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PRESCHOOL CHILDREN'S THEORY OF MIND ABILITIES

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THE EFFECT OF MATERNAL MENTAL STATE TALK  
ON PRESCHOOL CHILDREN'S THEORY OF MIND ABILITIES

A Master's Thesis

by  
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To my mother, Ayşe Bozbıyık

and

my father, Mehmet Bozbıyık

for nursing me with infinite affection and love and their companionship for  
success in my life

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THE DEPARTMENT OF  
PSYCHOLOGY  
İHSAN DOĞRAMACI BİLKENT UNIVERSITY  
ANKARA

May 2016

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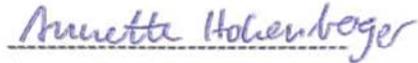
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## ABSTRACT

### THE EFFECT OF MATERNAL MENTAL STATE TALK ON PRESCHOOL CHILDREN'S THEORY OF MIND ABILITIES

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This study investigates the relation between maternal mental state expressions during story book reading and 3- to 5-year-old Turkish speaking children's theory of mind (ToM) abilities. Thirty-two children completed ToM, executive functions, and standardized language tasks. Following these, parents read a wordless picture book to their children. Mothers' mental state languages were coded in 3 levels of structural complexity: the word, the morphological, and the clause levels. At the word level we coded for the frequency and the diversity of mental state words (i.e., perception, physiological states, motivation/intention, desire, affect, cognitive, contrastive). At the morphological level we coded for modality for volitional wishes (-se, -sa) and modality for volitional suggestions (-e, -a). Mental state words with their subcategories were coded in accordance with their referents: (1) the child, the mother, or others (MSW-CMO) (2) story characters (MSW-SC). At the sentence level we coded for mental state causal explanations under two categories: (1) Explicit explanations and (2) Implicit Explanations. Results revealed that mothers' total MSW was related to children's ToM after controlling for strong predictors. Additionally, frequency of total MSW-CMO, cognitive-CMO, perception-CMO, perception-SC, and total perception word uses were correlated with children's ToM. Furthermore,

while cognitive words positively predicted children' ToM, explanations for cognitive words negatively predicted children's ToM. In line with correlational results that emphasize the role of perception words, an analysis that investigated the effects of perception, cognitive, and contrastive words found that the aggregate frequency of these categories predicted children' ToM. Lastly, only mothers' cognitive-CMO predicted children's ToM.

**Key words:** Mental State Words, Story Book Reading, Theory of Mind, Turkish Language

## ÖZET

### ANNELERİN KULLANDIKLARI ZİHİNSEL DURUM İFADELERİNİN ANAOKUL ÇAĞI ÇOCUKLARININ ZİHİN KURAMI BECERİLERİNE ETKİSİ

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Bu çalışmada annelerin yazısız hikâye kitap okurken kullandıkları zihinsel durum ifadelerinin 3 ila 5 yaşları arasındaki çocukların zihin kuramı becerilerine olan etkisi, Türk örnekleminde incelenmektedir. Otuz-iki çocuğa zihin kuramı seti, standartlaştırılmış kelime ölçekleri ve boyutsal kart sınıflandırma ölçeği uygulanmıştır. Akabinde, annelerden resimli, yazısız kitabı çocuklara anlatması istenmiştir. Annelerin kullandıkları zihinsel durum ifadeleri 3 yapısal karmaşıklık seviyesinde kodlanmıştır: kelime seviyesi, ek seviyesi ve cümle seviyesi. Kelime seviyesinde, sıklık ve çeşitlilik bazında zihinsel durum kelimeleri (örn., algısal, fizyolojik durum, istek, güdü/niyet, duygu, bilişsel ve karşıtsal) kodlanmıştır. Ek seviyesinde, dilek kipleri (-se, -sa) ve istek kipleri (-e, -a) kodlanmıştır. Yedi alt kategoriye ayrılan zihinsel durum ifadeleri hitap özelliklerine göre çocuğa, anneye veya başkalarına hitaben ve hikâye karakterlerine hitaben olmak üzere ikiye ayrılmıştır. Cümle seviyesinde ise zihinsel durum kelimelerini açıklayıcı cümleler belirgin açıklayıcılar ve dolaylı açıklayıcılar olmak üzere 2 kategoride kodlanmıştır. Bulgular annelerin kullandıkları zihinsel durum kelimelerinin kontrol değişkenleri kontrol edildiğinde zihin kuramı becerileriyle anlamlı ilişkiler olduğunu göstermiştir. Çocuğa, anneye veya başkalarına hitaben kullanılan zihinsel durum kelimeleri, bilişsel ve algısal kelimeler, hikaye karakterlerine hitaben kullanılan algısal kelimeler ve

toplam algısal kelimeler zihin kuramı becerileriyle anlamlı ilişki içindedir. Bunların yanında, bilişsel kelimelerin zihin kuramını artı yönde yordadığı, bilişsel kelimeleri açıklayan cümlelerin ise zihin kuramı becerilerini eksi yönde yordadığı bulunmuştur. Algısal kelimelerin zihinsel durum ifadeleri ile ilişkisi göz önünde bulundurularak algısal, bilişsel ve karşıtsal kelimelerin aralarındaki ilişkiyi incelemek için yapılan analizler bu kelimelerin toplamlarının zihin kuramı becerilerini yordadığı bulunmuştur. Son olarak, annelerin çocuğa, kendine veya başkalarına hitaben kullandıkları bilişsel kelimelerin çocukların zihin kuramı becerilerini yordadığı bulunmuştur.

**Anahtar kelimeler:** Hikâye Kitabı Okuma, Türk Dili, Zihin Kuramı, Zihinsel Durum İfadeleri

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## CHAPTER 1

### INTRODUCTION

Language development permeates the development of children's cognitive, and socio-cognitive abilities (Catts, Fey, Zhang, & Tomblin, 1999; Meacham, Vukelich, Han, & Buell, 2014; Piasta et al., 2012; Zucker, Justice, Piasta, and Kaderavek, 2010). Through social interactions, children come to appreciate the mental world of self and others (e.g., Ruffman, Slade, & Crowe, 2002; Symons, Peterson, Slaughter, Roche, & Doyle, 2005). Research has shown that there is cross-sectional and longitudinal relations between the quality of parental talk and children's theory of mind abilities (Ruffman et al., 2002; Symons et al., 2005; Adrian, Clemente, & Villanueva, 2007). One of the major factor that has been investigated for maternal talk in relation to children's theory of mind abilities is mothers' use of mental state words in different contexts. Mental state words are defined as words that describe the mental world of individuals (Ruffman et al., 2002; Symons, 2004). These could be words that related to self and others' thoughts, feelings, desires, intentions, and emotions.

Certain everyday language contexts have been found to elicit mental state talk from parent-child dyads. Shared book reading is a privileged context that facilitates the use of mental state talk about mothers and children that both reference one and another and also third persons' (the story characters') minds. Symons et al. (2005) have shown that mothers' use of mental state language about story characters while telling a story was correlated with children's theory of mind abilities (Experiment 1). Importantly, these finding were replicated in a longitudinal study with Spanish children. Adrià and colleagues

(2007) showed that mothers' use of cognitive state terms with their 3-year-old and 6-year-old children was correlated with their children's theory of mind abilities one year later.

