argues that it is important to also consider the cultural context when making claims about the value of certain parenting practices for children's social cognitive development. In several studies, Vinden (1996, 1999) found that children in non-European cultural groups (Mofu of Cameroon, Tolai and Tainae of Papua New Guinea) often performed more poorly on false-belief tests than children from Western cultures. In a follow-up study, Vinden (2001) examined parenting practices within non-Western cultural groups that might have explained this difference. She reported that while authoritarian parenting strategies were found to be detrimental to children's social cognitive development in European American families, they were not in Korean-American families. She postulated that the *meaning* underlying authoritarian parenting practices might explain the cultural differences. Carpendale and Lewis (2006) have speculated that parents' beliefs about child development and their role in that development may vary across cultures and may also explain these differences. Such an explanation, however, has never been studied empirically. I will return to the issue of parental beliefs later in this literature review.

## **Attachment**

Attachment theory has also provided a unique vantage point from which to understand how parenting may influence children's understanding of their social world. Mary Ainsworth, a colleague of John Bowlby, argued that seeing things from the child's

point of view and respecting children's individual perspectives and actions is the defining feature of a secure *attachment* relationship (Ainsworth, Bell, & Stayton, 1971). According to this perspective, a factor that influences the development of secure attachment is mothers' sensitivity and appropriate responsiveness to their infant's cues, such that mothers do not "socialize with the baby when he is hungry, play with him when he is tired, and feed him when he is trying to initiate social interaction" (Ainsworth, Bell & Stayton, 1974, p. 129). Indeed, there is some evidence that concurrent assessments of attachment security are positively correlated with children's metacognitive skills (Moss, Gosselin, Parent, Rousseau, & Dumont, 1997), false-belief performance (Fonagy et al., 1997), and emotion understanding (Laible & Thompson, 1998).

The construct of maternal sensitivity also appears to be important. Symons and Clark (2000) found that maternal *sensitivity*, defined as "responses to an infant's signals for proximity and contact", when assessed at age 2 was a better predictor of children's social cognitive development at age 5, including performance on an attachment-specific caregiver location task, when compared to a general measure of attachment security (a Q-sort observation of attachment security). This particular finding suggests that the beneficial effects of attachment for social understanding may be through specific maternal behaviours (e.g., sensitivity) rather than a measure of overall relationship security. This may be due to the fact that attachment security is often not clearly defined, and is assessed and rated using a variety of methods (e.g., self-report, observational Q-sort, strange-situation). In fact, a mixture of these methods has been used in the studies linking attachment and social understanding. Elaborating on the mechanisms underlying secure attachment, Elizabeth Meins and colleagues (Meins, Fernyhough, Russell, & Clark-Carter, 1998) have argued that maternal "mind-mindedness" explains the connection between maternal sensitivity and children's social cognitive development. I will return to this construct after first discussing other language-based links to children's social understanding.

## **Language Within the Parent-Child System**

It would be difficult to discuss parental contributions to children's social understanding without addressing the aspects of maternal language that have been

associated with children's early social understanding. The *type* and *quality* of the language used in parent-child interactions and its benefits for social understanding attracted much research attention based on a number of reported associations between false belief understanding and a child's own language (Cutting & Dunn, 1999; Happe, 1995; Jenkins & Astington, 1996) as well as those found in the language-learning environment in Dunn et al's longitudinal study (Dunn et al., 1991). These studies led researchers to conclude that aspects of maternal language as well as children's own language ability was an indication of their level of social understanding (see Milligan, Astington & Dack, 2007 for a meta-analysis). Similar to Meins, follow-up studies found that maternal language that referenced mental states was strongly related to children's social cognition, even more so than the child's own linguistic proficiency (e.g., Ruffman et al., 2002). Cross-cultural studies also reported evidence that children in cultural groups in which there is no word for belief tended to do more poorly on false-belief tasks than those that did (Vinden, 1996). This led to a focus on maternal language, specifically the use of feeling and mental state words, and their potential contributions to children's social-cognitive development.

There have been several different approaches to understanding the benefits of mothers' language for social understanding. The prominent approach is one that emphasizes mothers' use of mental state words in conversation with their children (e.g., Meins et al., 2002; Ruffman et al., 2002). Within other approaches the argument has been made that mentalistic understanding is based upon children being able to use the syntactic structure of *complementation* (de Villiers & de Villiers, 2000; de Villiers, 2000), or is related to exposure to conversation that contained more inter-connected clauses (e.g., Ensor & Hughes, 2008), or the degree to which maternal talk encourages children to *elaborate* on their verbalizations (e.g., elaborative vs. close-ended discourse; e.g., Ontai & Thompson, 2008). The current review of the literature focuses on the maternal use of mental state terms and explanatory/elaborative discourse. Readers are referred elsewhere for a review of the complementation (e.g., Carpendale & Lewis, 2006; Harris, 2005; Lohmann & Tomasello, 2003) and connectedness literature (e.g., Ensor & Hughes, 2008), as they are important but less relevant, to the current empirical investigation.

As stated earlier, the work of Dunn and colleagues (e.g., Dunn, et al., 1991) found that exposure to causal talk and talk about feelings was related to better false-belief performance and emotion understanding. In other investigations, mothers' use of mental state terms was associated with preschool-aged children's use of such words, both cross-sectionally and longitudinally (Furrow, Moore, Davidge, & Chiasson, 1992). For example, Moore, Furrow, Chiasson and Patriquin (1994) found that mothers' use of the word "belief" was related to children's later understanding of the differences between "think", "know" and "guess". Building upon this work, Ruffman et al. (2002) set out to differentiate the effect of mother-child talk (i.e., mothers' use of mental state terms) on children's theory of mind understanding. Ruffman and colleagues found a relation between mothers' use of mental state utterances during conversation with their children about photographs of common situations from the Thorpe Interaction Measure (Thorpe, 1996) and children's performance on a number of belief and desire social cognitive measures at three separate time points over the course of one year.<sup>1</sup> Ruffman et al. (2002) concluded that the effect of mothers' use of mental state terms on false-belief performance must be causal since (1) the relationship between maternal mental state language and children's false belief performance was not due to children's early false-belief ability, and (2) children's early false belief scores did not predict mothers' use of mental state terms.

Subsequent studies have replicated the positive correlation between mothers' mental state language and children's performance on standard theory of mind and inner state vocabulary tasks (e.g., Meins et al., 2002; Ruffman et al., 2006; Turnbull, Carpendale, & Racine, 2008). However, this association has not been consistently reported across all studies (e.g., Meins et al., 2003; Ontai & Thompson, 2008). In particular, Osorio, Meins, Martins, Martins and Soares (2012) reported that mothers' mental state references did not predict children's social symbolic play, whereas children's own *desire* references did. They also found that mothers' mental state language was correlated with children's use of mental state language, which was then predictive of children's social symbolic play. It was suggested that mothers' mental state

<sup>1</sup> In this study, the criteria for what constituted a mental state term were based upon the work of Bartsch & Wellman (1995). Please see the coding guide in Appendix B for details. There are other similar criteria used in the field (e.g., Bretherton & Beeghly, 1982).

references might influence children's social-cognition indirectly, through their own use of mental state language, and that mothers' language may have had an effect on their children's symbolic play at an earlier time-point. Other studies have found that mothers' references to children's own mental states, as opposed to general mental state references, may enhance children's mental vocabulary (Tampeau & Ruffman, 2006, 2008). Discrepancies in study findings may be a result of the large variation among tasks used to code for mental state language and the differing ages at which children have been assessed. A systematic analysis of these differences and their impact on study findings has not been conducted.

Another approach has been Meins's concept of mind-mindedness (MM). Meins defines mind-mindedness as a mother's ability to view her infant as an intentional being with mental attributes, rather than just physical and emotional needs (Meins et al., 1998). From this definition it is not clear whether mind-mindedness is necessary for secure attachment, but it is certainly different than the concept of maternal sensitivity, which is largely a behavioural construct. Examining this empirically, Meins and colleagues found longitudinal associations between secure attachment at 31 months, mothers' tendency to describe their child in mentalistic terms at 37 months (i.e., mind-mindedness), and children's false belief understanding at 48 months (Meins et al., 1998). Meins subsequently demonstrated that the link between "mind-mindedness" and social cognitive development was associated with mothers' appropriate (vs. inappropriate) mind-related comments while interacting with their infants (Meins & Fernyhough, 1999). Subsequent studies demonstrated that mothers' appropriate mind-related comments with their 6-month-old infants were correlated with later 'theory of mind' performance, but mentalistic descriptions at 48 months were not (Meins et al., 2002). Most importantly, Meins et al. found that maternal mind-mindedness predicted children's performance on social cognitive tasks better than general measures of attachment security and maternal sensitivity (Meins et al., 2002).

Meins' earlier research suggests that both sensitivity and mind-mindedness appear to be constructs describing a responsive and appropriately psychologically-minded parent. In her more recent work she has noted a distinction between appropriate and non-attuned mind-related in terms of its ability to differentiate attachment status

(Meins et al., 2012; Meins, 2013). For instance, Meins et al. (2012) reported no association between appropriate and non-attuned mind-related comments, and an association between appropriate mind-related comments and maternal sensitivity. These attributes appear to be more robust predictors of false-belief performance in young children than the broad construct of attachment security or maternal sensitivity. In another recent study, Meins et al. (2013) examined appropriate versus non-attuned mind-related comments and children's perspectival symbolic play at 26 months and children's false-belief performance and at 51 months. Path analysis suggested a direct link between appropriate mind-related comments and children's false-belief understanding as well as a negative association between non-attuned comments and children's internal state vocabulary and symbolic play. Subsequent to this, Laranjo, Bernier, Meins and Carlson (2014) reported a positive association between appropriate mind-related comments during a play-based interaction task at 12 months and children's false-belief understanding and Level 2 visual perspective taking at age 4. These findings lend additional support to the hypothesis that maternal language that correctly emphasizes the mental attributes and states of her child plays a role in children's social understanding.

Most recently, Meins has examined the differential effects of mind-related language and behaviour. In her early work it was implicitly assumed that a parent who thinks of and describes her child in psychological terms also interacts with her child in such a manner. The concept of maternal sensitivity, which is measured behaviourally, however, was too not specific enough to reflect mind-related parenting behaviours. Until recently, this had not been tested. In a re-analysis of her 2001 data, Meins (2013) found that appropriate mind-related comments relate to specific mind-related behaviours such as response to infant gaze (Meins, 2013). However, speech-based measures of MM were more predictive of attachment status (i.e., secure/insecure), leading her to conclude that it is attuned psychological language that is most important for attachment. The degree to which this differentiation is also important for social understanding has not yet been tested.

Yet another aspect of parents' language that has received attention in the literature is the extent to which mothers encourage children to provide more information

and expand on a topic in an open-ended manner (i.e., *elaborative discourse*) (e.g., Ontai & Thompson, 2008). For instance, elaborative discourse, a maternal conversational style, has been found to correlate with preschool-aged children's performance on social cognitive tasks (Welch-Ross, 1997; Ontai & Thompson, 2008). In one such study, children and mothers were asked to discuss an event that was fresh in the child's memory. Mothers' conversational turns were coded as elaborative if they encouraged the child to provide additional information, asked the child to complete a sentence that the mother had started, and/or the mother repeated the child's verbalization and added a prompt as an invitation for the child to continue speaking (e.g., Yeah or No). In their sample of 78 preschool children, Ontai and Thompson (2008) compared the association of maternal elaborative discourse and mental state words with children's 'theory of mind'. They found a significant association between maternal elaborative discourse and children's 'theory of mind' but no association with mental state words. In a follow-up study, Ontai and Virmani (2010) reported evidence that this maternal communication style is early-developing, stable and predicted by child characteristics and the quality of the parent-child relationship.

Similar to elaborative discourse, the extent to which mental states (including emotions) are explained or elaborated by mothers has also been studied (e.g., Garner, Jones, Gaddy, & Rennie, 1997; Peterson & Slaughter, 2003; Symons, Peterson, Slaughter, Roche, & Doyle, 2005). For example, in two separate studies, Peterson and Slaughter (2003) found that maternal conversational preferences for elaborated and explanatory talk about mental states measured via the Maternal Mental State Input Inventory (MMSII) was related to children's performance on social cognitive tasks. In a follow-up study Slaughter, Peterson, and Mackintosh (2007) used a more direct measure of mothers' explanatory talk; mothers' narration of a wordless picture book with their preschool child. Their results demonstrated that mothers' clarifications of story characters' thoughts were correlated with children's false belief understanding. In contrast, simply mentioning cognitive or mental state terms was not related to children's performance on social cognitive measures. Another study compared mentalistic elaborations referring to the self (child or parent) and story characters in parent-child dyads during a book-reading task (Symons et al., 2005). Story character mentalistic elaborations were related to 5- to 7-year-old children's theory of mind composite scores.

This effect was a result of parent, not child, elaborations. Further support for this position can be found in the study cited earlier looking at mentalistic elaboration during joint book-reading (Symons et al., 2005). Symons and colleagues found that parent-child discussion of the theme of the story was associated with performance on the social cognitive measures.

Ontai and Thompson (2008) draw from the arguments of Tomasello (2000), Harris (1999), and Nelson (1996) to suggest that elaborative discourse provides children with opportunities to hear, share and reflect on multiple perspectives. Although this might be the case, there is no evidence that the coding systems for elaborative and explanatory talk actually measure the extent to which perspectives are shared and considered. Ontai and Thompson's coding system does not differentiate between conversations in which mothers are simply requesting information from those in which they are engaging in a back-and-forth dialogue as they strive to understand and clarify their children's thoughts and points of view. It is possible that elaboration is an improvement upon the mental state term approach and is a crucial element of parent-child interaction that allows children to have the experience of sharing their thoughts and experiences. However, the limitations of its methodology do not permit these types of conclusions.

Other research has examined the context of parents' use of mental state words (e.g., Peterson & Slaughter, 2003) as well as the amount of discussion of human activity (e.g., Turnbull, Carpendale & Racine, 2008; Turnbull & Carpendale, 1999). These studies have provided an alternative perspective on how children's language environments influence their growing social understanding because they suggest that counting mental state words may capture only part of the story. These approaches are argued to represent an improvement upon the *elaborative/explanatory* approaches presented above (e.g., Turnbull et al., 2008; Turnbull & Carpendale, 1999) because they investigate conversational dialogue about mental states and human activity in context, without focusing on specific words or types of conversations. For example, as argued elsewhere (Turnbull & Carpendale, 1999), one of the drawbacks of using mental state words exclusively as a marker for the discussion of psychological material in parent-child conversations is that mental state words are not necessarily required. For example,

words like “hide”, “trick”, “see”, “look”, “tell” and “say” are not typically considered mental state words yet they can refer to an attempt to manipulate or modify someone’s knowledge (Turnbull et al., 2008). Based on this observation, Turnbull et al. (2008) had parents and their preschool-aged child construct a story from a wordless picture book about a false-belief scenario. The researchers divided the story into sections and identified where the discussion of a specific element of the story was critical to understand the entirety of the false-belief scenario in the book. They counted the number of mental state words used by the dyad as well as the number of false-belief elements discussed, and examined the relation between these measures and children’s performance on two false-belief tasks. Results showed that mental state words did predict children’s performance on the false-belief tasks, but that when both talk about the false-belief elements and mental state words were taken into account, the number of false-belief elements discussed accounted for more variability in children’s false belief performance than number of mental state words.

In another investigation (Hutchins, Bond, Silliman, & Bryant, 2009), the manner in which mental state words were mentioned (i.e., true mental state, to direct interaction, to direct reflection, other) had a differential association with mothers’ personal epistemological complexity. Mothers with the least complex beliefs about knowledge used mental states to direct interaction, whereas mothers with more complex epistemological beliefs used mental states to direct reflection. Although this study did not examine relations between these functions of mental states and children’s social cognitive skills, the authors provided plausible reasons why they might be associated.

## **Differentiating the Effects of Language and Behaviour**

Although it is difficult to argue that one can exclude language from parents’ behaviours, Ruffman and colleagues designed a study to differentiate the differential contributions of parenting behaviours and language to children’s social understanding (Ruffman et al., 2006). Fifty-five children and their mothers were tested when the children were 3 years and 4 years of age. Children were given various tasks to assess their social cognitive skills (e.g., T1: false-belief transfer, desire-emotion, emotion-situations; T2: desire-action, false-belief contents, wicked desires, ambiguity) and level

of conflict/cooperation with a peer in a joint task. Mothers' mental state language, positive affect, negative affect, responsiveness, teaching, and control level were also assessed. The results demonstrated that maternal positive affect (warmth) correlated with children's positive conversation and cooperation with the peer, whereas maternal mental state language correlated with children's social cognitive task performance and cooperation with the peer. Their controversial conclusion was that it was "...only what mothers say (their mental state talk) that related to child theory of mind, and both what they say and what they do (their warmth) that related to child conflict cooperation" (Ruffman et al., 2006, p. 105).

In response to Ruffman and colleagues, Susswein (2007) attempted to better understand whether it was what mothers said or how they said it that mattered most for children's concurrent and prospective social understanding. This study assessed three free-play observation-based maternal parenting variables (authoritative control, responsiveness, involvement), which were combined to create a parental engagement composite. Susswein compared its contributions to children's concurrent false-belief understanding and later interpretation understanding with mothers' use of mental state words during a joint book-reading task. Results indicated that both mind-related terms and parental engagement variables were related to 3-year-old children's concurrent false-belief understanding, but only the parental engagement variables were predictive of children's later interpretation understanding at 5- to 7-years. Interestingly, it was also found that the use of mind-related terms in the book-reading task was correlated with the parental engagement variables. These results suggest a different pattern of relations than found by Ruffman et al. (2006), and question the interpretation that there is a clear differentiation between what parents 'do' and 'say' for children's false-belief understanding.

It is apparent from the research that various qualities of maternal language are linked to children's social cognitive development and that the nature of the association is likely multi-faceted. It seems that children who are exposed to a rich language environment where parents and children commonly discuss human activity, in which mental state terms are a prominent feature, are likely to benefit most in terms of their social understanding. Simply mentioning mental state terms may not be enough, instead

it is children's understanding of the context of their usage that matters (Appleton & Reddy, 1996; Turnbull et al., 2008). In other words, maternal language that is situated within the specific situations that arise in children's everyday social relationships and activities seems most beneficial. This could explain why elaborative discourse, interconnected conversation and use of mental state words to encourage child reflection may benefit children's social understanding. Further, there seems to be evidence that it is parental use of psychological language, rather than the child's own language proficiency or elicitation of psychological talk in the parent-child relationship, that is driving the language-social understanding association (Tampeau & Ruffman, 2006, 2008).

## **Maternal Epistemology**

In addition to understanding how parenting behaviour, attachment, and maternal language are related to children's social understanding, there is increasing interest in the parenting literature regarding another construct that may be important for understanding children's social understanding. It has been postulated that differences among mothers in terms of their beliefs about knowledge and the knowing process, known as maternal epistemology, are related to how they interact with their children and subsequently their child's level of social understanding (Hutchins et al., 2009).