In the current study we aim to investigate whether there is a relationship between Turkish mothers' mental state language and their children's theory of mind abilities during a shared bookreading activity. This study will allow us to investigate mothers' mental state language both in terms of frequency of mental state language, but also in terms of its diversity. In addition, we aim to analyze the unique effects of mental state talk in this context to children's theory of mind development while controlling for the effects of age, language and executive functioning. Accordingly, this study will provide an opportunity to investigate whether the relations found for mental state discourse in English speaking and Spanish-speaking mother-child dyads are also observed in Turkish speaking mother-child dyads. Given that no study has investigated this question with Turkish-speaking dyads, a secondary aim and contribution of this study will be to create and implement a comprehensive coding scheme of mental state language in Turkish that focuses on morphological and lexical units that demarcate mental state concepts.

In the following sections, the development of theory of mind ability in young children, the role of mothers' mental state language on this socio-cognitive ability, and previous literature about the relation between mental state language and theory of mind development in book reading context will be discussed.

### 1.1 Theory of Mind

In the past three decades, a vast body of research has focused on theory of mind development (see for reviews, Flavell, 2004; Miller, 2012; Wellman, Cross & Watson, 2001). Theory of mind is a socio-cognitive ability that entails understanding one's own and others' mental states such as emotion, desire, and belief (e.g., Jenkins, Turrell, Kogushi, Lollis, & Ross, 2003;

Wellman, 1990; Wellman & Estes, 1986). An important development in children's theory of mind ability appears between the three and five years of age (Wellman & Liu, 2004; Miller, 2012). Around four and a half years of age, children gain the insight that people's actions are based on their emotions, desires and beliefs, that different people can hold different emotions, desire and beliefs, and that false beliefs lead to actions that do not correspond to the real state of affairs (e.g., Jenkins et al., 2003; Wellman, 1990; Wellman & Liu, 2004).

The large body of research that has focused on theory of mind includes scholars from different disciplines with various questions. While some scholars are interested in explaining uniquely human ways of thinking about the social world (Premack & Wooldruff, 1978; Tomasello, 2001); others have investigated the relationship between theory of mind performance and other critical social and cognitive abilities such as executive functioning, attention, memory, impulse control (Perner & Lang, 1999), language (e.g., DeVilliers, 2005), school readiness (Astington & Pelletier, 2005), positive social skills (Watson, Nixon, Wilson & Capage, 1999), and moral reasoning (Baird & Astington, 2004).

The term theory of mind was first defined by Premack and Woodruff (1978) as the ability to attribute mental states to self and others. They conducted a comparative study on chimpanzees in order to investigate the difference between how human and nonhuman primates perceived social situations. More specifically, they focused on whether chimpanzees have theory of mind abilities. The authors had a chimpanzee named Sarah watch videotapes showing humans who were faced with problems such as reaching for food that is out of reach or trying to escape from a locked cage. Sarah was later presented with two photographs, one of which depicted the solution to the problem. Sarah seemed to have no difficulty in choosing the solution to the problem such that she picked a key for the locked actor and chose a stick for the inaccessible banana. Premack and Woodruff interpreted Sarah consistent preferences for the correct photographs as evidence for her ability to attribute

mental states to the actor in the videos. According to the authors, Sarah could appreciate the motivation of the actor given the problem, and chose the best solution for the actor's problem. Therefore, they concluded that chimpanzees and other nonhuman primates have the ability to reason about other's mental perspective.

In response to Premack and Woodruff's claims, some researchers argued that one could pass this video task without having to read others' minds by solely focusing on the problem and its consequences. These researchers proposed that sufficient evidence for a theory of mind interpretation was only possible through tests that measure false belief understanding (e.g., Dennett, 1978).

False belief tasks, also termed first-order theory of mind tasks, are based on two basic assessment procedures (Miller, 2012). Wimmer and Perner (1983) devised a paradigm, *unexpected transfer task* or the *unexpected location task*, that entailed children to predict a character's behavior based on that character's false belief about the location of an object. In this task, the child observes the location of an object while in the presence of another person (or puppet). When the other person leaves, the child watches the object being transferred to a new location. This sets up a condition in which the child knows the current location of the object and may or may not also know that the absent person is not aware of the new location. Theory of mind is assessed by asking the child where the other person would search for the item when he comes back (Wimmer & Perner, 1983). To pass the task, the child takes the perspective of the other person and reasons about that person's behavior based on this false belief such that person should search in a wrong place due to his or her false belief. Importantly, the task entails reasoning about someone's false reality while having access to the correct state of affairs (Miller, 2012).

Another commonly used false belief task is *unexpected contents task* or *unexpected identity task* (Perner, Leekham, & Wimmer, 1987). In this task, children are given a specific familiar container such as a crayon box which contains an unexpected content (e.g., a pen or a coin). Children are asked to guess the contents of the container. Afterwards, children are shown the

unexpected contents. Then, children are asked to judge what another person who has not seen inside the container would expect to find in the container. This task requires that children appreciate that others; may hold false belief due to their previous experience, and their belief may be different than the current state of affairs.

Children between the ages of three and five begin to succeed on these tasks (Miller, 2012). However, generally children younger than four years old perform poorly, making systematic errors where they assume that others' will think in line with themselves (i.e., with reality). A meta-analysis that included more than 4000 children across 178 studies showed this developmental transition persisted despite variations in the task or culture (Wellman & Liu, 2004). In general three year old children tend to fail these tasks, four year old children show a mixture of failure and success, and five year olds tend to successfully complete the task. Thus by five years of age children have reached first order false belief understanding which is a major milestone for theory of mind development (Wellman & Liu, 2004; Miller, 2012).

### 1.1.1 Theories of “theory of mind”

Several theories have been proposed to explain the emergence of children's theory of mind abilities. These theories make assumptions about the processes by which children attain an understanding of others' mental states (e.g., desires, emotions, beliefs) and false beliefs. They vary according to the importance they place on children's language environments and how children benefit from these language environments.

#### 1.1.1.1 Modularity theory

This approach builds on Fodor's (1983) conclusion that perceptual level processes are modular and that aspects of cognition are specialized for specific domains (Hermer & Spelke, 1996). Leslie has adapted and extended this idea to children's theory of mind, starting with children's ability to represent an object or event in more than one way. Based on his analysis of pretense, Leslie (1987) proposed that understanding of the mind is an innate ability and argued

that children are born with a special brain mechanism which enables them to have metarepresentations. Within the cognitive module that handles theory of mind processing, Leslie proposed further specialized submodules (e.g., Theory of Mind Mechanism- *ToMM*) that processes and represents mental states.

Leslie argued that ToMM is in place by the time children start representing one object as another as manifested by pretense. According to this view, pretense involves copying of a primary representation into a metarepresentational context. This ability is referred to as decoupling (Leslie, 1987). For example, when children take a banana to their ear and say “hello”, they copy the representation of a telephone onto the primary representation of the banana. This process allows for representing an object or an event with two separate meaning and is called *metarepresentation*. The ability to create metarepresentations first occurs with the ability to engage in pretend play at around two years of age and at the age of three to four this ability is manifested in the ability to attribute mental states to others (Leslie, 1987 cited in Leekam & Perner, 1991).

Support for the modularity account of theory of mind development comes primarily from studies done with children with autism (Leslie & Thasis, 1992; Baron-Cohen, 1989b). Baron-Cohen, Leslie, and Frith, (1985) have compared the performance of children with autism and children with Down syndrome. Both of these groups had a mean age of 11 years. These groups were compared to a group of typically developing preschoolers. The results showed that performance of children with autism lagged behind the other two groups, who showed similar performance. According to this theory, language input may serve as a “triggering” for the development of theory of mind. The necessary component is maturational in origin. Consequently, the delay that children with autism show in theory of mind development have been taken as evidence to suggest that theory of mind processing is carried out by an innate mechanism in the mind that children with autism lack (Leslie, 1991)

#### 1.1.1.2 Theory theory

This framework is philosophically developed by Adam Morton (1980) and claims that understanding of mind occurs in a theory-like manner (Carpendale & Lewis, 2006). This theory states that through social interactions individuals develop theories about the mental world (Wellman & Gelman, 1992). Research that investigated the theory theory account of socio-cognitive development in children gained momentum in the 1990s (Wellman, 1990). It was argued that children begin to understand the mind through the process of theory construction and revision (Gopnik & Wellman, 1994). This account provides a three-pronged definitional criteria for the term “theory”: (1) theory has *coherence*, it is not a collection of isolated facts, (2) a theory makes *ontological distinctions and commitments* reflecting the contrast between objects in the physical world and mental entities in the mind, and (3) it gives a *causal explanatory framework* that combines different constituent elements mental state domains (Wellman, 1990).

Adults can easily differentiate physical events from mental states. However, children gradually appreciate the difference between perceptually accessible events and mental states (Carpendale & Lewis, 2006). Wellman (1990) argued that there are two essential milestones in the development of theory of mind: understanding desires and understanding beliefs. Desires constitute the foundation for motivation. Understanding desires entails appreciating that an individual's behavior is governed by their desires. According to Wellman (1990), around two years of age children become desire psychologist (i.e., they develop theories about other's behavior by understanding their desires). For example, one may wish to be at a beachside on a warm sunny day, in the middle of a cold winter day. In other words, desires have no truth value. In contrast, beliefs may be wrong. For example, lack of access to new information, may render one's beliefs incorrect. To illustrate, a person who believes that the ice cream vendor is situated at a particular street corner, may be surprised to find that the vendor has moved and is no longer there. According to Wellman (1990), at age four, children come to distinguish beliefs from desires, so their understanding of mind becomes more complex.

Support for the theory theory account of theory of mind development comes from studies involving naturalistic talk. Bartsch and Wellman (1995) observed 10 children's development of desire and belief understanding (6 boys and 4 girls) from 2- to 5- years of age through their natural talk in everyday settings. They revealed that children used consistently more desire verbs than belief verbs. This remained the same both for all children and for each child individually. Until 2 ½ years of age children exclusively used desire verbs, but no belief verbs were observed. After 2 ½ years of age, the amount of belief words increased and then became equal with desire verbs. Around 4- years of age, belief words exceeded desire verbs. The other support for this account comes from a meta-analytic study investigating a possible rank-ordering of different theory of mind tasks. Wellman and Liu (2004) demonstrated that children first show understanding of other's desires before they understand other's beliefs. To sum up, naturalistic talk studies and a meta-analysis for a theory of mind scale have been taken as a evidence for theory of mind competence being theory like in nature. Further, through social interactions children become desire psychologist first and develop theories about desires and then at around four, they started to differentiate desires from beliefs.

For the theory theorist language provides children with opportunities to learn mental state concepts. For instance, Astington (2001) proposed that mental state terms are a way to develop theory of mind abilities such that through acquiring the meaning of words like "think" or "know" children are able to gain access to the concepts of belief. Children build on these concepts through experience in social interactions, developing expectations and revising these expectation in the light of real life experience.

#### 1.1.1.3 Simulation theory

This approach argues that the primary cognitive ability behind children's theory of mind reasoning is imagination. Imagination allows children to take the perspectives of others. This process is dependent on children's ability to view others as similar to self (i.e., "like me approach") and predict how they would feel, what they would desire or believe, if they found themselves in the

same situation. The approach has been studied by both philosophers (e.g., Heal, 1986; Goldman, 1989 cited in Carpendale & Lewis, 2006) and by developmental psychologists (e.g., Harris, 2000; Tomasello, 2001).

According to Harris (1992), there are four stages that explain how and when children learn to use mental simulations. During the first year of life, infants show their simulation ability by synchronizing their activities with others (i.e., imitation). Next, at the end of the first year, children initiate actions to affect another person's current attitude which is the second step. The third step occurs around three years of age where children begin to anticipate other people's actions based on their mental states. In step four, children attain the ability to simulate the perspective of another person whose beliefs do not correspond with reality as in false belief tasks (Harris, 1992).

While most theories of socio-cognitive development (e.g., sociocultural theory, theory theory) argue that simulation may play a factor in children's understanding of self and others' mental states (e.g., Tomasello, 2001), direct empirical tests that lend support to this account are scarce. One example may be Bradmetz and Schneider's (1999) work on young children's understanding of story characters' feelings as different from those of the child as the listener of the story. Through a series of experiments, Bradmetz and Schneider have shown that young children confuse their own point of view with that of the character. For example, young children consistently assert that Little Red Riding Hood, upon entering the grandmother's house, will be scared. However, at this point in the story Little Red Riding Hood does not yet know that it will be the wolf (and not the grandmother) that she will encounter. This consistent theory of mind mistake, not unlike the ones children make in the Maxi task, may support the idea that children merge with the character, and fail to maintain two simultaneous representations (one for self and one for other). A supporting argument comes from García Pérez, Hobson, and Lee (2008) who show that shifting between different perspectives is the key difficulty for children with autism.

Simulation theory assumes that perspective taking is afforded by social interactions. These interactions are invariably characterized by rich linguistic exchanges. Conversations where two people hold different opinions, pretend play where players construals of reality differ, bookreadings where the teller, listener and the characters have different mental realities all important language contexts that are hypothesized to promote children's theory of mind development.