The study of personal epistemologies comes from a branch of philosophy concerned with the nature and justification of human knowledge (i.e., epistemology). Although there seems to be a lack of consensus on how to label, describe and define the construct of personal epistemology (i.e., it is referred to as epistemic beliefs/views, personal epistemologies, epistemological thinking, positions, ways of knowing, reflective judgment) (see Hofer & Pintrich, 1997), it has typically been considered an important determinant of thinking regarding competing knowledge claims across the lifespan. In the review that follows the various theoretical and research programs concerned with personal and maternal epistemologies will be summarized in order to demonstrate the value of empirically examining an association with children's social cognitive development.

Personal epistemologies have been studied by a variety of research groups who have conceptualized the construct in a similar but not identical manner (e.g., Perry, 1970, 1981; Belenky, Clinchy, Goldberger, & Tarule, 1986, 1997; Baxter Magolda, 1987, 1992; King & Kitchener, 1994; Kuhn, 1991; & Kuhn et al., 2000). A description of each model is beyond the scope of the current paper (refer to Hofer & Pintrich, 1997 for a summary); however, I will briefly describe the models' similarities. Most models more or less posit that personal epistemologies are developmental in nature, although there are some exceptions (Schommer, 1990). William Perry (1970) was the first to provide a comprehensive account of how individuals come to an increasingly mature understanding of the knowing process. In his study of college students learning experiences, Perry charted the course of epistemic development as it was revealed through qualitative interviews. He found that college students' epistemic "positions" fell into one of nine stages; ranging from that of an absolute conviction regarding the nature of knowledge (*Dualism*) to a belief that knowledge is simply a matter of opinion, all of which are equally valid (*Multiplicity*), to a more relativistic position in which knowledge is thought to be more personal and contextual (*Relativism*). In the last stages of relativism there is a commitment to a position based on reasoned argument and evidence (*Commitment within Relativism*).<sup>2</sup> In other words, personal epistemologies typically start out with an investment in the absolute fidelity of knowledge (i.e., it is either a fact or not), and gradually move toward a view that knowledge is wholly subjective in nature and no opinion is better than the next, and later that knowledge is constructed and subjective but decisions must be made, not by weighing the 'facts,' but by considering the relative value of some kinds of knowledge over others. In the latter stages, some arguments may be better supported than others for a variety of reasons and taking a position based on these reasons is thought to reflect a more "optimal" and complex way of thinking of knowledge and knowing (Boyes & Chandler, 1992). This process has been described by Perry's followers, as, more or less, moving from a dogmatic/dualistic to a more rational and relativistic view of knowledge and knowing (see, for example, Benack & Basseches, 1989; Broughton, 1978; Chandler, Boyes, & Ball, 1990; Kitchener & King, 1981;

<sup>2</sup> There are several stages within each of Perry's four positions, For example, dualism contains stages 1 to 3, multiplicity comprises stage 4, relativism stage 5 and commitment within relativism contains stages 6 – 9.

Kitchener, King, Wood, & Davidson, 1989; Kuhn, Amsel, & O’Laughlin, 1988; Mansfield & Clinchy, 1997; Reich, Oser, & Valentin, 1994; Sinnot, 1989).

Perry developed and validated his nine-stage model with a sample at Stage 4 (Multiplism), whereas seniors were more likely to endorse the positions of the last 4 stages (Relativism - Commitment within Relativism). However, it was uncommon for college seniors to fall into the very last and most complex position, as it was viewed as a maturity of “outlook and function beyond the level expected of the experience of a college senior” (Perry, 1968, p. 15). Those who have followed in Perry’s footsteps have contentiously argued that the highest levels of relativistic thinking may only be achieved by a minority of individuals receiving high level degrees, particularly in the field of philosophy (Kitchener & King, 1981; King & Kitchener, 1994).

As noted by Hofer and Pintrich (1997), other research groups have applied somewhat different labels to the construct and studied them in different contexts and samples, but more or less conceptualize the underlying construct of personal epistemology as a developmental process of change whereby knowledge claims are evaluated on increasingly more subjective and evaluative terms. That is, epistemic development boils down to, more or less, some form of Perry’s objectivism-relativism-rationalism transition. For example, Baxter Magolda (1987, 1992) followed up on Perry’s work utilizing a mixed gender sample and reported on an “epistemological reflection” model. Belenky et al. (1986) studied “ways of knowing” and outlined six “epistemological perspectives” in an exclusively female sample. King and Kitchener (1994) postulated four stages of reflective judgment as it pertained to thinking and reasoning about ill-structured problems. The developmental account<sup>3</sup> of epistemic beliefs has typically been assessed via interviews, but shorter self-report questionnaires using likert-type scales and representing the construct quantitatively have also been developed (Kuhn et al.,

<sup>3</sup> There is also a competing “system of beliefs” account that is not discussed in this paper. Whereas those that espouse the “developmental process” account specify that views about knowledge and knowing are qualitatively different to one another and follow a sequence from less to more differentiated (Perry, 1970; Belenky et al., 1986; Kuhn et al., 2000), the “system of beliefs” approach states that personal epistemologies can be differentiated categorically and represent one or more independent dimensions of beliefs (Schommer, 1990). Readers are referred to Hofer and Pintrich (1997) for a review.

2000; Wood, Kitchener & Jensen, 2002; Krettenauer, Hallett & Chandler, 1999). Readers are referred to Ahola (2009) for a discussion of both the utility and challenges in measuring personal epistemologies with quantitative measures.

These approaches have described the transition from objectivist views of knowledge construction to more relativistic and rational positions as occurring most rapidly during the post-secondary period. Others have challenged these claims and studied epistemic development in young children (Kuhn 1991; 1993; Kuhn et al., 2000; Carpendale & Chandler, 1996; Chandler & Carpendale, 1998) and young adults (Boyes & Chandler, 1992; Chandler, 1975, 1987, 1988; Chandler & Boyes, 1982; Chandler et al., 1990) and have reported data demonstrating an earlier onset of relativistic thinking than postulated by Perry and his followers. Chandler and colleagues outlined a four-stage model (*Naïve Realism, Defended Realism, Dogmatism/Skepticism, Post-skeptical Rationalism*) that has most closely followed Perry's model. It has been most prominent in its explication of the adolescent identity formation process (e.g., Boyes & Chandler, 1992; Krettenauer, 2005).

Much of the literature cited above has been concerned with understanding personal epistemology in the context of the learning environment (see Hofer & Pintrich, 1997 for a review). The examination of personal epistemologies, especially those of mothers, as potentially important determinants of parental beliefs about child-rearing, parenting behaviours, and parent-child interactions has been brief (Bond & Burns, 2006; Bond, Belenky, Weinstock, & Cook, 1996), and there has been no empirical investigations concerning how they might be related to a variety of child social-emotional or cognitive outcomes.

Those utilizing Belenky's model of North American mothers' "epistemological perspectives" have come close, however (Belenky et al., 1986,1997), and these results are most relevant to the current discussion and study. According to Belenky and colleagues (1997), there are five stages of epistemic development, that range from simple (*Silenced Knower*) to more complex (*Constructed Knower*) views about knowledge, the self as knower, and the process of knowing. At the simplest level – *Silenced knowing* – women tend to view themselves as voiceless and unable to

participate in the knowing process. The next step, *received knowing*, on the other hand, envisions a passive receiving and storage of information and tends to view knowledge as passed along from experts. *Subjective knowing* views knowledge and truth as private, as belonging wholly to the individual and not to be shared or subjected to evaluation by others. *Procedural knowing* involves seeing knowledge and truth as being developed, knowable, subject to evaluation and communicable. The most complex maternal stance, *constructed knowing*, describes mothers who view knowledge and truth as constructed, person and context dependent, dynamic and changing.

Across several studies of mothers of preschool children, more complex maternal epistemological beliefs predicted mothers' complexity of beliefs about child development (Bond & Burns, 2006), use of authoritative parenting strategies (vs. authoritarian) (Bond & Burns, 2006; Bond et al., 1996), recruitment of their children as active participants in problem-solving tasks, and use of more stimulating learning strategies with their children (Bond et al., 1996). These relationships were found regardless of income and education level. Other studies found that complexity of epistemological beliefs was related to higher levels of contingent verbal exchanges in mothers of young children (Jimerson & Bond, 2001), and adolescents' perceptions of their mothers as more communicative and engaged (Holmes, Bond, & Byrne, 2008).

Perhaps the tightest link between maternal epistemology and parenting was described in Hutchins et al. (2009). Using Belenky's WAYS of knowing interview, they found that more complex epistemological perspectives were associated with maternal amount of talk and use of mental state words with their 5- to 10-year-old children. As stated earlier, mothers' epistemological complexity predicted how mental state words were used by mothers. For example, mothers with less complex epistemologies used mental states terms to direct interaction, whereas mothers with more complex epistemologies used mental states to promote reflective thinking. Furthermore, children of mothers with more complex epistemologies talked more and used more mental state words. Hutchins et al. argue that this pattern of results provides evidence for the assertion that epistemological perspectives influence the language-learning environment that then may contribute to children's "theory of mind" development. However, children's theory of mind was not measured in the study and so this interpretation was suggestive

only, and made in light of the previous research linking maternal language to theory of mind (e.g., Ruffman et al., 2002). This is similar to Meins' contention that language (i.e., mind-mindedness) may be a reflection of parenting style.

These few studies suggest that studying mothers' epistemologies may be important for understanding both parenting behaviour and the course of children's social understanding. However, there are more specific theoretical reasons why these constructs might be associated. At a distal level, there is the oft-cited argument that personal epistemologies influence adult behaviour through some form of unconscious cognitive mechanism (Harkness & Super, 1996; Pomerleau, Malcuit, & Sabatier, 1991). Others have discussed belief systems as a possible starting point for the interactions and experiences that occur within the parent-child system (Belsky, 1984; McGillicuddy-DeLisi & Sigel, 1995). In fact, there is a small body of research linking parental belief systems with the quality of parent-child interactions, conceptualizations of child development, and the methods parents use to socialize their children (e.g., Guttentag, Pedrosa-Josic, Landry, Smith, & Swank, 2006; Harkness & Super, 1996; Sigel & McGillicuddy-DeLisi, 2002). If beliefs, broadly defined, are linked to the way mothers think and act it is not too far off to suggest that the way they view knowledge may also play a role in the parent-child system. It is through such parenting behaviours and actions that maternal epistemology may influence children's social cognitive development. Put simply, if a mother is more apt to approach competing knowledge claims in more relativistic terms, they may be more likely to approach parenting in a similar manner. For instance, a mother who believes that knowledge is constructed by the knower and based on reasoned evidence and arguments may be more likely to interact with her child in a more responsive, calm and calculated manner. Further, mothers' approach to problem-solving may be more reasoned and they may spend less time "teaching" their children and more time letting them explore, learn for themselves and reflect critically on their experiences. Perhaps these types of interactions provide a benefit to children's own ability to understand their social world and think interpretively. Such relations have not been adequately addressed by the research.

## The Current Study

In the sections that follow I present an empirical study of the relations between various measures of mothers' parenting and social understanding skills in a sample of 5- to 8-year-old children and their mothers. Specifically, the present research investigated the association between the frequency of mothers' mental state term use (MMST), self-reported parenting styles (authoritarian, authoritative, permissive), observed maternal behaviour (engagement, responsiveness, sensitivity of control), self-reported epistemological beliefs, and children's ability to understand the interpretive nature of knowledge and emotions. Children's social understanding skills were assessed using measures of interpretation understanding and mixed emotions. These measures are thought to tap into children's understanding that there is more than one way to view the same event and that one can experience multiple emotions simultaneously. Given the positive associations reported or hypothesized in the literature between high quality parenting practices and other measures of social understanding, the maternal variables were expected to be independently associated with children's performance. Further, since the complexity of maternal epistemology has been implicated as an attribute of the parent-child system that may influence parenting style, behaviour and language, its association with the other parenting variables was examined. In the literature it has been implied, but never tested, that the complexity of maternal epistemological beliefs may be more associated with children's social understanding when compared to other parenting variables. This idea was also examined in the current study.

The goal of the present research was not to make causal claims or interpretations but rather to highlight the relations between a variety of parenting variables that have either been previously identified in the literature as the predominant predictors of children's early social understanding (e.g., false-belief, belief-dependent emotion, emotion understanding, desires), or that have not yet been studied within the context of children's social cognitive skills (e.g., maternal epistemology). The use of measures of children's understanding of interpretation and mixed emotion also addresses a developmental question, because these tasks are indicators of a type of social understanding that emerges later in development and has not received much attention in the social understanding literature.

## Method

### Participants

Participants for the current study were drawn from a sample of mother-child dyads that took part in the final phase (Time 2) of a two-part longitudinal project examining the development of children's social understanding. Mothers were recruited from communities surrounding Simon Fraser University through local advertising. Families were entered into a cash draw for their participation in the study.

The original sample consisted of 109 parent-child dyads—102 mother-child pairs and 7 father-child pairs. Since the purpose of the current study was to investigate maternal parenting, the fathers were removed from the sample, leaving 102 mother-child dyads in the Time 2 sample<sup>4</sup>. Twelve additional dyads were excluded from the sample; five due to videotape recording problems leading to loss of data on several key variables, and an additional seven due to unavailability of transcripts. The final sample consisted of 90 mother-child pairs. The children ranged in age from 5 years to 8.75 years ( $M = 6.74$ ,  $SD = 0.94$ ). Approximately 57% ( $n = 51$ ) of children in the study were under 7 years old. Gender distribution was roughly equal ( $n_{female} = 46$ ,  $n_{male} = 44$ ).

<sup>4</sup> There is increasing discussion about the effect of father-child interaction on children's social-emotional development (see Paquette, 2004 for example). There is a growing body of evidence that father-child interaction is important and may have a differential effect than that of mothers (e.g., Grossman et al., 2002; Lamb & Lewis, 2004; Gamble, Ramakumar, & Diaz, 2007; Putnick et al., 2012; Webster Low, Siller and Kisst Hackett, 2013). However, a majority of the literature linking family practices to children's social understanding involves mothers only. This is certainly a drawback of the literature and one that needs to be addressed. Due to low sample size this study was not able to examine father's potential influences or make any comparisons between mothers and fathers.

## Procedure

Mothers were first asked to construct two stories with their child based on two sets of storybooks that contained detailed pictures but no words (see descriptions below). Afterwards, children completed two experimental tasks with a trained research assistant, understanding of interpretation and mixed emotions (see *Measures* section). While the child completed these tasks with the experimenter, the mother completed several self-report measures of parenting, two of which were of interest in the current study (see *Measures* section). Mothers completed a demographic questionnaire either at Time 1 or Time 2, depending on at what time point they entered the study.

Mother-child dyads completed the experimental protocol in a university developmental psychology lab ( $n = 81$ ) or in their own home ( $n = 9$ ). Mothers and their children were administered experimental tasks in the same order. Experimental tasks were not counterbalanced because of concerns that children's experience with the tests of interpretation would influence their subsequent interpretation and narration of the stories.

## Description of storybook tasks

Each dyad was asked to narrate two storybooks without words: the *Billy and Sarah* story and the *Sam and Laurie* story. Each storybook consisted of a set of pictures depicting an interaction between two children set within a theme involving some aspect of social understanding. Mothers and their children were told that the mother should turn the pages but to create a story based on the pictures in the book in any way they wanted.

The Billy and Sarah story depicts a situation in which a boy named Billy has a false belief about the whereabouts of a chocolate bar. The story begins with a mother giving Billy and Sarah each a chocolate bar. Sarah eats her chocolate bar right away and Billy decides to save his for later and hides his chocolate under a sleeping dog. Unknown to Billy, Sarah sees him hiding his chocolate bar. She decides to play a trick on him by taking the chocolate and putting it in her pocket. Later on, Billy returns to the dog to retrieve his chocolate and discovers that the chocolate is missing. A conflict

between Billy and Sarah ensues in which it is discovered that Sarah has taken his chocolate bar. Their mother becomes involved in a conversation with the children and assists them in resolving the conflict.

The Sam and Laurie story illustrates a more complex social situation, one in which two children hold different beliefs about the same object, their family dog, Carp. The story was designed to elicit talk about interpretation and subjectivity. The pictures display two children, Sam and Laurie, each having very different experiences with Carp. Carp behaves badly with Sam (e.g., digs in the garden, pees on the floor, chases a cat up a tree) but is helpful and well-behaved when with Laurie (e.g., playing Frisbee with her, carrying her lunchbox, pulling her in a wagon). The last few pictures show a potentially ambiguous situation where Carp is pulling on a boy's pant-leg while a truck races past. The last picture depicts a policeman questioning the children. Dyads were given a brief introduction regarding the interpretive nature of the story and asked to look at the last two pages first (ambiguous situation, policeman involvement). After going through the story, dyads were to answer the following questions based on the last two pictures: "What would Sam say to the policeman about what Carp did?", "What would Laurie say to the policeman about what Carp did?", and "What would the policeman think and do after he listened to Sam and Laurie?".

## **Measures**

### **Demographics**

Mothers filled out a demographic questionnaire at their first entry into the study. They were asked to report on several demographic characteristics, including family structure (i.e., single or dual parent household), primary language spoken at home with the child, number and age of siblings, and highest level of maternal education. However, because these questionnaires were not completed at the same time point, some characteristics are not comparable across mothers and children (i.e., educational attainment or number of siblings at Time 2 if mother completed demographic information at Time 1). Based on mothers' reports, 86.7% of the children were from 2-parent families at study entry and 88.9% spoke primarily English at home with their child. Cantonese

(3.3%), Mandarin (4.4%) Spanish (1.1%), and French (1.1%) were identified as also being spoken at home. Approximately 77.5% of children had at least one other sibling living at home and 26.7% of these children had an older sibling. A majority of mothers (85.5%) reported having had some university or college education (elementary only=1.1%, high school only=13.3%, university degree=33.3%).

The demographic questionnaire did not ask mothers to self-report their ethnicity. As such, the primary researcher visually analysed videotapes to estimate the distribution of ethnicity in the sample. Although this is not the most accurate or valid method of obtaining ethnic status it was deemed the only option available given the lack of information in the archival data. Those mothers classified as Caucasian accounted for 76.7% of the sample. The remaining mothers were classified as Asian (15.6%), South Asian (4.4%), Latino (2.2%) and First Nations (1.1%). Five dyads appeared to be mixed-race.

### **Mothers' epistemological beliefs**

Mothers completed the Epistemic Doubt Questionnaire (EDQ) (Krettenauer, Hallett, & Chandler, 1999) to assess their epistemological beliefs. The EDQ assesses the degree to which respondents endorse epistemic beliefs consistent with Naïve Realism, Defended Realism, Dogmatism-Skepticism, or Post-skeptical Rationalism. As noted earlier, Chandler and colleagues (Boyes, 1987; Boyes & Chandler, 1992; Chandler, 1975, 1987, 1988; Chandler et al., 1990) adapted these four broad categories from Perry's original nine stages of epistemic development (see Perry, 1970).