#### 1.1.1.4 Socio-cultural theory

Katherine Nelson (1996; 2005) suggested that theory of mind ability develops through shared symbolic practices such as cultural/societal belief systems, narratives, and metaphors. In this view, the child enters a world of minds and is socialized into thinking about others' mental states. This is in stark contrast to other theories that view the child as engaging in solitary theoretical reflections. Moreover, from Bruner's perspective, culture has an important effect on children's understanding of mind because they learn mental states within cultural frameworks. Scholars that emphasize the critical role of culture, language, and conversation with others for children's developing understanding of mind, propose that these contexts provide the child with different points of view (e.g., Astington & Baird, 2005; Harris, 1996; Nelson, 2005). Astington and Baird (2005) underscored the constitutive role for social interactions on children's theory of mind abilities. They stated that social interactions form a foundation for language development which enables children to comprehend the mental states of others. Harris (1996) argued that social interaction in the form of conversation, pretend play and shared bookreading provides children with opportunities to learn and improve their perspective-taking abilities. According to Harris, in these types of social interactions children acquire the necessary exposure to other people's desires, beliefs, and intentions in meaningful contexts. Nelson (2005) proposed that not only face to face interactions, but also understanding the ideas of community and morality, customs and cultural conventions facilitate children's theory of mind development. This understanding is only conveyed through language

during interactions with social agents and the culture such as reflecting on knowledge, imaginative constructions, reminiscing with parents and others, explanations of events and actions as well as cognitive functions.

#### 1.1.1.5 The role of language as conceptualized by different theory of mind theories

Three of the major theories discussed (i.e., theory theory, simulation theory, socio-cultural theory) construe language as necessary and central to theory of mind development. Theory theorists suggest that sequencing of the theory of mind abilities which show a progression from understanding desires around 2-years of age to understanding beliefs at around four years of age. They assert that language input such as uses of desire and beliefs words have instrumental role on this development. Thus for the theory theorists, language serves an instrumental role to support children's construction of theories about the mind through social interactions and language. The developmental sequence thus plays a significant role, manifesting the stages through children's theory building about the mind (Wellman, 2010).

The simulation theory (Harris, 1995) clearly places emphasis on language as a platform through which children experience different perspectives. In this view, conversations, pretend play, and narrative activities help the child to recognize and to take different perspectives. Simulation as a process has been accepted as a viable mechanism by both theory theory and socio-cultural theory. Hence, any evidence that points to perspective-taking through language could be interpreted to support either theory theory or socio-cultural theory.

Socio cultural theory view the role of language embedded in social interactions as constitutive of theory of mind development. Socio cultural theorists propose that children come to understand other people's mental states through social interactions surrounded by language input within a cultural framework. It is important to note that cultural variations in the sequencing of theory of mind that are supported by culture specific way of talking about the mind may be indicative of evidence for socio-cultural theory. Another important point would be to highlight the dynamic and social nature of theory of mind development.

The child, according to the socio-culturalists, is never alone, but is always scaffolded by adults in his or her quest to understand the mind. It would thus be expected that true evidence for socio-cultural theory would entail a dynamic relation between adults' talk about the mind and children's understandings.

The fourth theory (i.e., modularity theory) attributes a triggering function to language where language activates the theory of mind modules that are innate and unfold according to a specified timetable (Leslie, 1994). Such modular accounts struggle with explaining the observed sequence of theory of mind development where children first come to understand desires and emotions and then they start to understand beliefs and finally, false beliefs. Wellman (2010), has used this criticism and asked why theory of mind modules were not triggered by language input such that children come to process all mental states around the same time.

The current study focuses on the relations between environmental language input and children's theory of mind. Given that participating children were 3- to 5-years of age, a modularist account should not see value in seeking these relations. However, theory theory, simulation theory and socio-cultural theory would all expect relations between mothers' mental state language and children's theory of mind. Theory theorists would claim that children who are exposed to mental state language would learn mental state concepts better which would in turn improve children's theory of mind. Simulation theorists would assert that children who are exposed to mental state language would get more practice in perspective taking which in turn would increase their theory of mind performance. Finally, socio-cultural theorists would assert that children who are immersed in interactions that are rich in mental talk would gain an understanding of the mind as it exists situated in the child's culture. They would thus learn their culture's way of conceptualizing the mind which in turn would increase their theory of mind performance. The study will establish a first step with Turkish speaking children as to whether their theory of mind understanding is at all influenced by their mothers' mental state language. If the hypothesized relations exist, future studies that are specifically design to

test theories of theory of mind development would use fine-tuned designs to disentangle among alternative explanations.

## 1.2 Mental State Language

Mental state language involves words that describe the mental world of individuals (e.g., Jenkins et al., 2003; Ruffman et al., 2002). These could be words that are about thoughts, feelings, desires, intentions, and emotions. Research on mental state talk has traditionally focused on three main categories: cognitive, desire, and emotion states. Cognitive state words include think, know, believe, forget, remember, understand, and wonder which can refer to beliefs and other mental events related to mind, imagination, and metacognition. Desire state words involve want, wish, desire, and prefer which represent the meaning of someone's desire for something. Emotion state words reflect direct and indirect feelings towards objects, events, individuals or situations and include terms such as happy, sad, angry, and hurt (Symons, 2004). In addition to these categories, Bretherton and Beeghly (1982) emphasized the importance of perception words (e.g., to look, to see) especially for younger children. They created a comprehensive coding scheme which included 6 sub-categories (i.e., perception, physiological, affect, volition, cognition, and obligations).

Children's understanding and use of mental state language is widely used as an indication of theory of mind development (e.g., Ruffman, et al., 2002; Adrià et al., 2007; Symons et al., 2005). Preliminary studies demonstrated that discourse in perspectively rich contexts such as conversations between children and family members or peers (e.g., Brown & Dunn, 1992; Jenkins et al., 2003) and during book reading (e.g., Sabbagh & Callanan, 1998) promote children's acquisition of mental state talk.

### 1.2.1 Discourse with family members and children's mental state understanding

Longitudinal studies have indicated that children's mental state talk was related to the amount of talk about mental states that they hear at home during family

conversations (Brown & Dunn, 1992). For example, children's talk about cognitive mental states were found to be associated with maternal use of cognitive state language during home observations (Jenkins et al., 2003). Brown and Dunn (1992) showed that the nature of the conversation partner plays a role in children's learning and using of mental state talk. They focused on children's emotion talk with their siblings and their mothers. Children were observed at their homes when they were 33 months olds (time 1) and again when they were 47 months old (time 2). This study revealed that 47 month-old children talked more about others' emotions when they were talking with their siblings as compared to when they were talking with their mothers. This is possibly due to the differences in the nature of the relationship children have with different family members. Children have reciprocal relationships with their siblings based on shared interest, and equal status. Yet they have "complementarity interaction" with their mothers which is characterized by asymmetrical power and caretaking relations. The reciprocal relationship with siblings help children to take perspective more easily than they can with their mothers even though siblings' talk is characterized by a focus on the self, whereas mothers' talk is focused more on their children's emotional state (Brown & Dunn, 1992).

Furthermore, Jenkins et al.'s (2003) longitudinal study explored the effect of family interactions during home observation on 2-year-old's younger siblings' and 4-year-old's older siblings' ability to talk about the mind. Children were tested two times, with two years in between testing sessions. Results indicated that 4-year-old children with an older sibling were exposed to more cognitive state talk than children without an older sibling. Importantly, early exposure to cognitive and desire states predicted children's talk about mental states two years later above and beyond the effects of concurrent mental state talk. While these studies did not include a theory of mind assessment, ability to talk about mental states was seen as a transitional pathway for theory of mind understanding (Symons, 2004).

### 1.2.2 Family discourse during book reading

Book reading is a common context that facilitates interactions between parents and their children. Previous studies have explored the role of maternal talk during book reading on young children's theory of mind development both concurrently (Symons et al., 2005; Racine, Carpandale, and Turnbull, 2007; Peterson & Slaughter, 2003; Slaughter, Peterson, & Mackintosh, 2007) and longitudinally (Ruffman et al., 2002; Adrià et al., 2007). Symons et al. (2005) investigated the relation between mental state language and 5- to 7- year old children's performance on different false belief tasks (i.e., unexpected identity and unexpected content tasks, a change of location task, and an emotional false belief task). They invited participants (90 % of those were mothers) to the lab and analyzed not only the effect of parental mental state words but also children's mental state words as well as the composite score of these two on children's performance on different false belief tasks. They focused specifically on mental state language about the story characters and did not distinguish between the subtypes of mental state words. The results revealed that only the composite score comprised of the total number of character mental state words of the parent and the child was correlated with children's theory of mind abilities.

A similar study that focused exclusively on parental (89.74% of those were mothers) use of emotion words in book reading. In this study, Racine and colleagues (2007) investigated 3- to 5- year-old children's theory of mind abilities in relation to the child's and their parents' use of emotion words across two levels of complexity: (1) emotion talk based on beliefs of the story characters (Belief-Dependent Emotion Talk) and (2) emotion talk based on real situations of the story characters (Non-Belief-Dependent Emotion Talk). Children and their mothers read a book that included emotional content. Bookreadings took place either at the laboratory or at the participants' home. The authors assessed children's false belief understanding by using a change of location false belief task and an unexpected content task and they assessed children's emotion understanding by using an affective perspective taking task. Their analyses demonstrated that, after controlling for children's age, all emotion words used by the child and the mother, belief-dependent talk about

emotions predicted children's false belief understanding. In addition non-belief dependent talk predicted children's emotion understanding after controlling for children's age. They concluded that children's understanding of beliefs and emotions were interrelated with talk about different aspects of the psychological world.

Talk about mental content is not limited to use of words. Mothers also frequently explain the basis of mental states by describing why a person might feel sad in a particular situation, or why someone acted in a way that is incongruent with reality based on his false belief. Peterson and Slaughter (2003) investigated the relation between maternal mental state explanations and 4- to 5- year-old children's theory of mind abilities. They assessed children's theory of mind abilities using the "Maxi" change of location task at the children's preschool. Mothers' mental state explanations were tested by using a self-report questionnaire, the Maternal Mental State Input Inventory (MMSII). This questionnaire provided 12 vignettes describing social situations and asked mothers to select their preference on the basis of their choice of interactions with their children from 4 different choices for each of the vignettes. One of the four choices included explanation of mental states. The authors found that maternal choices for mental state word explanations were correlated with children's theory of mind abilities. This remained significant after controlling for children's age and verbal ability.

The research reviewed so far examined either mental state words or mental state explanations, and did not adopt a comprehensive focus that included both mental state words and explanations. Slaughter and colleagues (2007) adopted a comprehensive coding scheme that looked at both mental state words and explanations and sought to elucidate their relation to 3-year-old children's theory of mind abilities. Children completed a change of location false belief task. Mother-child dyads shared a storybook either at home or in the preschool setting. Slaughter and colleagues coded maternal contrastives (false belief endings between mothers' thought and reality about the story) and mental state words with subcategories (i.e., cognitive, affect, and perception words) and

mental state explanations of these subcategories. Their results indicated that contrastives and mothers' cognitive explanations were correlated with children's theory of mind abilities both in bivariate correlation and partial correlations when controlled for children's age and mother's verbosity. They did not find this relation for affect explanations and perception explanations as well as affect and perception words.

These studies provided some evidence for concurrent relations between mothers' language and children's theory of mind abilities. However, in order to argue that mothers' language promotes theory of mind, longitudinal studies are necessary. Two longitudinal studies provide support for such a relation (Ruffman et al., 2002; Adrià et al., 2007). Ruffman et al. (2002) investigated the effect of maternal mental state language on 3- to 4-year old children's theory of mind development during picture telling interactions. The pictures were chosen to elicit mental state talk. Mothers were asked to talk about these pictures in the same way they would if they were reading a story book. Children were tested three times, with 5 months in between the first and the second testing sessions and with a year in between the second and the third testing sessions. Across the three time points, children were administered theory of mind measures that increased in complexity; Time 1: change of location, desire-emotion, and emotion situation tasks; Time 2: change of location, unexpected content, desire-emotion, and desire-action tasks; Time 3: false-belief transfer, translocation justification, false-belief contents other, contents other justification, false-belief contents self, desire-action, and wicked desires. Mothers' use of both mental state words with its sub-categories (i.e., desire, emotion, modulation of assertion, think and know and other mental state words) and non-mental state words (i.e., descriptions, elaborations, causal talk, factual talk, links to child life, don't know, physical states, orienting utterances, repetitions of other, and self-repetitions) were coded as well as composite score of mental state words and non-mental state words. The authors did not discuss cross-sectional relations within time points since they were interested in longitudinal relations. They found that maternal modulations of assertions, think and know, and other mental state categories at time 1 were correlated

with children's theory of mind development at time 2 and maternal modulations of assertions, think and know at time 2 were correlated with children's theory of mind development at time 3. They also found some longitudinal relations with non-mental state talk. Noteworthy for the focus of the current study, causal talk at time 1 was correlated with children's theory of mind development at time 2 and there was a trend between time 1 and time 3. Additionally, they found that a maternal composite score of mental state words was correlated with children's later theory-of-mind understanding after controlling for potential predictors (i.e., children's own use of mental state language, their earlier theory-of-mind understanding, their language ability, their age, mothers' education, and other types of mother utterances).

A comprehensive analysis of mental state talk should include not only the use of mental state words and mental state explanations but also should focus on who the mental states are referring to. This matters for those frameworks that place special emphasis on bookreading as a privileged context that elicit mothers and children to focus on third persons' (i.e., story characters) mental perspective (e.g., Nelson, 2005). Addressing this issue, Adrià et al. (2007) focused exclusively on maternal cognitive state words in their investigation of 3- to 5- year-old Spanish-speaking children's theory of mind development and its relation to book reading discourse. Importantly, this investigation sought to determine whether bookreading discourse predicted children's theory of mind over time. Children were tested at two time points, with a year in between testing sessions and were presented different theory of mind measures. At Time 1 children completed change of location and unexpected contents tasks. At Time 2 they completed white lie, irony, deception, and certainty tasks. Maternal cognitive state language was coded at three levels. First, they grouped cognitive verbs in three categories: "to know", "to think", and other cognitive verbs. At the second level they coded according to the referent of the mental state verbs: the child, the story characters, and mothers and others. At the third level, the discourse functions of the verbs were grouped in three categories: questions, explanations, and other functions. The authors found that mothers' use of total cognitive state verbs was correlated with children's theory of mind