According to Chandler's conceptualization, epistemic beliefs are categorized from least to most complex based on beliefs about whether knowledge claims are evaluated with certain, objective, and knowable criteria (i.e., there is only one set of facts, those with different opinions simply have access to the wrong information); this is known as *Naïve Realism*. In the next stage, *Defended Realism*, knowledge acquisition is more relativistic such that given the same facts people can come to different beliefs, all of which are not equally valid; some are right and others are wrong. These stages of Realism characterize a set of beliefs that knowledge acquisition is often a matter of

deciding what is true and false or right and wrong. In the *Dogmatism* stage the subjectivity of knowledge is acknowledged, but an investment in one right opinion predominates. In other words, there is thought to be an authority figure or voice with knowledge that is “more” true. Knowledge claims become subjected to less objective criteria, and thus become more uncertain, as one moves to more “optimal” forms of thinking. In the *Skepticism* stage, there is a greater belief that interpretations or knowledge claims are equally valid and that there is no relative value of one over another, it is simply a matter of “opinions” (Ahola, 2009). Those whose beliefs fall into the *Postskeptical Rationalism* arena understand that knowledge is constructed by the knower but that a decision must be made regardless of the uncertainty inherent in all forms of knowledge, and that choices about what position to take with regard to competing knowledge claims are based on “rational” evidence and arguments.

The EDQ is a likert-type research instrument designed to evaluate the extent to which respondents thinking fall into these broad stages regarding competing knowledge claims. It is arguably a more accessible measure for research compared to common interview protocols due to its practicality and ease-of-use (Ahola, 2009; Hallett, Chandler & Krettenauer, 2002), but it has potential for missing the nuanced nature and complexities inherent in epistemic thinking.

The EDQ has been studied in undergraduate (Hallett et al., 2002) and adolescent samples (Krettenauer, 2005). Hallett et al. (2002) reported a factor structure that is consistent with Chandler’s adaptation of Perry’s theory. Although not a perfect reflection of Chandler’s model, in a sample of undergraduates three groups of students broadly consistent with the four stages were identified by cluster analysis based on their endorsements of the EDQ epistemic belief statements (i.e., objectivists, skeptics, rationalists). The study revealed little support for retaining the Realism and Dogmatism scales as separate (Hallett et al., 2002) because the measure could not statistically differentiate the groups as predicted based on age. Given this, it was recommended that the two scales be condensed into one and called “objectivism”. As predicted, these three groups were differentiated based on age and educational attainment.

There are 12 items on the original EDQ, each of which presents two competing claims about knowledge (e.g., “Some people say that parents should be very permissive with their children, and others say that they should be very strict”) and four randomly ordered statements, each of which characterize a belief that is consistent with one of the four epistemological stances. Respondents indicate their agreement with each statement in the item, ranging from 1 (completely agree) to 5 (completely disagree). Respondents are also asked to indicate which statement expresses their own viewpoint best. Therefore, typically, two scores are generated from parents’ responses; one score indicating their relative endorsement of each stance out of 5 and another indicating their preference of one perspective over another across the 12 scenarios.<sup>5</sup> See Table 1 for an example item.

**Table 1. Sample EDQ item**

1.	Some people say that parents should be very permissive with their children, and others say that they should be very strict. It appears to me that:	
(a)	Both of these views amount to little more than personal preference for one style of raising children over another, and neither can be said to be better than the other.	<b>SKE</b>
(b)	Experts who study these things ought to determine which of these approaches is best for raising children.	<b>DOG</b>
(c)	When people discuss questions like this they mess things up. There is clearly one style of raising children which is superior to the other.	<b>REA</b>
(d)	The fact that there are many different ways of raising children is not a good reason to assume that all are equally good.	<b>RAT</b>
WHICH STATEMENT EXPRESSES YOUR OWN VIEWPOINT BEST?		
CIRCLE <u>ONE</u> : (a) (b) (c) (d)		

<sup>5</sup> Hallett and colleagues (Hallett et al., 2002) also suggested that the measure be analysed according to respondents’ possible differential response to items assessing brute facts versus institutional facts. Brute facts are those considered separate from human convention (e.g., physical truths), whereas institutional facts refer to those whose meaning is structured by social context and rules (e.g., the meaning of “marriage” is culturally-determined). Hallett et al. divided the 12 EDQ items into brute vs. institutional facts as a way to better understand an individual’s potential differences in epistemic beliefs between these two facets of epistemological life. This method of examining the data was not used in the current study.

Due to missing data on relative endorsements<sup>6</sup>, mothers' reports on the perspective that best described their own viewpoint were used as the primary score in the current study.<sup>7</sup> The frequency of response for each category across all 12 items was calculated for these composites (e.g., Realism vs. Dogmatism vs. Skepticism vs. Rationalism).<sup>8</sup> Consistent with Hallett et al. (2002), the Realism and Dogmatism scales were combined into one Objectivism scale.<sup>9</sup>

## Parenting styles

Mothers completed the Parenting Authority Questionnaire (PAQ; Buri, 1991). The PAQ assesses the extent to which parents endorse Baumrind's authoritarian, permissive, or authoritative parenting practices (Baumrind, 1966, 1968, 1971). It consists of 30 statements of parenting behaviours (e.g., Authoritarian: "I do not allow my child to question any decision I make"; Permissive: "I allow my child to decide most things for himself/herself without a lot of direction from me"; Authoritative: "I take into consideration my child's opinions when making family decisions, but I do not decide something simply because he or she wants it"). Mothers rated the extent to which they agreed or disagreed with the statements on a 5-point Likert scale (i.e., 1 = strongly disagree, 5 =

<sup>6</sup> Fifteen out of 90 mothers did not provide responses to all 12 sub-items but instead only responded to the question concerning their "best" viewpoint. Because data were missing for each sub-item on all 12 items of the EDQ, data imputation was deemed statistically inappropriate as a method of retaining the data.

<sup>7</sup> To better understand the nature of the loss of this data and any potential bias that may occur by only using the EDQ total scores, chi-square analyses were run to determine whether those with missing data on the *average agreement* responses differed on demographic variables. There were no differences in child age ( $t(88) = -0.13, p = .89$ ), maternal education (Fisher's exact test  $p = 1.00$ ), primary language (Fisher's exact test  $p = .64$ ), ethnicity (Fisher's exact test  $p = .09$ ), family type (Fisher's exact test  $p = .41$ ), experimental setting (Fisher's exact test  $p = .17$ ) or gender (Fisher's exact test  $p = 1.00$ ) between those with and without missing data for the *average agreement* items.

<sup>8</sup> Out of 1,080 data points, there were 19 missing. To avoid biasing individual data in an extreme direction, data was imputed by entering in the score for the stance that had the highest frequency of endorsement for that individual item. In all but one case, the substituted and most frequently endorsed belief was Rationalism (item 11 had higher levels of Objectivism endorsements than any other so that stance was imputed instead). Three participants had two data points imputed.

<sup>9</sup> Two other scoring methods are available with the EDQ, *average agreement* and *brute vs. institutional differentiation*. Please refer to Hallett et al. (2002) for an explanation of these alternative scoring strategies.

strongly agree). The PAQ has demonstrated good test-retest reliability, internal consistency reliability, construct and criterion validity (Buri, 1991; Buri, Louiselle, Misukanis & Mueller, 1988). In these studies, maternal authoritarian parenting was negatively related to both authoritative and permissive parenting whereas maternal permissive parenting was not associated with authoritative parenting.

In the current study, the total score for each of the 10 sets of questions was summed and averaged across items to provide participants with a score for each parenting style. Final scores ranged from 1 to 5 with higher scores indicating more agreement with a particular parenting style. Cronbach's alphas for the authoritarian, authoritative and permissive parenting scales were .85, .69 and .73, respectively. The values for the authoritarian and permissive scales are similar to those reported in initial psychometric analyses which were considered acceptable (i.e., Buri, 1991; et al., 1988). The authoritative parenting alpha value obtained in the current study is lower than other obtained values and should be considered questionable based on standards in the literature (see Henson, 2001 for a discussion).

## **Coding of storybook interactions**

The conversations between mothers and children during each storytelling task were video-recorded and transcribed verbatim by trained research assistants. The transcripts and video-taped interactions were used to derive the following measures: mothers' behaviour, child lexical diversity and volubility, and maternal use of mental state words. A detailed discussion of these measures is provided below.

### ***Maternal behaviour***

Mother-child interactions and storybook transcripts were coded for three types of maternal behaviours using an adapted version of an observation-based measure of mothers' behaviour (Johnston, 2004; see also Johnston, Murray, Hinshaw, Pelham, & Hoza, 2002). Johnston's original scale consisted of six categories (i.e., authoritative control vs. autocratic control, sensitivity of control, general responsiveness, positive affect, acceptance of child, involvement) rated by observers on a 7-point scale (i.e., 1 =

low, 4 = neutral, 7 = high). It was originally used on a sample of mothers interacting with their ADHD diagnosed children during a variety of structured and unstructured tasks.

The development of the current coding scheme involved becoming familiar with maternal behaviours typically examined in the parenting and social-cognitive development literature (i.e., authoritative vs. authoritarian, control/intrusion, responsiveness, affectivity, involvement, warmth, engagement). The maternal behaviours from Johnston et al.'s coding scheme that were determined most relevant for the tasks in the current study were *maternal engagement*, *responsiveness*, and *sensitivity of control*. After viewing many tapes, it was clear that there was very little variability in mothers' "acceptance of child" and "involvement" from Johnston et al.'s original coding scheme. Further, mothers' warmth and positive affect were deemed important but not as a stand-alone coding category. Therefore, a new coding category labelled "maternal engagement" was created to capture maternal involvement and behavioural indicators of affect matching and positivity. The "acceptance of child" category was dropped as it was seen as less relevant and difficult to capture behaviourally in the storybook tasks. The coding schemes for maternal responsiveness and sensitivity of control were directly derived from the Johnston et al. (2004) study.

*Responsiveness* refers to mothers' observed methods of reacting to their children's needs to maintain both task and interpersonal engagement. A mother who is highly responsive will respond to her child's reactions to the story and try to engage a child who becomes off-task so as to re-engage them in a manner that is sensitive to the child's challenges with concentration. A mother who is less responsive may try to redirect her child's attention more harshly or not respond to their child's reactions to the story.

The *Sensitivity of control* category is meant to capture variability in how mothers structure a task and direct their child's involvement with it. A mother who is highly controlling would direct the task herself, whereas a mother who is not as controlling will structure the task to allow her child to take the lead. As is explained in Appendix A, mothers who were highly controlling or were not able to appropriately structure the child's involvement with the storybook tasks were given *lower* scores on this dimension.

The *maternal engagement* category was created by amalgamating the *involvement* and *maternal affective tone* scales from Johnston's coding scheme. For the current study more emphasis was placed on the extent to which mothers were able to demonstrate and maintain shared enjoyment, positive affective exchanges, and attunement to the child through both verbal and nonverbal mechanisms throughout the story.<sup>10</sup>

Videotapes of mother-child interaction were viewed to help determine the unique range and variability of maternal behaviours observed during the storybook tasks, and the coding schemes were modified accordingly. For instance, the behavioural anchors for the categories were tailored to account for the structured and unique nature of the storybook tasks. These three coding categories were conceived to be correlated but independent sub-dimensions of maternal behaviour. The complete coding guide, with behavioural anchors unique to the tasks of the current study, can be found in Appendix A.

The author and a research assistant coded each storybook for these 3 mother behaviours. Coders watched the videotapes and went through the transcripts, when appropriate, to provide an interaction code for *each page of the two stories* (see Appendix A for a detailed description). The Billy and Sarah story consisted of 18 pages, for a total of 54 codes. The Sam and Laurie story contained 11 pages, for a total of 33 codes. Scores from each of the coding categories were averaged to create three composite scores for: maternal engagement, maternal responsiveness, and maternal sensitivity of control. The research assistant coded 29 (32%) videotapes storybook interactions. Ratings were compared across 837 data points for each coding category. Inter-rater reliability was calculated using the intra-class correlation coefficient for absolute agreement (two-way random model, single measure). ICCAs were as follows:  $ICCA_{engagement} = .75$  (95% CI: .71 - .77),  $ICCA_{responsiveness} = .75$  (95% CI: .72 - .78), and  $ICCA_{control} = .80$  (95% CI: .77 - .82). Over a total of 2,511 data points 1,925 involved

<sup>10</sup> Maternal "involvement" was viewed as less relevant as an independent code for the storybook task because (1) the storybook task was structured in such a way that mothers were naturally more involved in the activity, and (2) examination of the data revealed that there was very little variability in this maternal behaviour. Further, aspects of maternal "involvement" were represented to some extent in the other coding categories included in the study.

perfect agreement, 505 involved disagreements of one point, and 81 involved a disagreement of two or more points. The author's codes were used in cases of disagreement.

## **Verbal ability**

A measure of language proficiency was not included in the archival data. As such, estimates of children's verbal ability were derived from the storybook transcripts. Having an estimate of verbal ability is necessary to replicate and possibly control for the effect that children with more proficient language skills tend to perform better on false-belief measures (see Carpendale & Lewis, 2006 for a summary). When standardized measures of specific language abilities (e.g., PPVT) are not available, the most commonly accepted measures of verbal ability in the speech and language literature are vocabulary development (semantic diversity) and speech productivity or volubility (Hoff & Naigles, 2002; Le Normand, Parisse, & Cohen, 2008). The number of different, or unique, words produced by a child is believed to be an indication of children's lexical diversity, whereas the number of total words produced indicates their overall vocabulary or volubility. Traditionally, the number of total words is divided by the number of different words to produce a Type-Token Ratio (TTR) (Templin, 1957); this is considered an overall indicator of vocabulary proficiency. Word-type (number of different words) has been found to be more strongly correlated with standardized measures of vocabulary development (e.g., PPVT; Dethorne et al., 2005), and appears to have more predictive validity than word-token (i.e., number of total words) (Hewitt, Hamber, Yont, & Tomblin, 2005) in estimating children's expressive language skills. These estimates are typically derived from free-speech samples. Due to the structured nature of the tasks used to derive language proficiency in the current study, use of both was deemed appropriate. The literature recommends at least 50 to 100 random words be sampled for each child and the frequency of unique words counted from this sample (Lee, 1974; Miller 1981; Templin, 1987). Some have argued that more reliable estimates are obtained using time-samples of free-speech (Heilmann, Miller & Nockerts, 2010); however, this was not feasible for the current study.

To calculate these two estimates of children's verbal ability, a database was programmed by a computer science research assistant using Microsoft Access and Excel software. Words were counted if they were included in the Oxford dictionary (utterances such as "mhm" were not considered real words and were not counted). Transcripts were examined for slang or modified words that appeared in high frequency but were not included in the dictionary (e.g., wanna, gonna, thinkin, sleepin) and were deemed close enough to reflect a bonafide use of the word. These words were added to the dictionary list and counted towards children's verbal proficiency scores. Children's lexical diversity and volubility was calculated for each individual story, summed and averaged to create an overall diversity and volubility score.

### **Mental state terms**

Maternal use of mental state words were counted in general accordance with the definitions and procedures outlined by Bartsch and Wellman (1995) and Ruffman et al. (2002). Words that refer to forms of *mental activity* were counted as mental state words and explicit attention was given to the context and the meaning inherent in the use of the word. Words that referred to various emotions, beliefs, desires, and modulations of assertion were counted. "Think" and "know", when referred to as mental activities (e.g., I am thinking, I know because I saw her do it) were also coded as mental state words. The word "like" was only coded when referred to as a feeling ("I like her"). In line with other investigators (see Bartsch & Wellman, 1995; Ruffman et al., 2002), conversational uses of mental state words (e.g., "I don't know", "What do you think", "Do you know what?") were also counted as mental state words. Repetitions and parroting of mental state words were not coded as mental state words. Children's use of mental state words were coded using these guidelines as well. Each transcript was coded independently for the frequency of mental state words regardless of length. See Appendix B for the coding guide, which contains more details regarding the coding of mental state words.

Transcripts for the Billy and Sarah story were coded by two research assistants. The Sam & Laurie story was not utilized due to problems with completion of the coding. Fifty-seven transcripts (63%) were originally coded at the time of the study and were used in the current analyses as reliability ratings. A second coder coded all of the

transcripts and these codes were used for data analysis. The coding guide for each was identical. Inter-rater reliability was calculated for this measure using the intra-class correlation coefficient for absolute agreement (ICCA) (two-way random, single measure model). The ICCA is a measure of inter-observer agreement that is mathematically equivalent to a squared weighted kappa. The value of the ICCA for mothers' mental state terms was .99 (95% CI: .98 - .99); the ICCA for children's mental state terms was .93 (95% CI: .88 - .96).

## **Social understanding measures**

Two different measures of children's social cognitive development were used in the current study. They roughly approximate children's abilities within the cognitive and affective domain as per their task content. Given this, children's scores on these measures will be considered as independent measures of children's abilities. In fact, there have not been any investigations of possible differences in the development of children's social cognitive abilities when cognitive and affective-type tasks are compared. Each measure is described below.

### ***Interpretation tasks***

Children's understanding of interpretation was assessed using an experimental procedure outlined in Carpendale and Chandler (1996). In each of three scenarios (i.e., lexical ambiguity, ambiguous referential communication, ambiguous figure), children were presented with a problem using puppets involving multiple interpretations and were asked to (1) *explain* if and why multiple interpretations were possible, (2) *predict* if a third puppet would be uncertain about the problem and why, and (3) if it would be silly, and why, if another puppet had a completely nonsensical, or *deviant*, interpretation of the problem. Thus, children were asked *explanation*, *prediction*, and *deviant* interpretation questions. The deviant interpretation question was not scored for the current study. The questions were always presented in this order. Children were counted as *passing* a task if for each question they acknowledged the realistic possibility of multiple interpretations for each problems, gave a sensible reason for their understanding, or demonstrated poor confidence in predicting the exact judgement of a third person presented with the same problem. Inability to produce such answers resulted in a *failure* on that particular part of

the task. Two points were possible for each question (explanation, interpretation), for a total of four points per interpretation problem. The order of presentation of the interpretation problems was counterbalanced across participants.

**Lexical Ambiguity.** Adapted from procedures used by Shultz and Pilon (1973), this task presented children with an interpretive problem involving lexical ambiguity (i.e., the homonym “ring”). Research assistants presented children with two puppets, Mary and Maxi, who were told to “wait for a ring”. They were then asked what they were waiting for. Both puppets describe waiting for a different kind of “ring”. Mary described waiting for a “ring for her finger,” whereas Maxi stated he was “waiting for a telephone to ring” (counterbalanced). Children were then presented with explanation and prediction questions. Children could receive four points for this task if they acknowledged the following: (1) that it would be sensible for each puppet to wait for a different ring as there were many kinds of rings to wait for, (2) if they noted that they would not know what kind of ring another puppet would be waiting for because they could answer in different ways or were uncertain in identifying what the third puppet might be waiting for.