abilities both concurrently and longitudinally. These correlations remained significant after controlling for children's age, verbal ability, and maternal education at time 1 and verbal ability, maternal education, and children's age at time 2. The results also revealed cross-sectional relations between cognitive state verbs that referenced the children and children's theory of mind abilities after controlling children's age, verbal ability, and maternal education at Time 1. Interestingly, they found marginal cross-sectional relation between maternal cognitive state verbs that referenced the story characters and children's theory of mind abilities after controlling for children's age, verbal ability, and maternal education at Time 1. However, they did not observe any relation between maternal cognitive state language that referenced the mother or others, and theory of mind abilities. Their results regarding mental state explanations showed only cross-sectional relations between maternal cognitive explanations and children's theory of mind abilities after controlling for children's age, verbal ability, and maternal education at Time 1. These results were also observed longitudinally, between time 1 and time 2 even when controlling for children's theory of mind understanding, age, verbal ability, and maternal education. Of particular relevance for the current study, they found a relation between cognitive words that referenced the child as well as cognitive words that referenced the story characters at time 1 and children's theory of mind performance at time 2 when children's theory of mind understanding, age, verbal ability, and maternal education at time 1 and children's age time 2 were accounted for.

### 1.3 The Current Study

To sum up, these previous studies have investigated the different aspects of mental state language (e.g., different subcategories and words vs explanations) and demonstrated concurrent and longitudinal relations between children's theory of mind abilities on English and Spanish speaking children. The current study aimed to fill a twofold gap in existing research.

To the best of our knowledge, this study is going to be the first to explore the relation between maternal mental state talk and Turkish speaking children's

theory of mind abilities. In order to provide a deeper understanding of the potential relations between Turkish mothers' bookreading language and children's theory of mind, the present study employed an extensive language analysis that focused not only on the words that mothers used, but also the referents of those words (i.e., mother, child and others vs. story characters). Additionally, we coded for causal explanations involving mental state content. While we expected similar results to previous literature, we should note that cultural variation in mental state language and its relation to theory of mind was considered as a possibility. However, given that this study explored an under-researched issue with a Turkish sample, the quality of cultural variation was not clearly identified.

Second, while cultural differences may affect generalizability of the previous results on the present findings, linguistic differences may also elicit different findings. Given the scarcity of research in this area, we had to adapt and develop mental state language coding schemes for Turkish. Due to its morpho-syntactic structure, the Turkish language has unique characteristics in terms of mental state talk (Ilgaz, Allen, & Bozbiyik, 2015) which we took into consideration when adapting the coding scales that have been widely used with English speaking children. The study conducted by Ilgaz Allen, and Bozbiyik (2015) investigated whether narrative context and oral story telling effect 3- to 5- year-old Turkish speaking children's use of mental state language. This Turkish data revealed that some contrastives like "meğerse", "sandı", "hani", and "halbuki" carry mental state information (Ilgaz, Allen, & Bozbiyik, 2015-SRCD). Furthermore, there are some morphological structures concerning modality for volitional wishes (-se, -sa) and modality for volitional suggestions (-e, -a) in Turkish that are expressed using words in other languages (to want, to desire). However, Turkish speaking people can express their wishes and suggestions with these morphological structures. Therefore, the present coding scheme included these unique characteristics in order to be inclusive of all mental state information in Turkish maternal talk. Accordingly, in the current study, modality for volitional wishes and volitional suggestions, contrastives that

elucidate the difference between two states of reality as well as traditionally coded mental state words, were included.

The aim of the present study is to investigate the relationship between maternal mental state language and 3-, 4-, and 5- year-old Turkish preschoolers' theory of mind abilities in a shared book reading activity. Indeed it may be more appropriate to label the shared book reading activity as a story telling activity. That is because we provided mothers with a wordless picture book in order not to influence the nature of their mental state language usage with the words in a book. However, we opted to call this a book reading activity since in essence it asks for the mothers to narrate a story using the book and groups the current study along with other studies that have used similar narrative-elicitation paradigms.

It was hypothesized that (1) mother's use of total mental state words and total cognitive words would be related to children's theory of mind abilities after controlling for children's age, children's receptive and expressive language abilities, and executive functions. It was expected that (2) mothers' use of explanations for mental state words and explanations for cognitive mental state words would be related to children's theory of mind abilities after controlling for children's age, children's receptive and expressive language abilities, and executive functions. It was hypothesized that (3) mothers' use of cognitive mental state words and explanations for cognitive mental state words would predict children's theory of mind abilities when controlling for children's age, their receptive and expressive language abilities, and executive functions. It was also expected that (4) cognitive mental state words that reference the story characters would predict children's theory of mind abilities after controlling for children's age, their receptive and expressive language abilities, and executive functions.

## CHAPTER II

### METHOD

#### 2.1 Participants

Thirty two Turkish-speaking mothers and their children participated in the study. Children's age ranged from 3 to 5 ( $M = 3.84$ ,  $SD = .81$ ) years of age. Mothers' age ranged from 27 to 50 years ( $M = 36.72$ ,  $SD = 4.83$ ). Mothers' education ranged from elementary school to PhD education. Overall, mothers were highly educated with 84.36% having a university degree (See Table 1 for child and mother demographics). Mothers' also had high MLU scores relative to their children's age (Miller & Chapman, 1981). MLU scores were similar for both boy and girls and for all ages. Parents and children were recruited through advertisements sent to the employees of the Bilkent Holding Group as well as to parents from Bilkent University's Alumni Association. Due to the recruitment strategy, children came from families belonging to middle socioeconomic status backgrounds. Children' parents signed an informed consent form that was approved by the Bilkent Ethics Committee. Upon the completion of the study children received a set of crayons, a coloring book, a t-shirt with the Bilkent Developmental Lab Logo and stickers. The parents received a DVD recording of their interaction with their children in the lab.

Table 1. Child and Mother Demographics by Age and Gender

	3			4			5		
	B n = 4	G n = 9	T n = 13	B n = 5	G n = 6	T n = 11	B n = 3	G n = 5	T n = 8
Child Age in month	39.75 (3.50)	40.11 (3.44)	40.00 (3.32)	53.80 (5.26)	53.67 (2.07)	53.73 (3.64)	62.67 (4.62)	61.60 (1.95)	62.00 (2.93)
Mother Age in years	37.25 (8.77)	33.67 (3.50)	34.77 (5.51)	38.00 (5.24)	39.00 (2.97)	38.55 (3.96)	35.00 (4.00)	38.80 (3.70)	37.38 (4.03)
Education	4.75 (1.26)	5.00 (.50)	4.92 (.76)	5.80 (.84)	5.17 (.75)	5.45 (.82)	5.33 (1.53)	4.60 (1.52)	4.88 (1.46)

Note: Values in parentheses are standard deviations. Mothers' education was coded as: (1) illiterate, (2) elementary school, (3) junior high, (4) high, (5) university, (6) MA, (7) PhD, (8) others

## 2.2 Materials

### 2.2.1 Background information

#### 2.2.1.1 Demographic form

This form included questions related to parents' age, education, child's birthdate, number of children living in the household and family income (See Appendix A).