**Ambiguous referential communication.** This task presented children with a problem of interpretation concerning ambiguous referential communication. Children were told that a sticker was hidden under one of three cards displayed in a row in front of them. Two of the cards were drawings of large blocks (one red, one blue) and one small red block. The research assistant then told the puppets that the sticker was under the “card with the big block” and went on to narrate a conversation in which the puppets decided where the sticker was. One puppet insisted that the sticker was under the large red block and the other thought it was under the large blue block. Children were asked to explain this difference of interpretation and predict where a third puppet would think the sticker was (as well as their certainty about what the puppet would think). Full points were awarded to children who noted that (1) both puppets’ choices made sense because there are in fact two large blocks in front of them, (2) a third puppet could choose either card or would choose one card but not be sure. This task was also adapted for the current study from another experimental hiding protocol developed by Sodian (1990).

**Ambiguous Figure.** Children were presented with Jastrow's "duck-rabbit" line drawing (Attneave, 1974). The puppets again chose to interpret the drawing in different ways and were asked the requisite explanation and prediction questions. Full points were awarded to children who (1) understood that the puppets could see the drawing as a duck or rabbit and provide reasons why, (2) communicate that another puppet might also interpret the drawing in either way or be uncertain about interpreting it a certain way because the drawing is ambiguous.

Children's performance on all three tasks was summed into a total score. Children could obtain a total of four points per task, for a maximum of 12 points overall. A trained research assistant coded all of the tasks from the video-recordings. Another research assistant coded 47% of the tapes ( $n = 42$ ) to establish inter-rater reliability. Reliability was calculated using the intra-class correlation coefficient for absolute agreement (ICCA), specifying a two-way random effects model (single measure). Across 540 data points, the ICCA was .73 (95% CI: .65 - .79). Cases of disagreement were resolved by discussion. For 11 participants, the original coder's ratings could not be located. To reduce data loss, the reliability coder's ratings for these participants were used for data analysis.

Children's performance was examined across tasks for descriptive purposes. Thirty-one percent of children passed (score of 2) the lexical ambiguity explanation question and 30% percent passed the prediction question. For referential communication task, 24% passed the explanation question and 21% passed the prediction question. Sixty-two percent of children passed the explanation question of the ambiguous figures explanation question and 56% passed the prediction question.

### ***Mixed emotions***

This task was based upon Dunn's (1995) adaptation of a storytelling task (Gordis, Rosen, & Grand, 1989). Children were presented with two pictorial scenarios. In the first a child is about to ride a bike for the very first time. In the second vignette a child protagonist receives a phone call from a friend explaining that he/she is unable to attend a movie with the child. Children were first asked how the target child in each scenario might feel (i.e., "How might Jason/Jennifer feel about riding a two-wheeled bicycle for the

first time?”). Children were awarded one point for every opposite valenced emotion they identified, up to two points. Children were then asked why the child might feel that way (i.e., “Why might Jason/Jennifer feel...?”). If children explained the simultaneous experience of the two opposite valenced emotions they were awarded an extra point, up to 2 points. If this explanation was spontaneous (i.e., before the question was asked), children were awarded an additional point. Another point was also awarded to children who recognized that the two emotions could be felt simultaneously. If their answer did not acknowledge the possibility of feeling a mixture of emotions (e.g., excited and scared about riding a bicycle for the first time; happy about seeing a movie but sad or disappointed that a friend could not join them), children were asked if there was anything else that Jennifer/Jason might feel at the same time. Children who still did not acknowledge the experience of simultaneous emotions were provided with a prompt (i.e., “Actually, Jennifer/Jason feels both happy and sad”) and then asked why this might be. The questions were asked after both vignettes; children were able to attain a maximum score of six for each vignette, for a total of 12 possible points.

Two research assistants coded the mixed emotions task. Inter-rater reliability was calculated for 50% of participants ( $n = 45$ ). Intra-class correlation coefficients calculated were for absolute agreement (two-way random effects, single measure). Over 720 data points, the ICCA was .96 (95% CI: .94 - .96). In cases of disagreement, the primary coder’s ratings were used.

## Results

### Research Questions

The current study was concerned with answering two research questions:

(1) Are there relations among maternal language, behaviour, self-reported parenting style and personal epistemology? Specifically, are the “optimal” ends of all the measures and scales of the maternal variables consistently related? For example, is mothers’ use of mental state words correlated with authoritative parenting, maternal responsiveness, engagement, sensitivity of control and rational maternal epistemological beliefs?

(2) Are the above maternal variables positively associated with children’s understanding of interpretation and mixed emotions, such that higher quality parenting predicts children’s higher performance on interpretation and mixed emotions tasks.

### Hypotheses

#### Mothers mental state terms (MMST).

(1) It was expected that MMST would be positively correlated with authoritative parenting, parenting behaviour and complexity of mothers’ epistemological beliefs (i.e., more rational beliefs).

(2) It was also hypothesized that MMST would be negatively correlated with authoritarian parenting, parenting behaviour and mothers’ rational epistemologies.

## **Mothers' epistemological beliefs**

- (1) EDQ data would follow a pattern of complexity similar to that reported by Hallet and Chandler (1999) and Hallet et al. (2002). That is, mothers' reports of their epistemological beliefs would fall into an objective, skeptic, and rational pattern.
- (2) Mothers' rational epistemologies were predicted to be positively associated with authoritative parenting, higher quality parenting behaviour (more engaged, responsive and sensitively controlling), and MMST. Negative associations were expected with authoritarian parenting.
- (3) Mothers' objective epistemologies were expected to be negatively associated with authoritative parenting, parenting behaviour, and MMST while a positive association was expected with authoritarian parenting.

## **Relations between maternal variables and social understanding**

- (1) It was hypothesized that each set of maternal variables (MMST, parenting styles, maternal behaviour, and epistemological beliefs) would each independently predict variability in children's understanding of interpretation and mixed emotions after controlling for any covariates.
- (2) It was also expected that maternal epistemological beliefs would predict additional variance in children's understanding of interpretation and mixed emotions beyond that of the other maternal variables.

## **Data Analytic Approach**

Data were initially examined to determine if they needed to be reduced or amalgamated. This involved making decisions regarding how to combine data across experimental tasks (e.g., observational data for each story); for other variables (e.g., EDQ) this entailed more detailed analysis of the structure of the raw data using cluster analysis. Data were then examined to identify any demographic covariates (e.g., child age, gender, ethnicity, maternal education). Relations among the parenting variables

were examined using correlational and univariate GLM analyses (i.e., ANOVA). Lastly, the relations between the maternal variables and the two social understanding measures were examined via hierarchical linear regression. The possibility that epistemological beliefs might explain additional variance beyond that of the other maternal variables was tested by entering this variable into a regression equation after statistically controlling for the effects of the other parenting variables and covariates.

All analyses were run controlling for Type I error at a  $\alpha$  value of .05, thereby accepting a false-positive rate of 5% (unless otherwise stated). Where appropriate, this approach is contrasted with a Bonferroni correction for multiple comparisons (using a stringent family-wise error rate of .05).

## **Data Reduction**

### **Maternal behaviour**

The codes for the maternal behaviour scales were first examined descriptively. It was observed that a majority of mothers tended to score lower on the first page of the Sam and Laurie story (the picture of Sam, Carp, & Laurie) than on subsequent pages. Further examination of some of the videotapes revealed that this was the case because they did not discuss the first page at all or very briefly and were subsequently awarded a lower score (see Table 2). Instead of just dropping this code, its effects were examined statistically using a set of paired samples t-tests. Results suggested that including the codes from the first page significantly decreased mothers overall mean scores on the SL story for the engagement, responsiveness, and control scales (see Table 2). Results were also significant when using a Bonferroni correction for multiple comparisons. Visual inspection of the codes for each mother also indicated that they were not representative of mothers' typical responding on other pages of the stories, and should be dropped. As such, the number of codes used to calculate average scores for each of the maternal behaviour scales for the Sam and Laurie story was reduced from 33 to 30.

**Table 2. Paired samples t-tests comparing SL story with and without codes for first page**

Maternal Behaviour Variables	SL all codes <i>M (SD)</i>	SL no first page codes <i>M (SD)</i>	<i>t(89)</i>	<i>p</i>
Engagement	2.93 (0.66)	2.96 (0.68)	-3.91	.000
Responsiveness	2.17 (0.58)	2.20 (0.60)	-4.73	.000
Control	2.43 (0.76)	2.48 (0.79)	-5.07	.000

Another paired samples t-test was run to determine if the mean codes for the three categories of maternal behaviour differed between the two stories. Results demonstrated no statistically significant differences for any of the three coding categories between the two stories (see Table 3 below). As such, it was decided that the best method for summarizing maternal behaviours for data analysis would be to combine the codes from both stories to create overall *maternal engagement*, *responsiveness* and *control* composites reflective of mothers' average behaviour across both stories.

**Table 3. Paired samples t-tests comparing maternal behaviour means between BS & SL stories**

Maternal Behaviour Variables	BS Story <i>M (SD)</i>	SL Story <i>M (SD)</i>	<i>t(89)</i>	<i>p</i>
Engagement	3.04 (0.61)	2.96 (0.68)	-1.80	.08
Responsiveness	2.28 (0.56)	2.20 (0.60)	-1.68	.10
Control	2.50 (0.83)	2.48 (0.79)	-0.31	.76

## Verbal ability

To calculate the lexical diversity composite (i.e., estimate of verbal ability), children's total number of spoken words was examined as a baseline for determining the length of the fixed language sample calculation. When data were summed for both

stories, the child with the least amount of total spoken words was identified as a reference point (total words = 61). Using this child's volubility would have limited the calculation of lexical diversity to a random sample of 60 words. A visual examination of the range of total words spoken by all children suggested that this child's score was much lower than the overall average of 557 words. To avoid loss of this participant, a decision was made to use the ratios calculated using 100 random words, as it was most consistent with recommendations in the literature and because it was thought that this would be the most conservative estimate given the structured nature of the task. For the one participant whose total word count was less than 100 words, their lexical diversity score was imputed based on 60 random words.

### **Mental state word usage**

Mothers' and children's mental state word usage was first calculated using the coding scheme described in Appendix B. However, visual examination of the data revealed a high frequency of conversational uses of mental state terms. The nature of the storybook task elicited many questions from mothers, including frequent statements that included conversational variants of mental state words (e.g., "what do you think?"). It appeared that these questions occurred more often in the storybooks than they would naturally in free-speech, due to the unique nature of the task, and were potentially inflating some mothers mental state utterance scores and creating arbitrary differences between participants. To determine if this was the case, a simple descriptive analysis of conversational versus non-conversational uses of "think" and "know" words was conducted. Results suggested that conversational uses of these mental state words were accounting for over 30% of mothers' mental state words in roughly 68% of mothers. In children, the proportional use of conversational mental state words was 14%. As this was deemed a problem for the quality of the data, it was regarded appropriate to remove conversational uses of "think" and "know" from the frequency counts for both the mother and child composites. The correlation between mothers' use of mental state words before and after non-conversational uses of "think" and "know" were dropped was high ( $r(88) = .90, p = .000$ ), suggesting that it may have eliminated some error variance for some mothers' scores but that generally scores remained highly correlated.

## **Maternal epistemological beliefs**

In line with previous investigations (i.e., Hallett et al., 2002) and due to the unique sample characteristics in the current study, data from the EDQ questionnaire were examined to validate its overall structure. As noted in the Method section, the EDQ was meant to measure relative agreement with the various epistemological beliefs outlined by Chandler and colleagues. It was not intended to describe respondents' level of epistemological development. However, because of the problems with missing data highlighted in the Method section, a decision was made to analyse the EDQ data in a unique way. Essentially, because mothers were asked to indicate which epistemological statement best described their own viewpoint, it was deemed more appropriate theoretically and statistically to use the data to place mothers' into epistemological groups ranging from less to more complex. To do this, mothers' endorsements of epistemological beliefs across the items (i.e., objective, skeptic, rational) were summed, leaving each mother with a frequency score for each category. These categories or groups, which theoretically represent the complexity of mothers' epistemological beliefs, were then the basis for further inferential analyses. This allowed a more cogent comparison and interpretation based on epistemological complexity, rather than a simple estimate of agreement with various epistemological stances. Although this was not a traditional way of summarizing the data, much of the epistemological belief literature summarized earlier has examined personal epistemological beliefs in a similar manner (see Hofer & Pintrich, 1997). In fact, Krettenauer (2005) used the EDQ in this very manner with a sample of adolescents guided by Kuhn's model of epistemological development. As such, using this approach for the current study allowed for more parsimonious comparisons with the majority of the existing literature.

In summary, the goal here was to sort the raw data into groups based on natural clusters in the data. Consistent with epistemological research, the groups would ideally fall into a continuum ranging from least to most complex based on the categories outlined by Chandler and colleagues (i.e., objective least complex, rational more complex). Meaningful differences on other study variables based on these groupings were then examined.

Inspection of the EDQ means and standard deviations suggested that the mothers in the study endorsed on average less than one objective statement, although the standard deviation was large relative to the mean ( $M = 0.93$ ,  $SD = 0.87$ ). Mothers endorsed just over three skepticism statements on average ( $M = 3.54$ ,  $SD = 1.89$ ) and five rationalism statements ( $M = 5.38$ ,  $SD = 2.05$ ). These statistics demonstrate that the mothers' in the study, as a whole, endorsed epistemological beliefs more towards the complex end of the spectrum.

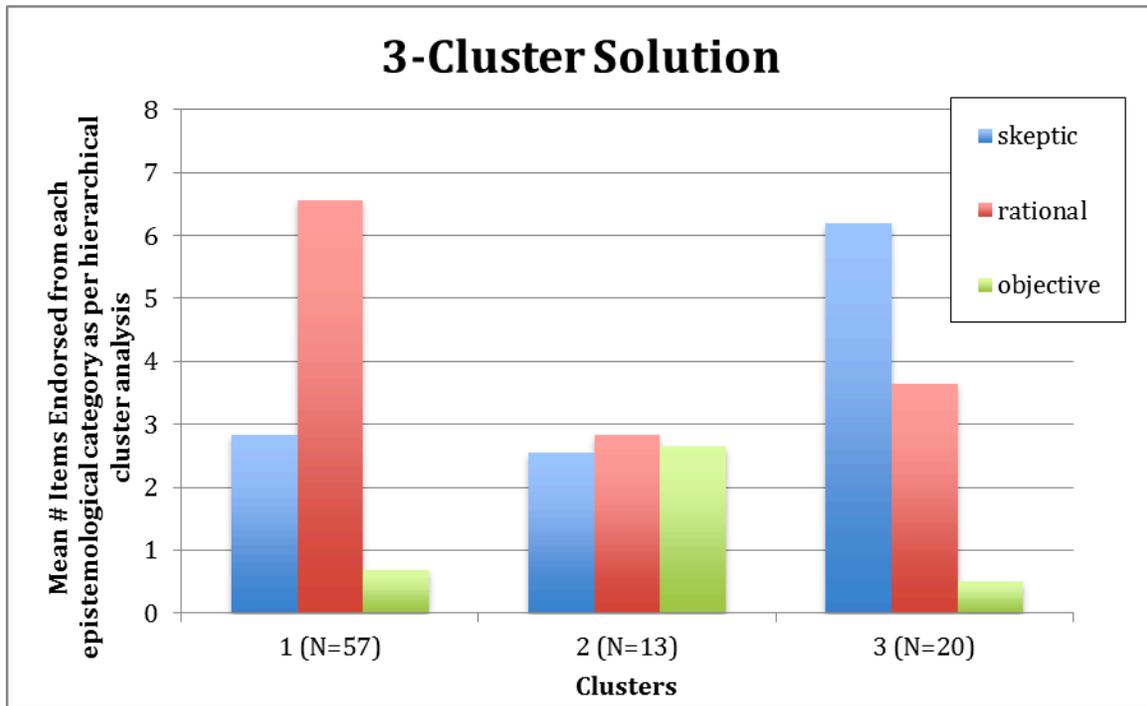
A set of cluster analyses was then performed to better understand how this distribution of the data affected the structure of the EDQ. A hierarchical cluster analysis was first run to better understand the natural structure of the data and to verify that the data fit the theoretical model for the EDQ. A subsequent *k*-means cluster analysis was performed based on this exploratory analysis.

As can be seen in Table 4, results from the hierarchical cluster analysis using Ward's methods suggest that a three-group solution fit the data best because there was a distinct and substantial change in the distance coefficients at the point between the third and fourth clusters. Figure 1 provides a graphical representation of each cluster and its mean level of endorsements for each epistemological stance.

**Table 4. Re-formed Agglomeration Table, Hierarchical Cluster Analysis**

No. of Clusters	Agglomeration Last Step	Coefficients this step	Change
2	267.00	179.91	87.09
3	179.91	102.44	77.47
4	102.44	72.30	30.14
5	72.30	57.97	14.33
6	57.97	48.41	9.56
7	48.41	40.78	7.63

**Figure 1. Differentiation of the three-cluster solution based on epistemological stances endorsed by mothers.**



A one-way ANOVA was run specifying the three clusters as the between groups factor and the three epistemological stances as the dependent variables. Results demonstrated a significant between groups effect for skepticism ( $F(2, 89) = 59.18, p = .000$ ), rationalism ( $F(2, 89) = 63.67, p = .000$ ) and objectivism ( $F(2, 89) = 91.82, p = .000$ ). These results remained significant correcting for multiple comparisons. Post-hoc multiple comparisons (LSD) identified differences ( $p < .001$ ) in skepticism scores between cluster 1 & 3 and 2 & 3; rationalism scores differed between clusters 1 & 2 and 1 & 3; and, objectivism scores differed between clusters 1 & 2 and 2 & 3. Means are presented in Table 5. This pattern of results is somewhat consistent with the theoretical underpinnings of EDQ. It suggests that three distinct natural groups exist in mothers' data that closely follow a Rationalist (Cluster 1) and Skeptic (Cluster 3) pattern. Cluster 2 seemed to reflect a somewhat diffuse/undifferentiated pattern, a grouping that appears

unique to this data set.<sup>11</sup> These results were still significant when correcting for multiple comparisons.

**Table 5. LSD Multiple Comparisons for Hierarchical Cluster Analysis specifying a 3 cluster solution (Clusters x Epistemological Stance)**

Epistemological Stances	Cluster 1	Cluster 2	Cluster 3
Skepticism	2.84	2.53	
			6.20
Rationalism	6.56		
		2.84	3.65
Objectivism	.69		.50
		2.65	

Note: means on separate rows differ significantly ( $p < .001$ ).

Given that this pattern of results was largely consistent with the theory and intent of the measure, a follow-up *k*-means cluster analysis specifying three clusters was conducted. The hierarchical cluster analysis was deemed necessary from a theoretical point of view; however, a technique using a centroid measure of distance was deemed more appropriate for the final cluster solution. *K*-means cluster analysis is an iterative process and determines the best fit of the data based on the a priori *k* number of groups specified. The *k*-means clusters were used for all subsequent analysis of the EDQ data.

Figure 2 provides a graphical representation of the mean number of item endorsements for each cluster using the *k*-means analysis. The 3-cluster solution differentiated mothers' data in the following ways: Cluster 1 ( $N = 19$ ) specified a group that endorsed a relatively equal amount of rational, skeptic, and objective statements on the EDQ. This group was given the label of *diffuse/undifferentiated*. Cluster 2 ( $N = 36$ ) had a much higher number of endorsements of rational statements in comparison to the

<sup>11</sup> Previous structural analyses with the EDQ have utilized mixed gender samples with a wide range of educational background (see Hallett et al., 2002). Differences in the current sample, therefore, may reflect the uniqueness of the sample. It may also reflect the unique use of the EDQ data in the current study (i.e., use of "best viewpoint" endorsements). In his study of adolescents, Krettenauer (2005) took a different approach and chose to eliminate subjects from his pool of data if they demonstrated this type of response pattern. Due to the high number of mothers demonstrating this pattern of responding, this approach was not followed in the current study.

skeptical and objective categories and was called the *extreme rationalists*. Cluster 3 ( $N = 35$ ) demonstrated similar frequencies of skeptical and rational statements with much lower relative objective endorsements; they made up the *mixed skeptic/rationalist* group.

**Figure 2. K-means cluster analysis of EDQ, 3-factor solution**



A one-way ANOVA, specifying the clusters as the between group variable and epistemological beliefs as the dependent measures, was performed to test whether the clusters differed in important ways to distinguish them further conceptually. The ANOVA demonstrated a main between group effect for the three EDQ beliefs (see Table 6). Results remained significant when controlling for multiple comparisons.

**Table 6. Means, SD's and ANOVA Table for 3-cluster solution (between groups x Epistemology)**

Dependent Variable	Cluster 1 Diffuse Group	Cluster 2 Extreme Rationalist	Cluster 3 Rationalist/Skeptic	F(2, 89)	<i>p</i>
Skepticism	2.94 (1.18)	2.14 (1.17)	5.31 (1.28)	63.33	.000
Rationalism	3.26 (1.28)	7.3u9 (1.02)	4.46 (1.20)	98.50	.000
Objectivism	2.26 (0.65)	.63 (0.58)	.53 (0.38)	21.38	.000

Post-hoc multiple comparisons (LSD) identified differences ( $p < .001$ ) in skepticism and rationalism endorsements between clusters 1, 2 & 3. Specifically, cluster 3 had higher scepticism endorsements than both cluster 1 & 2 and cluster 1 had higher scepticism endorsements than cluster 2. With regards to rationalism, cluster 2 had higher rationalism endorsements than both cluster 1 and 3, and cluster 3 had higher scores than cluster 1. Objectivism scores only differed between clusters 1 & 2 and 1 & 3. Results were significant using a Bonferroni correction for multiple comparisons. This latter result provided further evidence that the diffuse/undifferentiated cluster differed in theoretically important ways from the other clusters. These mothers endorsed a larger frequency of objectivist statements relative to the other two clusters. Given that the mean for endorsement of objectivist statements was quite low in this sample of mothers, this seemed like an important distinction. As noted above, a group similar to this has not been identified in other samples with this measure; this may reflect a problem with the measure or simply that this is a genuine kind or form of epistemic development in a sample of middle-class mothers participating voluntarily in a child development study.

Previous investigations have undertaken additional analyses to confirm that the epistemological groupings make sense theoretically, for example, with respect to educational attainment. This was also considered important for the current study, but largely from an exploratory point of view. As such, three 2 x 2 chi-squares were computed, comparing mothers with and without postsecondary education by their cluster membership. When the *diffuse cluster* and *extreme rationalist cluster* were compared

based on education (maternal education x [diffuse cluster, extreme rationalist cluster]), non post-secondary educated mothers were more likely to belong to the diffuse group, whereas post-secondary educated mothers were more likely to belong to the extreme rationalist cluster,  $\chi^2(2, N = 55) = 7.10, p = .008$ . The strength of this relationship was weak ( $\phi = .36, p = .008$ ). The second chi-square (maternal education x [diffuse cluster, mixed skeptic cluster]), revealed no differences,  $\chi^2(2, N = 54) = 0.28, p = .59$ . The third chi-square analysis (maternal education x [extreme rationalist cluster, mixed skeptic cluster]) was significant  $\chi^2(2, N = 71) = 5.27, p = .02$ . Specifically, mothers belonging to the extreme rationalist group were significantly more likely to have some post-secondary education than the mothers in the mixed skeptic group. The strength of the association was negative and weak ( $\phi = -.27, p = .022$ ).

This set of results is consistent with both the theory and empirical findings of both the epistemological development and EDQ literature because it specifies that as education levels increase, epistemic beliefs move from least to most complex. In this sample of mothers, the diffuse group was less educated than the extreme rationalists, but not the mixed skeptics; and the extreme rationalists and mixed skeptics were more likely to be university educated than not.

## **Descriptive and Demographic Analyses.**

### **Descriptive statistics**

Table 7 contains the means, standard deviations, and obtained score ranges of study variables.

**Table 7. Descriptive Statistics for Study Variables**

	<i>Mean</i>	<i>SD</i>	<i>Scale Range</i>	<i>Obtained Range</i>
<b>Demographic Measures</b>				
Maternal Education	3.18	0.70	1.00 – 4.00	1.00 – 4.00
<b>Child-Derived Measures</b>				
Child Age	6.74	0.94	--	5.00 – 8.75
Child Verbal Ability	0.76	0.05	0 – n/a	0.63 – 0.88
Child Total Words	557	272	0 – n/a	61.00 - 1496
Child Mental State Words <sup>a</sup>	8.89	5.81	0 – n/a	0.00 – 31.0
Interpretation Understanding	7.27	2.73	0 - 12	1.00 – 12.0
Mixed Emotions	7.04	1.91	0 - 12	3.00 – 11.0
<b>Mother-Derived Measures</b>				
Maternal Mental State Words <sup>a</sup>	13.57	10.39	0 – n/a	1.00 – 48.00
Authoritarian Parenting	2.65	0.73	1-5	1.20 – 4.20
Authoritative Parenting	4.22	0.41	1-5	3.30 – 5.00
Permissive Parenting	2.28	0.52	1-5	1.20 – 3.80
Maternal Engagement	3.01	0.60	1 - 4	1.11 – 4.00
Maternal Responsiveness	2.25	0.54	1 – 3	1.11 – 3.00
Maternal Sensitivity of Control	2.49	0.76	1 - 4	1.11 – 4.00
# of Objectivist Belief Endorsements	0.93	0.87	0 - 12	0.00 – 3.50
# of Skeptic Belief Endorsements	3.54	1.89	0 - 12	0.00 – 8.00
# of Rational Belief Endorsements	5.38	2.05	0 - 12	1.00 – 10.0

**Notes:** <sup>a</sup>Based on frequency of non-conversational mental state utterances.

### **Demographic analyses**

Study data were initially analysed to explore potential differences in children’s performance on the social cognitive measures due to child age, maternal education, ethnicity, and gender. Consistent with previous research, Pearson product-moment correlations between age and the two social cognitive measures were significant and positive ( $r(88)_{\text{interpretation}} = .45, p = .000$ ;  $r(87)_{\text{mixed emotion}} = .40, p = .000$ ). Due to limited variability in maternal education among mothers in the study (see *Method* section for description), mothers were placed into one of two categories (*no post-secondary* or *at least some postsecondary*). There were no differences on the social cognitive variables due to maternal education ( $t(88)_{\text{interpretation}} = -.05, p = .96$ ;  $t(88)_{\text{mixed emotion}} = 0.69, p = .49$ ).

Maternal ethnicity data were also further reduced into two groups, Caucasian or non-Caucasian, to compensate for uneven sample sizes. No differences were found on the social cognitive measures ( $t(88)_{interpretation} = 0.04, p = .97$ ;  $t(88)_{mixed\ emotion} = 0.38, p = .70$ ). Differences among social cognitive variables due to gender were also non-significant ( $t(88)_{interpretation} = 1.53, p = .13$ ;  $t(88)_{mixed\ emotion} = 1.33, p = .19$ ).

Relations between demographic and maternal variables were also explored so that potential mediators could be controlled in subsequent analyses. Results are presented here.

### **Maternal behaviour composites**

Significant relations between the maternal behaviour composites and child age, maternal education, and ethnicity were found. Specifically, child age was significantly and negatively correlated with maternal engagement ( $r(88) = -.33, p = .001$ ), responsiveness ( $r(88) = -.37, p = .000$ ) and sensitivity of control ( $r(88) = -.31, p = .003$ ). This means that mothers of older children were less engaged and responsive and less likely to structure the interaction appropriately to the child's needs. Further, university educated mothers were more responsive than non-university educated mothers ( $t(88) = -2.50, p = .01$ ). Caucasian mothers were rated higher than non-Caucasian mothers on all maternal behaviour variables ( $t(87)_{engage} = 2.68, p = .009$ ;  $t(87)_{responsiveness} = 2.92, p = .005$ ;  $t(87)_{control} = 2.51, p = .014$ ). There were no differences due to gender with respect to maternal engagement ( $t(88) = -1.00, p = .32$ ), responsiveness ( $t(88) = -1.04, p = .30$ ), or sensitivity of control scales ( $t(88) = -.84, p = .41$ ).

### **Maternal mental state terms (MMST)**

Relations with child age were non-significant ( $r(88) = -0.12, p = .24$ ) and no differences due to gender ( $t(88) = -0.19, p = .06$ ) or maternal education, ( $t(88)_{MMST} = -0.50, p = .62$ ) were found. However, Caucasian mothers used more mental state words than non-Caucasian mothers ( $t(87) = 3.30, p = .001$ ).

## Self-reported parenting styles

Child age was not significantly related to authoritarian, authoritative or permissive parenting and there were no differences due to child gender, maternal education or ethnicity.<sup>12</sup>

## Epistemological groups

When differences between in the rationalist, mixed skeptic/rationalist and diffuse groups were examined in terms of demographic variables, there were no effects of ethnicity ( $\chi^2(2, N = 90) = 5.80, p = .06$ ), gender ( $\chi^2(2, N = 90) = 0.38, p = .83$ ) or child age ( $F(2, 90) = 2.50, p = .09$ ). Differences due to maternal education were previously reported and roughly suggest an increase in maternal education as epistemological complexity increased, although the difference between the mixed skeptic/rationalist and rationalist group was non-significant.

## Other potential mediators/covariates

Independent samples t-tests were performed to identify any differences in demographic characteristics and in study variables due to experimental setting. There was a difference between home-based and lab-based experimental groups in age only; the children given experimental tasks in their home were older than the children completing the experimental protocol in the lab ( $t(88) = -2.20, p = .04$ ). There were no differences between the two groups on the other demographic<sup>13</sup>, parenting<sup>14</sup> or outcome variables<sup>15</sup>.

<sup>12</sup> Child age was not related to any of the maternal parenting styles ( $r(88)_{\text{authoritarian}} = .07, p = .49$ ;  $r(88)_{\text{permissive}} = .02, p = .86$ ;  $r(88)_{\text{authoritative}} = .09, p = .42$ ). There were no differences on parenting variables due to maternal education ( $t(88)_{\text{authoritarian}} = 1.82, p = .07$ ;  $t(88)_{\text{permissive}} = 1.60, p = .11$ ;  $t(88)_{\text{authoritative}} = -1.12, p = .27$ ) or ethnicity, ( $t(88)_{\text{authoritarian}} = -1.03, p = .31$ ;  $t(88)_{\text{permissive}} = -1.54, p = .13$ ;  $t(88)_{\text{authoritative}} = 0.41, p = .69$ ). Gender effects were also non-significant ( $t(88)_{\text{authoritarian}} = 1.03, p = .31$ ;  $t(88)_{\text{permissive}} = 0.49, p = .63$ ;  $t(88)_{\text{authoritative}} = -0.74, p = .46$ ).

<sup>13</sup>  $\chi^2(2, N = 90)_{\text{gender}} = 1.28, p = .52$ ;  $\chi^2(2, N = 90)_{\text{ethnicity}} = 0.00, p = .68$ ,  $\chi^2(2, N = 90)_{\text{maternal education}} = 0.10, p = .62$

<sup>14</sup>  $t(88)_{\text{authoritarian}} = 0.89, p = .38$ ;  $t(88)_{\text{authoritative}} = -1.11, p = .27$ ;  $t(88)_{\text{permissive}} = -1.13, p = .26$ ;  $t(88)_{\text{engagement}} = -0.91, p = .37$ ;  $t(88)_{\text{responsiveness}} = -.253, p = 0.80$ ;  $t(88)_{\text{control}} = -0.40, p = .69$ ;  $t(88)_{\text{MMST}} = -1.13, p = .29$ ,  $\chi^2(2, N = 90)_{\text{epistemological groups}} = 1.47, p = .48$ .

<sup>15</sup>  $t(88)_{\text{mixed emotion}} = -1.03, p = .31$ ;  $t(88)_{\text{interpretation}} = -0.08, p = .94$ .

Children's verbal skills and mental state utterances were also considered as possible covariates for analyses involving the social cognitive measures. As described in the *Method* section, there were two indices of child verbal ability that were calculated in the current study—total words spoken and lexical diversity. Results of product-moment correlations demonstrated a varied pattern of results. Children's lexical diversity scores (i.e., the verbal ability composite score) were not significantly correlated with the interpretation understanding ( $r = .16, p = .14$ ) or mixed emotions tasks ( $r = .09, p = .38$ ). In comparison, the total number of words spoken by children was significantly and positively correlated with both interpretation understanding ( $r = .24, p = .03$ ) and mixed emotions ( $r = .29, p = .005$ ). Furthermore, the frequency of children's mental state utterances was significantly and positively correlated with interpretation understanding ( $r = .22, p = .04$ ); however, this relation dropped to non-significant once age was controlled ( $r_{\text{partial}} = .138, p = .20$ ). No relation was found between child mental state utterances and performance on the mixed emotions task ( $r = .17, p = .12$ ).

## **Relations Between Maternal Variables**

Pearson product-moment correlations for all maternal parenting variables were calculated. Child age was controlled for in all correlations due to its association with the maternal behaviour variables. Results are presented in Table 8 and summarized in narrative form below.

**Table 8. Partial Correlations Between Maternal Language, Parenting Style, and Behaviour Variables (controlling for child age)**

Variables	1	2	3	4	5	6	7
1. Maternal Mental State Words	---	---	---	---	---	---	---
2. Authoritarian Parenting	-.02	---	---	---	---	---	---
3. Authoritative Parenting	.02	-.22*	---	---	---	---	---
4. Permissive Parenting	-.20	-.31**	-.12	---	---	---	---
5. Maternal Engagement	.29**	-.29**	.27*	-.17	---	---	---
6. Maternal Responsiveness	.33**	-.28**	.26*	-.28**	.78***	---	---
7. Maternal Sensitivity of Control	.51***	-.19	.25*	-.33**	.68***	.88***	---

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

As can be seen in Table 8, many of the maternal variables were associated with each other in a theoretically consistent manner. For example, higher scores on the authoritarian parenting scale of the PAQ were significantly negatively associated with both authoritative and permissive parenting styles. This highlights the point that mothers who tend to self-report using parenting methods involving more unilateral control are less likely to also be laissez-faire and use less collaborative parent-child strategies in their childrearing. The relation between authoritative and permissive parenting was not significant, suggesting that these types of parenting styles share little association. This is consistent with model of parenting styles initially described by Buri (1991) and Baumrind and followers.

Furthermore, there was a high degree of consistency with the PAQ subscales and the observer-rated maternal behaviour variables. Specifically, high scores on the authoritarian scale of the PAQ were significantly and negatively correlated with maternal engagement and responsiveness, but were not correlated with maternal sensitivity of control. The authoritative parenting scale showed a positive correlation with all maternal behaviour scales after controlling for child age. High scores on the permissive scale were associated with lower scores on both the maternal responsiveness scale and the

maternal sensitivity of control scale. There was no relation between permissive parenting and maternal engagement. In other words, permissive mothers were less responsive and more controlling but not any more or less engaged with their children. Overall, these results demonstrate a high degree of consistency between self-reported and observation-based measures of parenting.

As can be seen in Table 8, after controlling for child age, maternal mental state utterances were not associated with any particular self-reported parenting style, but were significantly positively correlated with all three measures of maternal behaviour during the storybook task. In other words, mothers who used more mental state terms were also more likely to be more engaged, responsive, and more sensitively controlling during interactions with their child regardless of the age of their child.<sup>16</sup>

After controlling for multiple comparisons using a Bonferroni correction the correlation between MMST and maternal engagement was no longer significant. All significant correlations with the authoritative and authoritarian scales also dropped to non-significant.

To examine the relation between each of the maternal epistemological belief groups and the other maternal variables, ANCOVA's were calculated using the three groups of maternal epistemological beliefs generated in the cluster analysis (*diffuse, extreme rationalist, mixed skeptic/rationalist*) as the between groups variable; again child age was controlled statistically. Five ANCOVA's were calculated with the following variables as dependent measures: (1) maternal mental state words, (2) overall maternal

<sup>16</sup> A set of pre-selected correlations were re-run splitting children into two age groups: 5- to 6-year-olds and 7- to 8-year-olds. Sample size was low for the 7- to 8-year-olds so there may not have been adequate power to detect significant correlations. Correlations between age and understanding of interpretation were significant for the younger age group ( $r(53)$ interpretation = .31,  $p = .02$ ;  $r(53)$  mixed emotions = .37,  $p = .006$ ) but not the older group ( $r(35)$ interpretation = .08,  $p = .65$ ;  $r(35)$  mixed emotions = .07,  $p = .68$ ). The correlation between age and maternal behaviour was non-significant for both groups as was the relation between both the PAQ subscales and maternal behaviour and the social understanding measures.

behaviour<sup>17</sup>, (3) authoritarian parenting, (4) permissive parenting, and (5) authoritative parenting.

Results of the ANCOVAs are presented in Table 9. Between subjects effects were found for maternal mental state words, overall maternal behaviour, and authoritarian parenting style (using an  $\alpha$  value of .05). The effect sizes were low, however. No relations were found between the epistemological groups and permissive parenting style, or authoritative parenting style.