#### 2.2.1.2 Book reading habits survey

This is a short survey conducted by Ilgaz & Aksu-Koç (2005) that asks parents about children's exposure to oral and written narratives in the home setting (See Appendix B). We should note that although we asked mothers to fill out the book habits survey, it did not include any questions about how familiar they are to make a story from pictures. Mothers' answers to the survey mostly tend to represent their familiarization to make a story from pictures, asking a specific question for that would be better for deeper understanding of their habits about making a story utilizing from pictures.

### 2.2.2 Theory of mind measure

#### 2.2.2.1 Theory of mind battery

This indicates a set of 6 theory of mind tasks (i.e., diverse desires, diverse beliefs, knowledge access, explicit false belief, contents false belief and appearance-reality emotion). The scale was developed by Wellman and Liu (2004) and adapted into Turkish by Özorán (2009). The scale has been used extensively with both English and non-English speaking children (e.g., Shahaieian, Peterson, Slaughter, & Wellman, 2011; Meins, Fernyhough, Arnott, Leekam, & Rosnay, 2013). The scale was adapted to Turkish by Özorán (2009). In order to keep the cognitive load of the test equal across tasks, all tasks were administered with picture props. In all these tasks, children

were presented with gender-matched drawings of children and supplementary pictures to explain the scenario.

#### 2.2.2.1.1 Diverse desire

This task assesses children's ability to understand a desire that is different from their own and their ability to predict an individual's behaviors based on their desire. The experimenter first shows two pictures: a cookie and a carrot. Next, the child is asked which one his or her favorite. Then, the experimenter shows the picture of a gender-matched character and tells the child that this character's favorite food is different than that of the child. The test question states that the character in the picture is hungry and can only have one of the food items. The child's task is to pick one of the food items for the character. In order to get 1 point the child must choose the food item that the character is reported to like.

#### 2.2.2.1.2 Diverse belief

This task assesses children's ability to understand a belief that is different from their own and their ability to predict an individual's behavior based on the belief. The experimenter shows the child a different gender-matched character and states that the character is searching for his or her cat. There are two possible places that the cat may be: under the car or inside the bushes. Pictures depicting a car and bushes are presented. First, the child is asked tell his or her own belief about the location of the cat. The experimenter tells the child that the character believes the cat to be in the hiding spot not chosen by the child. The child is then asked to tell where the protagonist will look for the cat depending on his or her belief. In order to get 1 point the child must choose the location that the character believes the cat to be.

#### 2.2.2.1.3 Knowledge access

This task assesses children's ability to understand that seeing leads to knowing and the consequent appreciation that someone who has not seen inside a box

will not have knowledge about the contents of it. The experimenter shows the child a nondescript box and asks to guess what is inside the box. After the child makes a guess, the experimenter opens the box to reveal a little dog figurine. The experimenter then shows the child a gender-matched picture of a character and states that the character has not seen what is inside the box. Following this statement, experimenter asks the child two questions: 1. Does the protagonist know the inside of the box? and 2. Did the protagonist see the inside of the box? In order to get 1 point the child must give correct responses to both questions (i.e., “no” to both questions).

#### 2.2.2.1.4 Explicit false belief

This task will assess children’s ability to predict a individual’s behavior based on their belief which contrasts reality. The experimenter introduces a new gender-matched character and states that the character is looking for his or her gloves. Following this, the experimenter shows two pictures of possible places the gloves might be found: a bag and a closet. The experimenter states that the gloves are actually in the bag, but that the character mistakenly believes that the gloves are in the closet. The child is then asked two questions: 1. Where will the protagonist search for the gloves?, 2. Where is the actual location of the gloves? In order to get 1 point the child must give correct responses to both questions (“in the cupboard” and “in the bag” respectively).

#### 2.2.2.1.5 Content false belief

This task assesses children’s ability to appreciate that others may have false beliefs based on the suggestive appearance on an object. In this task, the experimenter shows the child a familiar box (i.e., ‘*bonibon*’ candy box), and asks what the child thinks is inside the box. After the child answers this question, the experimenter shows that the box contains a crayon. Following this, the experimenter introduces a different gender-matched character and states that the character did not look inside the box. Then the child is asked two questions: 1. What does the character think is inside the box?, 2. Did the

character see inside the box? In order to get 1 point the child must give correct responses to both questions (i.e., “a candy” and “no” respectively).

#### 2.2.2.1.6 Apparent-real emotion

This task assesses children’s ability to appreciate that individuals may feel and display different emotions simultaneously. First a child is presented a picture of three emotions happy, sad, and neutral and then asked to pick the three emotions in the picture. Later, a story about a protagonist and his or her aunt is told. In the story, the protagonist’s aunt goes abroad and before leaving she promises to get a gift for the protagonist. The protagonist likes toys as gifts but does not like clothes. However, the aunt brings a clothes as a gift. The story states that the protagonist should hide his or her emotions from the aunt. Otherwise, the aunt would never buy a gift for the protagonist ever again. The control questions probe whether the child remembers what the aunt bought as a gift and what the aunt would do if she learned the protagonist’s real emotions. These two control questions ensure that the child has comprehended the story well enough to answer the ensuing theory of mind target questions. If the child answers any one of these questions incorrectly the story is repeated. If the child still gives incorrect answers to the control questions, the task is terminated and the child gets no points. If the child provides correct responses as “a cloth” and “won’t buy anything again” the child is asked two questions: 1. What did the protagonist feel when the aunt gave her clothes for a gift?, 2. How did the protagonist look like when the aunt gave the cloth? Children can answer by pointing to the picture with the three faces: sad, neutral and happy) for both of the target questions. In order to get 1 point children must give correct responses to both target questions (“sad” and “happy” respectively).

### 2.2.3 Executive function measure

#### 2.2.3.1 Dimensional card sort task (Zelazo, 2006)

The aim of this task is to measure children’s cognitive flexibility and inhibition (Zelazo & Muller, 2002). The task requires that children learn a rule for sorting cards, after sorting using this rule for a while they are asked to switch to a new rule and use it to sort the remainder of the cards.

#### 2.2.3.1.1 Color rule

In total, there are 8 cards including the two trial cards. Four of them are red cars and the other four of them are blue elephants. The cards are ordered so that more than two card having the same color does not appear consecutively. The instruction states that:

*“This is a color game. In the color game, the red ones go here (by showing the box with red elephant on it) and the blue ones go here (by showing the box with blue car on it). This one is red. Where does this one go?”*

Each correct sorting gets 1 point, if children sort all cards correctly, they get 6 points.

#### 2.2.3.1.2 Shape Rule

There are 6 cards, three of them are elephants and the other three of them are cars. There is no training. The cards are ordered so that more than two card with the same shape do not appear consecutively. The instruction states that:

*“This is a shape game. In the shape game elephants go here (by showing the box with red elephant on it) and cars go here (by showing the box with blue car on it). This is an elephant. Where does this one go?”*

Each correct sorting gets 1 point, if children sort all cards correctly, they get 6 points.