**Table 9. Summary of ANCOVAs examining differences in maternal variables across epistemological belief groups**

	Epistemological Belief Groups			<i>F</i> (2, 89)	<i>p</i>	$\eta^2$
	<i>Diffuse</i>	<i>Extreme Rationalist</i>	<i>Mixed Skeptic/Rationalist</i>			
<b>Maternal Variables</b>						
Maternal Mental State Words	18.20 (2.37)	13.72 (1.70)	10.89 (1.71)	3.11	.05	.07
Authoritarian Parenting	3.02 (0.17)	2.48 (0.12)	2.62 (0.12)	3.55	.03	.08
Authoritative Parenting	4.07 (0.09)	4.24 (0.07)	4.30 (0.07)	1.97	.14	--
Permissive Parenting	2.36 (0.12)	2.28 (0.09)	2.23 (0.09)	0.32	.73	--
Overall Maternal Behaviour	2.29 (0.12)	2.77 (0.09)	2.56 (0.09)	4.90	.01	.10

Post-hoc LSD pairwise comparisons using a demonstrated the following: mothers in the diffuse epistemological group used more mental state words than the mixed skeptic/rational group ( $p = .044$ ) only. For the maternal behaviour composite, mothers in the extreme rationalist group had higher scores (i.e., more optimal parenting) when compared to the diffuse group only ( $p = .008$ ). This comparison was also true of self-reported authoritarian parenting style ( $p = .029$ ) (i.e., mothers in the diffuse group were

<sup>17</sup> Readers should note that since the maternal behaviour variables were highly correlated with each other, scores on these dimensions were collapsed into one variable that reflected overall maternal behaviour during the storybook task to reduce the number of comparisons needed and thereby reduce the chance of Type I errors.

more authoritarian than the extreme rationalist group, but not the mixed skeptic/rationalist group). Only the main effect of overall maternal behaviour remained significant after correcting for multiple comparisons.<sup>18</sup>

## Relations Between Maternal and Social Cognitive Variables

For this analysis, a set of hierarchical linear regression analyses were performed predicting children's performance on the interpretation understanding and mixed emotions tasks. Child age, total words spoken by children and maternal education were entered as covariates in the regression analyses; this more conservative approach was utilized to control for any potential confounds and therefore reduce the possibility of erroneous results. A separate regression was run for each of the maternal parenting variables, first entering the appropriate control variables. For example, for each regression the covariates were entered into the regression equation as a block first (child age, maternal education, child total words). At the next block, the effect of each group of maternal parenting variable(s) was entered (i.e., maternal mental state utterances, maternal parenting style, maternal behaviour, epistemological complexity, in this order). These regressions were performed for each social cognitive measure. In all, eight regressions were run; two for each type of maternal variable, one predicting interpretation understanding and one predicting mixed emotions. The purpose of these regressions was to look at the effects of each maternal variable independently of the others. Two additional hierarchical linear regressions were performed to examine the predictive effects of the (1) covariates alone, (2) non-epistemological parenting variables, and (3) epistemological groups on children's interpretation understanding and mixed emotions. Results are presented in Tables 10 through 13.

When interpretation understanding was entered as the dependent variable and the maternal variables as the predictors (at step 2 after covariates), only age emerged

<sup>18</sup> The ANCOVA was run again on the two different age groups described in the follow-up correlation analysis. Significant main effects were found on the Overall maternal behaviour and authoritarian parenting variables for the 5- to 6- year olds only ( $F(2, 50)_{\text{matbehav}} = 4.40, p = .017$ ;  $F(2, 50)_{\text{authoritarian}} = 4.02, p = .024$ ).

across each of the four regressions as a significant single predictor of interpretation understanding (see Table 10 for  $\beta$  and  $t$  values). As can be seen in Table 10, standardized  $\beta$  coefficients were generally around .44, suggesting that for every 1 standard deviation increase in age, children's performance on the interpretation task increased by .44 standard deviations. These  $\beta$  values are quite robust.

The covariates as a block explained significant variability in interpretation understanding ( $R^2_{\text{covariates}} = 0.22, p = .000$ ), although child total words and maternal education did not account for significant variability in the model.

In step 2 of each of the four full models, none of the individual maternal variables were significant predictors of interpretation understanding and the addition of each group of maternal parenting variables did not add significant variability above and beyond the covariates. The four full models (covariates and maternal variables) accounted for approximately 22% to 25% of the variability in interpretation understanding. Maternal parenting styles, maternal mental state words, maternal behaviour and epistemological belief groups added 2.8%, 0%, 0.8% and 0.6% of the variability in interpretation understanding above and beyond the covariates, respectively.<sup>19</sup> The  $R^2\Delta$  values were not statistically significant. None of the  $\beta$  values for the individual maternal variables were statistically significant either.

The same pattern of results emerged when children's performance on the mixed emotions tasks was entered as the dependent variable ( $R^2_{\text{covariates}} = 0.20, p = .000$ ). The four full models (including covariates) accounted for approximately 19% to 22% in children's mixed emotions performance. The  $\beta$  values for child age ranged from .32 to .35. Maternal parenting styles, maternal mental state words, maternal behaviour and epistemological beliefs added 1.2%, 0.6%, 2.2% and 0.2% of variability in mixed emotions above and beyond the covariates, respectively<sup>20</sup>, although none of these  $R^2\Delta$

<sup>19</sup> Maternal Behaviour:  $R^2\Delta = .00, F\Delta(3, 83) = .286, p = .84$ ; Maternal mental state words:  $R^2\Delta = .00, F\Delta(1, 85) = .001, p = .98$ ; Parenting Styles:  $R^2\Delta = .03, F\Delta(3, 83) = 1.02, p = .39$ ; Epistemological beliefs:  $R^2\Delta = .006, F\Delta(2, 84) = .34, p = .71$ .

<sup>20</sup> Maternal Behaviour:  $R^2\Delta = .02, F\Delta(3, 83) = .78, p = .51$ ; Maternal mental state words:  $R^2\Delta = .01, F\Delta(1, 85) = .67, p = .42$ ; Parenting Styles:  $R^2\Delta = .01, F\Delta(3, 83) = .43, p = .74$ ; Epistemological beliefs:  $R^2\Delta = .002, F\Delta(2, 84) = .20, p = .90$ .

values were statistically significant. In each of the four full models, none of the maternal variables had significant  $\beta$  values.

The  $F$  statistic was statistically significant for all of the eight full models; however, this was primarily due to the strong effects of age on interpretation understanding and children's mixed emotions performance (see Tables 10 and 11, respectively). In summary, in all of the eight full models, none of the maternal variables, as groups or individually, explained significant variability in either of the social cognitive measures. Child age was the only significant predictor of children's interpretation understanding and mixed emotions performance.

**Table 10. Summary of Regression Coefficients Predicting Children's Interpretation Understanding from Maternal Variables**

Variable	Model 1		Model 2		Model 3		Model 4	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Child Age	.44	4.39***	.43	4.16***	.40	3.59***	.44	4.26***
Child Total Words	.12	1.21	.12	1.15	.15	1.28	.12	1.13
Maternal Education	.05	.52	.06	.58	.07	.68	.04	.72
Authoritative Parenting	-.17	-1.67						
Permissive Parenting	-.08	-.76						
Authoritarian Parenting	-.06	-.60						
Maternal Mental State Words			-.00	-.03				
Maternal Engagement					.11	.68		
Maternal Responsiveness					-.15	-.59		
Sensitivity of se					-.01	-.04		
Mixed Skeptic/Rationalist Group							.07	.51
Rationalist Group							.11	.83
Model R <sup>2</sup>	.25		.22		.23		.23	
F statistic	4.53***		5.96***		4.06***		4.88***	

\*\*\* $p < .001$ ,  $N = 90$

Note: **Model 1:** Child age, child total words, maternal education, parenting styles (authoritarian, permissive, authoritative. **Model 2:** Child age, child total words, maternal education, maternal mental state terms. **Model 3:** Child age, child total words, maternal education, maternal engagement, maternal responsiveness, maternal sensitivity of control. **Model 4:** Child age, child total words, maternal education, mixed skeptic/rationalist group, rationalist group.

**Table 11. Summary of Regression Analyses Predicting Children's Performance on Mixed Emotions Task from Maternal Variables**

Variable	Model 1		Model 2		Model 3		Model 4	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Child Age	.32	3.11**	.35	3.36***	.35	3.14**	.34	3.22**
Child Total Words	.20	1.96	.20	1.94	.21	1.80	.20	1.95
Maternal Education	-.04	-.36	-.05	-.47	-.07	.49	-.04	-.38
Authoritative Parenting	.10	.99						
Permissive Parenting	.08	.69						
Authoritarian Parenting	.05	.43						
Maternal Mental State Words			.08	.82				
Maternal Engagement					-.17	-.99		
Maternal Responsiveness					.39	1.49		
Maternal Sensitivity of Control					-.21	-.90		
Mixed Skeptic/Rationalist Group							.05	.37
Rationalist Group							.01	.04
Model R <sup>2</sup>	.21		.20		.22		.20	
F statistic	3.63**		5.38***		3.85**		4.14**	

\*\*p < .01, \*\*\*p < .001, N = 89

Note: Model 1: Child age, child total words, maternal education, parenting styles (authoritarian, permissive, authoritative). Model 2: Child age, child total words, maternal education, maternal mental state terms. Model 3: Child age, child total words, maternal education, maternal engagement, maternal responsiveness, maternal sensitivity of control. Model 4: Child age, child total words, maternal education, mixed skeptic/rationalist group, rationalist group.

For the second set of hierarchical linear regressions the covariates were entered in block 1, the non-epistemological maternal variables in block 2 and the epistemological groups in block 3. The models specifying the covariates as the predictors were significant for both interpretation understanding and mixed emotions (see Tables 12 and 14). The addition of the non-epistemological parenting variables and later the epistemological belief groups, did not add significant variability to either measure of children’s social cognitive skills. Again, none of the maternal variables emerged as significant individual predictors of the outcome measures once the effects of the others were all considered in the same regression equation (see Tables 13 and 15).<sup>21</sup>

**Table 12. Summary of Linear Regression Analyses Predicting Children’s Interpretation Understanding from covariates (block 1), maternal variables (block 2) and Epistemological Beliefs (block 3).**

Model	R <sup>2</sup>	Adjusted R <sup>2</sup>	R <sup>2</sup> Δ	FΔ (df1, df2)	Sig. FΔ
1	.219	.192	.219	8.033 (3, 86)	.000
2	.259	.165	.040	.604 (7, 79)	.75
3	.271	.157	.012	.641 (2, 77)	.53

Notes:

**Model 1:** Child age, child total words, maternal education. **Model 2:** Child age, child total words, maternal education, authoritarian parenting, permissive parenting, authoritative parenting, maternal mental state terms maternal engagement, maternal responsiveness, maternal sensitivity of control. **Model 3:** Child age, child total words, maternal education, authoritarian parenting, permissive parenting, authoritative parenting, maternal mental state terms maternal engagement, maternal responsiveness, maternal sensitivity of control, rationalist epistemology group, mixed skeptic/rationalist group.

<sup>21</sup> The possibility that results might have differed by age was also tested. The sample was split into the two groups discussed earlier. Two regressions, entering all maternal variables and covariates into the regression model, were re-run for the two measures of social understanding. The *F* statistic for the full models of each age group for each outcome variable was non-significant. The only significant individual predictor was age, for the 5- to 6-year-olds only ( $\beta_{\text{interpretation}} = .307, t = 2.06, p = .045$ ;  $\beta_{\text{mixeddemo}} = .337, t = 2.41, p = .02$ ). When descriptive data were examined post-hoc, the variance in Mixed Emotions and Interpretation Understanding were similar but mean scores were different. T-tests confirmed that children in the 7- to 8-year-old group scored significantly higher on both social understanding measures compared to the 5- to 6-year-old group ( $t(88)_{\text{interpretation}} = -4.03, p = .000$ ;  $t(88)_{\text{mixeddemo}} = -2.99, p = .004$ ).

**Table 13. Summary of Regression Coefficients Predicting Children's Interpretation Understanding from all Maternal Variables (Model 3 from Table 12)**

<b>Variable</b>	<b>B</b>	<b>SE (B)</b>	<b><math>\beta</math></b>	<b>T</b>	<b>p value</b>
Child Age	1.23	.34	.42	3.65	.00
Child Total Words	.00	.00	.17	1.45	.15
Maternal Education	.30	.84	.04	.36	.72
Authoritative Parenting	-1.15	.71	-.17	-1.62	.11
Permissive Parenting	-.58	.62	-.11	-.94	.35
Authoritarian Parenting	-.22	.45	-.06	-.50	.62
MMST	.01	.04	.05	.39	.70
Maternal Engagement	.65	.78	.14	.83	.41
Maternal Responsiveness	-.85	1.40	-.17	-.61	.54
Maternal Sensitivity of Control	-.34	1.01	-.10	-.34	.73
Mixed Skeptic/Rational Group	.66	.83	.12	.80	.43
Rationalist Group	.97	.86	.17	1.13	.26

Model  $R^2 = .271$ ,  $F = 2.382$ ,  $p = .011$ .  
 $N = 90$

**Table 14. Summary of Regression Analyses Predicting Children’s Performance on the Mixed Emotions Task from covariates (block 1), maternal variables (block 2) and Epistemological Beliefs (block 3).**

<b>Model</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>R<sup>2</sup>Δ</b>	<b>FΔ (df1, df2)</b>	<b>Sig. FΔ</b>
1	.196	.168	.196	6.977 (3, 86)	.000
2	.255	.161	.059	.898 (7, 79)	.51
3	.261	.146	.006	.298 (2, 77)	.74

*Note:* **Model 1:** Child age, child total words, maternal education. **Model 2:** Child age, child total words, maternal education, authoritarian parenting, permissive parenting, authoritative parenting, maternal mental state terms maternal engagement, maternal responsiveness, maternal sensitivity of control. **Model 3:** Child age, child total words, maternal education, authoritarian parenting, permissive parenting, authoritative parenting, maternal mental state terms maternal engagement, maternal responsiveness, maternal sensitivity of control, rationalist epistemology group, mixed skeptic/rationalist group.

**Table 15. Summary of Regression Coefficients Predicting Children’s Mixed Emotions from all Maternal Variables (Model 3 from Table 14)**

<b>Variable</b>	<b>B</b>	<b>SE (B)</b>	<b><math>\beta</math></b>	<b>t</b>	<b>p value</b>
Child Age	.71	.24	.35	2.99	.004
Child Total Words	.00	.00	.23	1.92	.059
Maternal Education	-.32	.59	-.06	-.55	.59
Authoritative Parenting	.53	.50	.11	1.06	.29
Permissive Parenting	.44	.43	.12	1.02	.31
Authoritarian Parenting	.23	.31	.09	.74	.46
MMST	-.67	.55	-.21	-1.23	.22
Maternal Engagement	.65	.78	.14	.83	.41
Maternal Responsiveness	1.89	.98	.53	1.93	.056
Maternal Sensitivity of Control	-1.02	.71	-.41	-1.45	.15
Mixed Skeptic/Rational Group	.44	.58	.11	.77	.45
Rationalist Group	.29	.60	.08	.49	.63

Model  $R^2 = .261$ ,  $F = 2.263$ ,  $p = .016$ .  
 $N = 89$

## Discussion

The purpose of the current study was to further clarify whether maternal behaviour, parenting style, language and epistemic beliefs were associated with 5- to 8-year old children's understanding of interpretation and mixed emotions. It is an extension of several other examinations that found positive associations between parental behaviour, parenting style and language to 3- to 5- year old children's false-belief, emotion and belief understanding. The inclusion of several maternal parenting variables in the current study provided the opportunity to examine their inter-relations as well as the individual and combined effects of the maternal variables for children's social cognitive skills. Results revealed that many maternal parenting variables were related to one another in conceptually consistent and logical ways but none of them, individually or as a group, significantly predicted children's understanding of interpretation or mixed emotions.

As expected, mothers' parenting behaviours were reliably statistically related across the different measures (i.e., self-report, observation-based interaction ratings). This result demonstrates that the various coding schemes and structure of the measures are assessing theoretically similar, although not identical, constructs. For instance, in general, mothers' higher quality parenting behaviours during the storybook tasks was consistently associated with more use of mental state words, higher quality self-reported parenting styles (less authoritarian and permissive, more authoritative) and more complex epistemological beliefs (rational versus diffuse beliefs). Additionally, mothers with more complex epistemological beliefs were more likely to demonstrate higher quality parent-child interaction and self-reported parenting styles. More specifically, mothers in this study who endorsed more rational and skeptic epistemological beliefs rated themselves as less authoritarian and demonstrated maternal behaviour that involved more responsiveness, sensitivity, listening and cooperation compared to those who endorsed more varied or diffuse epistemological beliefs. This latter result is

consistent with both the parenting and epistemology literature, which have highlighted a positive association between the complexity of mothers' epistemological thinking and positive parenting behaviours (e.g., Bond & Burns, 2006; Bond et al., 1996; Hutchins et al., 2009; Jimerson & Bond, 2001; Holmes et al., 2008).

It is interesting that many of the differences in parenting variables across the epistemological belief groups were between the *extreme rationalists* and the *diffuse/undifferentiated* groups. This suggests that holding a more rational view of knowledge and knowing doesn't necessarily confer advantages to mothers when compared to those who are emerging into rationalism (mixed skeptic/rationalist). It does, however, support a growing literature claiming that there are important differences between objectivists and rationalists in terms of parenting behaviour (e.g., Hutchins et al., 2009). Obtaining this type of result using a pencil-and-paper measure of maternal epistemology is unique and worthy of further examination in other samples of mothers and parents.

A result that was not expected was the difference in observations of parenting behaviour when Caucasian and Non-Caucasian mothers were compared. Although the sample sizes were quite different (69 Caucasian mothers, 31 Non-Caucasian mothers), there were significant group differences in maternal engagement, responsiveness and sensitivity of control. This result might be interpreted as indicating not a difference in the *quality* of parenting per se, but rather a cross-cultural difference in the way that mothers interact with their children. Observationally-based coding systems of behaviour are notoriously poor at taking into account the meaning underlying individual behaviour. In other words, Non-Caucasian mothers may still be interacting positively with their children, but may do so in a different way than Caucasian mothers. The coding scheme for mother behaviour used in the current study may not have been sensitive enough to these differences nor was it able to capture the culturally-constructed meaning underlying the maternal behaviours. Other research groups (e.g., Harkness & Super, 1996; Vinden, 2001) have been careful to point out that determining "good parenting" must be based on a careful examination of cultural-situated norms, attitudes, beliefs and behaviour. From a relational developmental systems approach, children's interpretation of such behaviour is also important to consider, as children's reactions to parents may

influence subsequent parenting and child behaviour as well as the interactive environment (Rohner & Pettingill, 1985). Future research should endeavour to be more sensitive to cross-cultural parenting practices when designing observational coding systems.

The lack of relation between maternal behaviour, language, parenting style, epistemic beliefs and the social-cognitive measures was not expected. It is certainly not consistent with the majority of previous investigations linking parenting and early social cognitive skills such as false-belief performance and emotion understanding. Since the maternal variables were related to each other in the expected directions, it is unlikely that the lack of significant findings are due to flawed or imprecise measurement of the parenting variables. This leaves measurement issues related to the social-cognitive variables, developmental explanations and theoretical issues as possible culprits.

The first and most parsimonious explanation is that parenting simply is not as influential for children's understanding of interpretation and mixed emotions as it is for false-belief understanding, at least not when it is measured *concurrently*. In the same data set, longitudinal relations between were found between parental engagement on a free play task and 3- to 5- year old children's understanding of interpretation two years later (Susswein, 2007). Susswein measured parental engagement during an unstructured parent-child activity, which might have been more sensitive to picking up subtle differences in parental engagement than the storybook tasks. The content of the storybook tasks may have also influenced mothers' use of mental state words (i.e., mothers may have used more or less varied mental state words than they naturally would in everyday interactions). The reasons why concurrent relations were not found in the current study may also lie in the types of maternal influences that were and were not examined in our sample. It may be that parenting matters more for the development of early social understanding abilities (i.e., false-belief, emotion understanding) since these skills may be more sensitive to more general aspects of parenting. In contrast, children's understanding of interpretation and mixed emotions may be related to more specific parental behaviours. Thus, broad parenting qualities may be necessary, but not sufficient, for more advanced forms of social-cognitive reasoning. In other words, the types of maternal influences that are important for children's understanding of

interpretation and mixed emotions may not have been adequately measured in the current study. For example, some authors have suggested that an explicit focus on perspective-taking in family conversations may be what is most predictive of children's expertise in conversational perspective taking (Deleau, 2012; Bernard & Deleau, 2007), and later children's social understanding (Harris, 2005). Or, following from Dunn et al. (1991), child-driven exploration and experiences, and family discussion of such explorations and experiences, which helps enrich and diversify their understanding of the interpretational nature of knowledge and the complexity of emotional experience may play a role. Other more specific parenting practices, such as mothers' or other caregivers talking about perspectives and the subjectivity of everyday experiences and interactions, or simply taking the child's perspectives into account to guide their actions may be more important. This type of explanation is similar to the arguments of Carpendale and Lewis (2004, 2006, 2015) and is consistent with a relational developmental systems approach (Carpendale, Hammond & Atwood, 2013; Forst, 2005). As such, a child's experiences in the social world as well as their discussion of these experiences with others in psychological or belief terms is what may contribute most to children's social understanding. The current study did not measure the extent to which children encountered similar situations to the ones in the storybooks or the mixed emotion tasks, or the extent to which parents discussed such experiences, but this might be important for future research in the area.

Children also acquire more and varied experiences in their social world as they grow, and thus it may be harder to detect the effects of parenting versus other types of socialization. This is not to say that parenting does not matter as children grow older, but that the role that mothers play may be different and these "other" non-parental relationships (e.g., siblings, peers, community groups, teachers) may weaken the statistical relation between parenting and social-cognitive outcomes sufficiently such that no effects are found. Once basic interpretive abilities are formed (i.e., they can pass false-belief tasks), children may require less or a different kind of socialization to continue developing these skills. Therefore, comprehending children's understanding of mind may require more complex models that take into account these other avenues of socialization.

It is also possible that the outcome measures used in the current study either did not produce enough variability in children's abilities to uncover the hypothesized relations or that they were insufficient measures of the interpretational nature of knowledge and experience. In the former case, the sample consisted of a relatively uniform group of children in terms of socio-economic and cultural background. Although this may suggest something important about the lack of effect of maternal parenting on middle-class Caucasian children's advanced social cognitive skills, it also leaves many questions about whether the parental variables included in the study would have an effect on a more diverse sample of children and parents. As discussed in the introduction, cultural norms and values play an important role in parenting behaviour (Vinden, 1996, 1997). Although possible, it is unlikely that the interpretation tasks were insufficient in measuring children's interpretive skills; however, it is possible that measures tapping into more experiential aspects of interpretation and emotion might be better, or more specific, indicators of these abilities.

The lack of association between maternal epistemological beliefs and the outcome measures was most surprising since these variables seem to be most similar in cognitive content. Although it would be appropriate to suggest that a more rational mother does not necessarily correspond with their child having more advanced abilities at understanding the interpretational nature of knowledge, there may also be other good reasons why a relation was not found. First, it is likely that maternal epistemological perspectives are not irrelevant to children's understanding of interpretation and mixed emotions, but that they are only one of many complex influences on children's social understanding. As can be seen in the data, they certainly are related to parenting behaviour and therefore likely have some bearing on the parent-child system. Perhaps parental personal epistemologies matter less for the emergence of children's interpretational abilities than for other markers of children's social, cognitive and emotional development (e.g., social competence, parent-child relationship quality) or later development of personal epistemologies in adolescence and beyond. Besides adolescents' perceptions of their parents as being more communicative and engaged (Holmes et al., 2008) these potential relations have not been explored to-date. It would be particularly interesting to better understand the relation between maternal personal epistemological thinking and the development of adolescents' own identity and

epistemological thinking. One would expect that a child growing up in an environment where the thinking they are exposed to through conversations with parents is more rational (compared to objective) would be more likely to develop more rational epistemological perspectives.

The results of the current investigation are consistent with the existing false belief literature in some important ways. The first concerns the positive relation between age and children's social understanding. In fact, age was the only variable that was robustly correlated with interpretation understanding and mixed emotions, even when it was examined with other possible predictors. However, when children were separated into two age groups, age was only a significant predictor of social understanding for the 5- to 6-year-olds. This suggests that the relation between age and social understanding reported might have been largely due to variability among the youngest children in the study. This result might be due to the fact that most 7- to 8-year-olds performed better on the interpretation and mixed emotions tasks. It should be noted, however, that the low frequency of children in the older age group might have reduced the statistical power needed to detect true effects in the older age group.

Although the current study did not provide data to explain what may underlie or mediate this relation, it did provide additional support for the finding that there is something unique about *age* that confers benefits to children's social cognitive reasoning. This is a common finding in the literature (see Carpendale & Lewis, 2015 for a review). Child age was also positively related to children's overall volubility and use of mental state utterances. The latter two variables were also positively associated with better social cognitive task performance, but not after the effects of age were controlled for statistically. It is intuitive that older children might talk more than younger ones and use more affective language, since they may have greater understanding and experience talking about mind-related concepts. As such, a link between expressive skills and/or language development and social cognitive ability exists. This is not surprising given the well-established correlation between language skills and false-belief understanding (see Milligan, Astington & Dack, 2007 for a meta-analysis) in both normal (Astington & Jenkins, 1999; Milligan, Astington & Dack, 2007; Slade & Ruffman, 2005) and atypical samples (e.g., autism, deaf children) (Tager-Flusberg & Joseph, 2005;

Courtin & Melot, 2005; Deleau, 1997). However, in the current sample of children this association does not seem as robust as age. Furthermore, as in the current study, many prior investigations have partialled out the effects of verbal ability and still found significant relations between age and social cognitive development, suggesting that there is something else about age that is important for children's social understanding.

What underlies the association between age and social cognitive abilities has not yet been fully explained in the literature, although there are many intriguing ideas and theories. Wellman et al. (2001) discuss these issues in a prominent meta-analysis of 127 false-belief studies, and conclude that age is a robust and reliable predictor of false-belief performance and experimental artefacts, such as task demands (e.g., verbal skill needed to demonstrate understanding), are not likely to account for individual differences in children's performance across studies. Although the meta-analysis did not include interpretation understanding-type tasks, their results were quite robust, with large effect sizes. As such, it would be reasonable to postulate that these results could hold when examining more advanced social cognitive abilities as well. Whether age is a proxy for some specific developmental achievement or process is yet to be understood in the literature. Age may simply offer children more social experience necessary for them to understand that people can have different opinions, perspectives and emotions.

The results of the current study also bring up interesting issues related to the association between mental state talk and social cognitive skills. Contrary to the literature, mothers' use of mental state words was not associated with children's performance on the interpretation and mixed emotion measures. This may be due to the possibility that the storybook had a high sensitivity in eliciting mental state words from mothers since it involves affective themes and visual stimuli. As such, all mothers might have been more likely to use mental state words than they would in normal everyday interactions with their child and thus the variability on this measure may have been reduced (i.e., more scores on the optimal end of parental language). Variability may also have been reduced due to the demographics of the mothers in the sample (i.e., middle-class, Caucasian, educated). These mothers might be more likely to use mental state language with their child, thus reducing variability. Although statistically this seems like a problem, other studies that have found a link between parenting variables and children's

social understanding also obtained scores on parenting variables more toward the optimal range (Ruffman et al., 2006). Also, although studies in the false-belief literature have used a variety of tasks and coding schemes, many have used similar experimental stimuli that contain emotion-laden pictures or tasks and found links between mental state utterances and children's performance on social cognitive tasks (e.g., Ruffman et al., 2002; Ruffman et al., 2006).

Alternately, there may also be something unique about advanced social cognitive skills such that they are less influenced by the language environment than other early-emerging social cognitive skills. As discussed earlier, evidence suggests that it is not the quantity of mental state language that is important but rather the context in which they are discussed (Dunn et al., 1991) and how they are discussed (Slaughter, Peterson & Mackintosh, 2007; Hutchins et al., 2009) and comprehended (Appleton & Reddy, 1996; Turnbull et al., 2008). The current study endeavoured to address this by examining at general categories of parenting behaviour that provide a context for language exchanges about the mind (e.g., responsiveness, sensitivity of control). Despite this, no significant relations emerged from the statistical analysis. Perhaps a more fine-grained approach, more in keeping with the coding categories for mental state talk examined by Hutchins et al. would be helpful here.

There is also the possibility that older children may benefit from a different kind of mental state talk, such as mind-related talk that is specifically linked to a particular social cognitive concept or skill, rather than simple mention of mental *states*. There is some evidence that this may be important for younger children as well. For example, Slaughter et al. (2007) found that mental states mentioned during narration of wordless storybook, much the same as in the current study, were only associated with 38- to 57- month old children's concurrent social cognitive skills when they were used in an explanatory manner as *cognitive clarifications* or explanations of *false-belief endings*. A possible opportunity for future studies would be to test the sensitivity of various tasks to parents' use of mental state words and their purposes (i.e., mentioning of states versus explanatory) and examine associations with a variety of social understanding tasks, both cross-sectionally and longitudinally.

Interestingly, mothers' use of mental state words was correlated with children's mental state word use and children's mental state word use was associated with high scores on the interpretation understanding task only (but not after child age was partialled out). Maternal mental state utterances, however, were associated with higher quality maternal behaviour (i.e., more responsive, engaged and less controlling mother behaviour). There was no relation with maternal parenting styles, but there were differences based on mothers' epistemological beliefs. In fact, mothers from the diffuse epistemological group used more mental state words than the mixed sceptical/rational group. The distribution of mental state words across epistemological categories may explain this otherwise unanticipated result. In other words, the distribution of mental state usage across epistemological categories was slightly bimodal, such that mothers' mental state word scores were high (although not statistically different) in the less and more complex epistemological groups. Although not examined in the current study, mothers in these two groups may have had different reasons for using mental state words. Like Hutchins et al. (2006), perhaps mothers in the diffuse group might have used mental state words as a way of directing the interaction, as they were found to be less engaged, responsive and less able to structure the interaction to meet their child's needs. On the flip side, mothers in the rational epistemological group may have used mental state words as a way to scaffold their child's understanding. Again, this is speculation and based on the distribution of mothers' mental state usage, as there was only a significant difference between the diffuse and mixed/skeptic rational group.

As discussed previously, the type of talk mothers and children engage in regarding emotions may also be important to consider. Rather than simply mentioning mental states, it may be more important that children and parents talk about the context of the emotions. For example, Racine, Carpendale and Turnbull (2007) found that parent-child talk regarding the belief-dependent aspects of emotion predicted false-belief understanding in 3- to 5 year old children, whereas talk about non-belief dependent aspects of emotion predicted their emotion understanding.

Overall, these results suggest that there is some benefit to mothers' use of mental state language, but that this benefit may be confined to the quality of the mother-child interaction rather than 5- to 8 year old children's social understanding. For

instance, mothers who were more skilled at structuring the interaction might have been more likely to draw attention to affective themes in the storybooks. However, it may also be likely that mothers who talked more also used more mental state terms and had more opportunity to obtain high scores on the maternal behaviour variables. In fact, follow-up correlation analyses confirm that mothers who talked more also scored higher on the maternal behaviour variables. This does not seem to be an artefact of child age, however. Specifically, results demonstrated that mothers talked less overall with older children and having an older child was negatively related to mother behaviour. In other words, the older the child the less parents talked and the lower parents scored on the maternal behaviour composites.

Additionally, it is possible that the early language-learning environment is a more robust predictive of later social understanding. Several longitudinal investigations have lent support to this idea (e.g., Ruffman, Slade & Crowe, 2002; Susswein, 2007). Young children may benefit more from mothers' use of mental state words because they have not yet developed an affective lexicon and may need this type of language learning environment to understand how mental state words and human action are linked. Older children may need less of this because they tend to have a more diverse emotional vocabulary and understanding of mental states; thus, their needs are different. This interpretation of the data is purely speculation. Future research will be important in examining such relations.

## **Limitations of Current Study**

*Sample.* The present research was limited by its design and sample in a few important ways. First, and noted earlier, the study examined *concurrent* relations between maternal parenting and social understanding, therefore limiting the discussion of causal associations between parenting and social understanding in older children. Future research should incorporate a longitudinal design if causal interpretations are of interest. Preliminary studies have suggested that earlier parenting does influence later social understanding skills (e.g., Susswein, 2007); these relations should continue to be explored. Further, a longitudinal design would enable researchers to study the effect of maternal epistemology on parent behaviours over time as well test the assertion that

epistemological beliefs influence parenting behaviours that then have a positive effect on children's social understanding.

The sample of mothers in the current study limits the generalizability of the results and might have influenced variability on the parenting variables. Mothers in the sample were mostly educated, Caucasian and middle-class, suggesting that, for the most part, children in the study came from homes with both physical and psychological resources. Thus, it might be that children with adequate social environments and with "good enough" parenting, do not specifically benefit greatly from the broad parenting domains of engagement, responsiveness and sensitivity of control when it comes to their social understanding. However, other parenting variables not measured may be beneficial. A more diverse maternal sample would help to sort this issue out empirically.

From a developmental point of view, the variation in the age of the children in the current study was also quite large and potentially problematic. This issue was touched on earlier as it related to the relation between age and the outcome variables as well as the effect of children's characteristics upon parenting behaviour. In the current sample children varied most on the mean overall scores for the interpretation understanding and mixed emotions tasks, but not on variability, when age was considered as an independent variables. Carpendale and Chandler (1996) found that most 8- to 9-year-olds pass the tests of interpretation, whereas younger children's performance is more likely to vary. Thus, the current results do not support the interpretation that 7- to 8-year-old children's scores had limited variability. It would be interesting to look at the two age groups again with a larger sample and more statistical power to determine if the differences found in the current study persist. Regardless, splitting the sample into two age groups did not change any results regarding the relation between parenting and social understanding. This adds further support for the notion that children's understanding of interpretation and mixed emotions may be more influenced by other factors in their social environment.

*Design.* The main limitation of the design of the current study was that standardized measures of language, SES and ethnicity were not collected. To counteract this problem alternate, and arguably less optimal, measures of these

variables were utilized. For example, the language measures in the study were derived from interactions constrained by the nature of the storybook activity. Most published studies include language measures that come directly from standardized assessment instruments that are arguably more accurate estimates of a child's language ability, including general language ability, single-word or sentence vocabulary, understanding of syntax, and memory for complements (Milligan et al., 2007). In terms of SES and ethnicity, the current study was only able to *approximate* these variables. Results related to these variables should be interpreted with this in mind.

It is well understood in the literature that children's behaviour, temperament, affect, cognitive development and interpretations influence parenting behaviours. Unfortunately, the present research did not include a standardized measure to take into account the effects of the children on their mothers' behaviour (e.g., temperament, state-related behaviour), although recent investigations have found that some parental predictors of children's social understanding (e.g., maternal language emphasizing appropriate mind-related comments) are not related to infant temperament (Meins, Fernyhough, Arnott, Turner, & Leekam, 2011). As reported earlier, age was as a significant influence on mothers' behaviour during the storybook task. Mothers were less engaged, less responsive and less sensitively controlling of older children than they were with younger children. The behavioural coding system was designed to take children's needs and characteristics into consideration; however, it may have been more sensitive to interactions between young children and their mothers. As children grow and develop their interactive needs may also change, and as such, what is considered an "optimal" parent-child interaction for a young child may not be so for an older child. For instance, a younger child might have needed more scaffolding and support to understand the Sam and Laurie story, and therefore mothers may have been more involved and active in the interaction. Future behavioural coding schemes should consider the age variation within their sample and design their coding systems accordingly.

One of the main assumptions underlying many statistical tests is the independence of observations. This is assumed in most study designs. In the current study, several variables were obtained from the same interaction task (i.e., maternal

behaviour, verbal ability, mental state terms). Future research should derive these measures from separate tasks in order to increase the confidence in the validity and reliability of the data.

Finally, the present research is limited in its generalizability to fathers. It is well understood that fathers play a unique and important role in their child's development. However, we know very little about how a father may influence his child's social understanding, as a majority of studies have examined maternal behaviours and mother-child interaction specifically. There have been a few studies of parental mind-mindedness that have reported similar proportions of appropriate mind-related comments in mothers and fathers (Arnott & Meins, 2007), as well as some preliminary evidence that paternal mind-mindedness has a positive concurrent effect on 4-year-old children's false-belief performance when measured via the usual interview format and an interactional task (Lundy, 2013). Lundy (2013) also found a similar impact of fathers and mothers in her study. The social understanding literature would benefit greatly from further research examining fathers' roles in their children's social understanding as well as determinants of paternal parenting that is important for children's social-cognitive skills. Further, it is possible that parenting programs aimed at enhancing children's social-cognitive development could be enhanced by the addition of this knowledge.

## **Conclusions**

Contrary to expectation, the current study was not able to establish a link between high quality maternal parenting practices and the types of social understanding that require the knowledge that others can view events differently or experience different emotions simultaneously. Given this, it may be the case that the maternal parenting variables examined in the current study simply do not confer the same benefit to children's growing sense of the interpretational nature of knowledge and emotion as they do to their overall social-emotional development. It is possible that these skills are better explained by children's general cognitive abilities (e.g., mental abstraction) or social experience (e.g., having been exposed to situations requiring this type of thinking and reasoning), or that there is a sensitive period in children's development in which parenting has more benefit to specific social cognitive skills. Future research

investigating these possibilities, but with a longitudinal design, may be in a better position to highlight the value of certain parenting practices over others for a range of children's social understanding and social-emotional development.

This study did, however, demonstrate the value of including measures of maternal epistemology in investigations of parenting. Mothers with more complex epistemological perspective tended to score more at the optimal end on the other parenting variables, lending further support to the claim that maternal beliefs about knowledge and the knowing process do influence their interactions with their children. It would be premature to conclude that they have no bearing on children's social cognitive skills based on the results of the current study. As such, it would be fruitful for further investigations to endeavour to establish an association, either using other measures of social understanding and/or with other age groups.

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# Appendix A: Maternal Behaviour Coding Guide

## Background & Overview

The current coding scheme is based upon an extensive literature documenting parenting practices related to both positive and negative outcomes in children. The coding categories were derived and/or taken directly from an existing coding scheme assessing a variety of parenting behaviours (Johnston, Murray, Hinshaw, Pelham & Hoza, 2002). This study employed six coding categories, including maternal involvement, affective tone, acceptance of child, authoritative control, responsiveness and sensitivity of control. Only two of the seven (**responsiveness** and **sensitivity of control**) were considered relevant for the design of the current study and were retained in their original form; another two categories (involvement, maternal affective tone) were utilized but combined into one dimension, referred to in the current investigation as **engagement**. Each of these dimensions is defined and described in the relevant section(s) below.

## Context

In the current study, children and a caregiver were asked to construct two stories based on two different storybooks without words. The first set of pictures is the *Billy and Sarah* story. This is a story about a false belief. The second set of pictures is the *Sam and Laurie* story and it involves a situation where two children have a different perspective about the same object, their family dog Carp. The dyads were not given any instructions except that the mother should be in charge of turning the pages. They were to construct their own story based on the pictures in the two books.

## Materials

Raters coded the mother-child interaction using both the transcripts and videotapes of each storytelling interaction. The transcripts were used so that raters were able to go back and reference details of the interaction, if needed. The transcripts contain all words spoken during the story interactions. The videotapes were viewed in order to rate the mothers because they contain valuable information about the mothers nonverbal style, including physical contact (e.g., pointing, eye contact, physical proximity), pacing, facial expressions and other subtle mothering behaviours that may affect raters assignment of codes and are not represented on the transcripts. Raters also had access to a copy of the storybooks in the event that they had challenges following the each mother-child dyad or needed to refer to the visual details of a specific storybook page.

## General Coding Instructions

Raters became very familiar with each coding category as well as its behavioural anchors. Raters could also consult Johnston et al.'s original coding guide for an overall understanding of the responsiveness and sensitivity of control dimensions, although they were cautioned to refer to the behavioural anchors and detailed descriptions in the current coding scheme to come to final decisions when rating.

Raters both watched the videotapes and went through the transcripts to provide an interaction code for **each section of the two stories**. The coding scheme has 3 coding categories: *Engagement*, rated on a scale of 1 (low) to 4 (high); Sensitivity of Control, rated on a scale of 1 (low) to 4 (high); and *Responsiveness*, rated on a scale of 1(low) to 3 (high). A score for each page of each book was given (see the tables at the end of this Appendix for descriptions of the visual content that accompanies the page #'s). Raters also produced an average score for each story, as an overall way to summarize the quality of the mother's behaviour.

## **Coding Procedure**

Raters followed the procedure outlined below.

- Raters watched the waiting room interaction and storybook task once before coding to familiarize themselves with the dyads style of interaction and the child's perceived interest, needs and abilities. Emphasis was placed on observing the child's skill and ability level so that mothers' behaviour was coded with reference to how they were or were not be matching their child's skills, abilities and needs.
- Raters went through each story section by section, assigning a score for each of the three coding categories.
- Raters went back and watched the tape again to confirm that their assignment of codes for each section of the story was the "best" representation of the mother's behaviour

## **Notes**

Raters began watching the tapes and reading the transcripts with an average rating in mind (the value of which depends on the scale).

## **Coding Categories & Behavioural Anchors**

### **(1) Maternal Engagement**

*Definition:* We were interested in the extent to which mothers were involved, interested and appeared to be enjoying the activity and their child. Elements important to determine level of engagement included:

- Maternal emotional tone, coded on the basis of verbal statements, nonverbal gestures, body posture, facial expressions, and tone of voice
- Ability of mother to hold joint attention
- Mother's level of interest in activity
- Expressions of enjoyment
- Affect matching

Interactions low in dyadic engagement were characterized by low maternal interest, disengagement, boredom, expression of negative affect, lack of attempts at affect matching and infrequent nonverbal referencing (e.g., looking at book the whole time rather than referencing the child).

Interactions which were high in dyadic engagement were observed to have a high degree of involvement of the mother, an genuine expression of interest and enjoyment in the activity, frequent affect expression, affect matching and complex nonverbal referencing (e.g., pointing, looking, physical contact).

*Scoring:* The engagement scale was coded on a scale of 1 (low engagement) to 4 (high engagement). Below are benchmarks/guidelines that assisted raters in assigning codes to mothers. However, please note that not all mothers fit perfectly into these categories. Raters made judgments about the quality of the interaction and what category it fit into *best*.

<b>Code Descriptions</b>	<b>Engagement</b> contains elements of <i>affective tone, interest, involvement, joint attention, affect matching</i> and <i>shared enjoyment</i> .
<b>4 (High quality)</b>	Consistently high level of engagement Mother appears highly interested and involved Lots of enjoyment and nonverbal referencing There could be lots of shared affect Affective tone is usually quite positive and warm most of the time
<b>3</b>	Mother is interested and involved enough to hold child's attention Some nonverbal referencing Proximity appropriate Enjoyment may be evident but is brief or not as intense as a 4 Interaction appears typical for a mother-child dyad. Affective tone neutral (euthymic) Nonverbal communication is neither warm nor irritated Some shared affect could be present.
<b>2</b>	Mother is typically calm and polite but may be noticeably flat or not does not express pleasure Mother and child simply just reading the story Very little shared affect or nonverbal referencing Enjoyment is not readily apparent.
<b>1 (low quality)</b>	Mother looks preoccupied, bored, withdraws Child withdraws frequently and/or refuses to participate further (it seems this behaviour is related to the mother's lack of interest in the activity rather than the child's mood state) Affective tone may be negative Mother may sound irritated when addressing child Facial expression and/or body posture indicate anger or sadness Nonverbal gestures may be hostile Mother may have rigid or unfriendly body posture

## (2) Maternal Responsiveness

*Definition:* Consistent with Johnston et al (2002), responsiveness refers to mothers' overall awareness of their child's needs or state and their ability to coordinate behaviour with their the child. Responsiveness was evident both verbally and nonverbally.

A mother low in responsiveness did not match their actions with the child's. She was unaware of her child's cues, needs, requests, or interests and generally did not coordinate her behaviour with that of her child. Mothers' were verbally demanding or showed indifference and/or ignorance of the child's requests. Mothers also ignored the

child's suggestions or directions. They showed a lack of sensitivity to the child's emotional cues, failing to acknowledge or adjust their behaviour in response to the child's emotional state or interests (Johnston et al., 2002).

How a mother paced the activity and their ability to re-engage their child if he/she became uninterested, distracted or strayed off-topic was also indicative of their responsiveness.

A mother high in responsiveness seemed to be aware of her child's needs, abilities, interests and engagement in the activity. She adjusted her behaviour to be in synchrony with her child and knew how to best facilitate the child's activities. Responsive mothers' were also aware of the constraints and requirements of the task and adjusted their behaviour to facilitate their child's success in the activity. Responsive mothers' would also change the protocol where appropriate to facilitate the child's performance.

*Scoring:* The responsiveness scale was coded on a scale of 1 (low responsiveness) to 3 (high responsiveness). Below are benchmarks/guidelines used to assist raters in assigning codes to mothers. However, please note that not all mothers fit perfectly into those categories. Raters made judgments about the quality of the interaction and what category it fit into *best*.

<b>Code Descriptions</b>	<b>Responsiveness</b> involves noticing and responding to the child's cues and ideas appropriately. For instance, responding to their ideas, behaviours and affect in a manner that facilitates further interpersonal interaction and mastery of the task. Responses tend to be affirmative and respectful of the child's cues and needs.
<b>3 (High quality)</b>	Mother is responsive to child's verbalizations and cues Mother comments frequently, provides positive or affirmative judgments of child's thoughts, feelings, behaviours. Mother places the child's needs ahead of a strict interpretation of the instructions.
<b>2</b>	Mother is sometimes responsive to child's verbalizations and cues, but there may be a lack of affirmative evaluations and/or restatements (e.g., ok vs. oh, you think that ____ because ____, ok), even if child is off-track.
<b>1 (low quality)</b>	Ignores child's verbalizations and cues, interrupts child or asks child's opinion at a time when he/she is thinking or concentrating. Mother may distract the child.

### (3) Maternal Sensitivity of Control

*Definition:* This category refers to the extent to which mothers' exert control or direct the child's thinking and actions within the storybook task. Coding sensitivity of control required assessing how much assistance or direction a child may have needed. Coding this category also involved close observation of the mothers' *scaffolding* strategies. In

other words, how mothers' were helping their child attain an understanding of what was occurring in the story based on the pictures. Raters were aware that the current task was designed to be too difficult for children to understand independently, and therefore required mothers' to *structure* the task in a way that aided the child's developing understanding of the stories.

Similar to Johnston et al. (2004), a mother who was low in sensitivity of control operated on his/her own agenda and made demands that were unreasonable for the child's abilities and/or interest level and showed a lack of sensitivity to the child's level of understanding or capability. The mother either did much more controlling and directing than was warranted for the child's developmental level or, in the other extreme, failed to give the structure and organization needed by the child in the situation. Thus, a parent who was low in scaffolding sensitivity could either be too directive with her child or not directive enough, depending on the needs, skills and abilities of her child.

For example, a mother that was excessively controlling would tell the whole story to the child without really stopping to elicit information from them and/or would bombard them with continual questions without allowing them time to think about the answer(s). Mothers' who simply told their child what happened were regarded as more controlling and directive, as they often did not allow the child to think through the problem, process the features of the story and generate their own thoughts and feelings about the pictures and how they were related to the story as a whole.

The other form of low sensitivity would be a mother who should be more involved with helping the child understand the story characters and theme. This type of mother would have allowed the child to tell the story to him or herself without ever stopping to highlight missed and misunderstood aspects of the story. They also failed to give instructions when needed and responses to the child's requests for assistance were ill-timed, ambiguous or misleading, or involved explanations that were either too complex or too simplistic for the child (Johnston et al., 2004).

For example, a mother might have repeated a statement or question even when it was obvious that the child was unable to understand it or use it to understand the story. Mothers' may also not have used instructions, questions, prompts, or statements that extended their child's ability to perform independently.

Mothers' who were less directive and controlling valued their child's participation and used methods that allow this to occur. To do this they used subtle instructions in a way that matched their child's behaviour, abilities and thinking style and level of understanding. They encouraged the child's participation by gave ample opportunity to think and speak and provided verbal prompts at appropriate times that were sensitive to children's performance. For example, a mother scoring high on this dimension would try to elicit information about the story from the child, participate if the child appeared to misunderstand, offer additional assistance by pointing to a part of the picture or referring to a previous page, and revise verbal prompts so as to help the child attain an understanding through their own thinking process. Verbal prompts were likely to be clear, very specific to the storyline or pictures and grow in complexity as the child showed that they understood. This allowed children to build understanding gradually. Instructions and prompts were also offered one at a time so as not to overwhelm the child.

*Scoring:* The sensitivity of control scale was coded on a scale of 1 (low sensitivity of control) to 4 (high sensitivity of control). Benchmarks/guidelines used assist raters in assigning codes to mothers are contained below. However, please note that not all mothers fit perfectly into these categories. Raters made judgments about the quality of the interaction and what category it fit into *best*.

<b>Code Descriptions</b>	<b>Sensitivity of Control</b> involves <i>structuring the task</i> so that child can be successful. Not taking control of task, but not letting the child take full control, there is synchrony and many <i>scaffolding strategies</i> may be used to help child both enjoy and attain full understanding.
<b>4 (High quality)</b>	<p>Storybook reading clearly child-led, with guidance from mother when required. Mothers actions seems to allow the child to think and formulate their own ideas and thoughts</p> <p>The interaction is structured so that the child can be successful at the task and contains many elements of good scaffolding.</p> <p>Mothers at a 4 are highly inquisitive with child. They will ask a lot of questions, rather than statements, which leads child to answer through guided questions (e.g., "what do you think comes next?").</p> <p>Mother stops to discuss incorrect interpretations of story, allowing child enough time to process before moving on or stating a command.</p> <p>Mother prepares and sets up environment.</p> <p>Mother acts as a resource for her child.</p> <p>Mother provides instructions that they are understandable to her child.</p> <p>Mother encourages collaborative decision-making.</p>
<b>3</b>	<p>Mother is doing a sufficient job helping the child to reach understanding by adequately taking control of the storybook, but at the same time is limiting their control to helping the child notice different elements of the story pictures that are relevant for understanding the story.</p> <p>Mothers coded a 3 are doing most of what a mother coded as a 4 would do, but there is room for some improvement and/or missed opportunities. For instance, a mother who missed a few opportunities to let the child notice something on their own or with less prompting (e.g., saying there are crumbs on the floors vs. look, what are these? I wonder where they came from?). Mother is often telling the child information rather than leading the child to it him or herself.</p>
<b>2</b>	<p>Control leans more towards either mother or child <i>predominantly</i>. Some structuring and scaffolding, but not as skilled or brief (e.g., goes too fast OR asks the same questions over and over OR explanations may be too complex, OR mother starts scaffolding but gives up before child has had time to demonstrate mastery).</p>
<b>1 (low quality)</b>	<p>Mother seems to be operating on her own agenda by highly controlling the telling of the story or simply letting child read story with relatively little feedback, structuring or scaffolding.</p>

*Note:* For this category of ratings, if children produced most or all of the story elements and appeared to understand a certain section of the story without the involvement of the mother (check coding sheet to make sure) raters coded that mothers' strategy as a 3 or lower depending on other aspects of their sensitivity. If the mother was consistently uninvolved with the child they would never receive a 4, even if the child understood all elements of the story.

### Billy & Sarah Story Coding Sections

<b>Code</b>	<b>Page # (Visual Content)</b>
1	1 (Picture of Billy & Sarah)
2	2 (Billy & Sarah get candy from mom)
3	3 (Sarah eats her candy)
4	4 (Billy saves his candy)
5	5 (Billy hides his candy under the dog)
6	6 (Sarah peeks)
7	7 (Billy goes outside to play)
8	8 (Sarah takes Billy's candy from under the dog)
9	9 (Sarah giggles because she took his candy; Sarah sees Billy playing)
10	10 (Billy thinks about his candy)
11	10b (Billy remembers he put candy under dog, in corner Sarah giggling)
12	11 (Billy looks for candy, it is gone)
13	12 (Billy accuses Sarah of taking candy)
14	13 (Billy pushes Sarah off of chair and candy falls out of Sarah's pocket)
15	14 (Billy sees candy; Sarah cries)
16	15 (Mom get involved and doesn't look pleased)
17	16 (Mom talks to both kids)
18	17 (Conflict resolved, Billy gets candy back)

### Sam & Laurie Story Coding Sections & Content

<b>Code</b>	<b>Page # (Visual Content)</b>
1	1 (Picture of Sam, Laurie & Carp)
2	2 (Laure & Carp playing frisbee)
3	3 (Carp peeing)
4	4 (Carp pulling Laurie in wagon)
5	5 (Carp digging a hole in the garden)
6	6 (Laurie & Carp sleeping)
7	7 (Carp biting Sam's shoes)
8	8 (Carp carrying Laurie's lunchbox)
9	9 (Carp chases cat up tree)
10	10 (Carp holding boys pants in mouth)
11	11 (Sam & Laurie with police officer)

# **Appendix B: Mental State Term Coding Manual**

## **General Introduction**

This purpose of this manual was to provide instructions for counting the frequency of mental state terms (e.g., beliefs, desires, emotions, modulations of assertion) in the transcripts of a mother-child book-reading activity.

## **General Instructions**

Transcripts were thoroughly reviewed and each instance where a mental state word was used was counted and recorded on an excel spreadsheet. Raters recorded both mother and child uses of mental state terms.

## **What is a Mental State Term?**

For the purposes of this manual, a mental state (MS) term broadly referred to words that described feelings, desires, beliefs, thoughts (e.g., think, know), and modulations of assertion (e.g., decide, expect, guess, pretend, suppose). A list of the types of words that fell into these categories and were counted as MS terms are below.

THINK & KNOW	DESIRES	MODULATIONS OF ASSERTION	COGNITIONS	EMOTIONS
When to referred to mental activity, e.g, “I am thinking”, “How do you think they will do that?”) or when referring to beliefs, desires or contrastives. Conversational uses will also be coded.	WANT LIKE LOVE DREAM HOPE WISH PREFER DISLIKE	MIGHT MAYBE PERHAPS POSSIBLY PROBABLY COULD BE MUST CERTAINLY DEFINITELY SURE GUESS FIGURE RECKON CERTAIN SUPPOSE WONDER EXPECT CURIOUS BET DECIDE	REMEMBER UNDERSTAND FORGET REMIND REALIZE IDEA CONSIDER HAVE IN MIND DAYDREAM DREAM MEAN IMAGINE WONDER BELIEVE PRETEND MAKE SENSE OF	HAPPY UNHAPPY SAD ANGRY FRIGHTENED MAD UPSET DISAPPOINTED WORRIED SURPRISED PLEASED EXCITED INTERESTED FRUSTRATED ANNOYED *FEEL [GOOD] [BAD] [SAD] HATE ENJOY GLAD CARE ABOUT

Note: It is possible that certain words could be coded into several categories. Raters paid special attention to the pragmatic use and the context of the word in question when assigning a category. Words that did not seem to fit clearly into a category were placed in the OTHER category.

**Conversational uses of MS terms (e.g., “think”, “know”) (see below) will be counted.**

- “I DON’T KNOW’
- “WHAT DO YOU THINK?”
- “DO YOU KNOW WHAT?”
- “YOU KNOW?”
- “I THINK SO”

**The following were NOT coded:**

- repetitions of own, referred to as parroting (e.g., “I think, I think”)
- straight repetitions of mother’s MS word(s)
- Uses exclusively prompted by mother (e.g., M: “tell him you want that”, C: “I want that”)
- Usages such as “looks like”, “supposed to” when it was apparent that the word is a common usage.

## How MS terms were classified

Raters read the description below of how to classify words as mental state terms. Maternal use of mental state words were counted in general accordance with the definitions and procedures outlined by Bartsch and Wellman (1995) and Ruffman et al. (2002). Words that referred to forms of *mental activity* were counted as mental state words and explicit attention was given to the context and the meaning inherent in the use of each word. Words that referred to various emotions, desires, cognitions, and modulations of assertion were counted. “Think” and “know”, when referred to as mental activities (e.g., I am thinking, I know because I saw her do it), were also be coded as mental state words. The word “like” was only be coded when referred to as a feeling (“I like her”). Despite convention (see Bartsch & Wellman, 1995; Ruffman et al., 2002), conversational uses of mental state words were counted (e.g., “I don’t know”, “What do you think”, “Do you know what?”) because it is almost impossible to know if a particular use of a word corresponds to its common “mental state” meaning. Also, it was thought that it was better to overestimate maternal usage of mental state words rather than underrate their skills. Repetitions and parroting of mental state words were not be coded as mental state words.

Each transcript was coded independently for the frequency of mental state words. Transcripts were coded by two research assistants after undergoing training and practice, reliability was established by calculating % inter-observer agreement on 25% of the transcripts.