### 2.2.4 Language Assessment

#### 2.2.4.1 Turkish receptive and expressive language test (TIFALDI)

TIFALDI is a standardized test that assess both receptive and expressive language development of children from 2 to 12 years of age (Berument & Guven, 2013).

#### 2.2.4.1.1 Receptive language test

There are a total of 516 pictures in the test. These pictures are from different categories that include: animals, clothing, food, fruit and vegetables, household items, furniture, occupations, body parts, math terms, toys, vehicles, house-garden sections, emotions, actions, goods and utensils. On each page there are four pictures. For each target picture, there are three other alternatives of the same category. For example, if a target picture is an animal, the other three choices are also animals. This test is ordered to progressively include harder vocabulary. The test starts with age appropriate items, and easier items are only asked if the child shows poor performance relative to the age appropriate starting point. For each target word, the experimenter shows the child a page with four pictures on it and asks:

*“Which one of these pictures shows a bed?”*

In order to determine the base performance, children need to answer 8 consecutive items correctly. The test is terminated when children give 8 incorrect responses out of 10 questions. The number of correct answers represents the child’s raw score. In order to calculate the standard score, children’s age equivalent score was depending the raw score according to Turkish Receptive Language Test booklet was

#### 2.2.4.1.2 Expressive language test

There are 80 pictures in the test. These pictures are belong to different categories such as animals, clothing, food, fruit and vegetables, household items, furniture, occupations, body parts, math terms, toys, vehicles, house-garden sections, emotions, actions, goods and utensils as in the receptive vocabulary test. On each page, there is one picture. As is the case with the

receptive vocabulary test, the expressive test starts with age appropriate items, and easier items are only asked if the child shows poor performance in age appropriate set. In this test, children are asked to name the target picture. Experimenter shows the child a page with one picture on it and asks:

*“What is this?” or “What is this called?”*

In order to determine the base performance, children need to answer 8 consecutive items correctly. The test is terminated when children give 6 incorrect responses out of 8 questions. The number of correct answers represents the child’s raw score. In order to calculate the standard score is children’s age equivalent score depending the raw score according to Turkish Expressive Language Test booklet.

#### 2.2.5 Wordless picture book

For this measure mothers were asked to tell a story from a wordless picture book, “Frog, where are you?” (Mayer, 1968). This book has been used to collect language data from both children and adults in different cultures (e.g., Slobin, 2005; Slobin, 2000; Berman & Slobin, 1994). This book has also been used in various studies that investigated the effect of mothers’ language on children’s cognitive and socio-cognitive abilities (e.g; Verhoeven & Strömqvist, 2001; Berman & Slobin, 1994). This book contains 24 pictures and tells the story of a boy and a dog as they search to find their missing frog. While they search for the frog, they encounters different animals and get into mishaps. At the end of the story, they discover that the frog actually had a family with a mate and baby frogs. The story ends with the child and the dog taking a baby frog home with them.

#### 2.3 Procedure

Parents and children were invited to the Bilkent Development Psychology Lab. Children were invited into the playroom and started their session with a 5-minute warm up with the experimenter. During the warm up session, the

experimenter and the child played with a standard set of toys. After the warm up children put the toys in an opaque box and placed it outside the lab door. This was done so that the children would not be distracted with the toys during testing.

Following clean up, the testing was started. Children received the theory of mind battery, executive function task and the language tasks (receptive and expressive) in that order. While theory of mind and executive function skills were measured, mothers filled out the demographics form and book reading habits survey. Parents were also asked to review the wordless storybook “Frog, Where are You?”. A second experimenter explained to the mother that they would be asked to tell the story depicted in the book to their children, once testing was finished. They were asked to familiarize themselves with the story. Mothers were asked to tell the story in a manner that was similar to what they do at home.

When the experimenter finished the theory of mind, executive functions, and language tasks, the mother was invited into the playroom. After entering, a toy set was given to the mother-child dyad and mothers were asked to play with their children for 10 minutes. At the end of this period, the experimenter entered the room to tell the dyad to start cleaning up. She gave the book to the mother and left the room for the mother to tell the story to the child. The play session is part of a larger study and the data from the play session will not be discussed in this thesis.

## 2.4 Language Coding

The book-reading sessions were videotaped and transcribed verbatim. Mothers’ language was coded according to three levels of structural complexity: (1) the word level, (2) the conjugation level, and (3) the clause level.

### 2.4.1 The word level

Mothers' use of mental state words (MSW) was coded in accordance with the traditional coding scheme developed by Bretherton and Beeghly (1982). This scheme included 6 subcategories of MSW: (1) perception MSW, (2) physiological MSW, (3) desire MSW, (4) motivational, (5) affect MSW, and (6) cognitive MSW. In addition, a separate category of words that serve to elucidate the difference between true and false belief, *contrastive* words, was also coded as the 7<sup>th</sup> category.

#### 2.4.1.1 Perception words

These are mental state words that provide perceptual information about something or describes the act of perceiving of a person (e.g., to look, to see, to smell, to hear).

[1]Did you see where the frog is?

*Kurbağanın nerede olduğunu gördün mü?*

[2]The child and the dog heard a sound.

*Çocukla köpek bir ses duymuşlar.*

#### 2.4.1.2 Physiological words

These are mental state words that provide physiological state information about a person (e.g., to sleep, to wake up, to be tired)

[3] They found a frog before they slept.

*Uyumadan önce bir kurbağa bulmuşlar.*

[4]The dog and the child got very tired in the forest.

*Köpeklerle çocuk ormanın içinde çok yorulmuşlar.*

#### 2.4.1.3 Desire words

These are mental state words that express a person's desire (e.g., to want, to desire, to wish).

[5] The frog wanted to go to his family and his children.

*Kurbağa ailesine ve çocuklarına gitmek istemiş.*

#### 2.4.1.4 Motivational words

These are mental state words including information about the one's motivations (e.g., to try, to promise).

[6] He tried to get out of the water.

*Suyun içinden çıkmaya çalışmış.*

[7] He promised not to go without telling anyone any more.

*Bir daha haber vermeden gitmemeye söz vermiş.*

#### 2.4.1.5 Affect words

These are mental state words that express emotions (e.g., happy, sad, afraid, angry, like).

[8] The child got scared when bees appeared.

*Arılar bir anda ortaya çıkınca çocuk korkmuş.*

[9] Do you like the story?

*Bu hikâyeyi sevdin mi?*

#### 2.4.1.6 Cognitive words

These are mental state words that provide information about cognitive states or cognitive processes (e.g., to think, to decide, to believe, to know, to remember).

[10] Do you remember? You had a frog, too?

*Hatırladın mı? Senin de bir kurbağan vardı.*

[11] The child thought that his frog was behind the trees.

*Çocuk kurbağasının ağaçların arkasında olduğunu düşünmüş.*

#### 2.4.1.7 Contrastives

These words, some of which are unique to Turkish language, serve to highlight the difference between two states of reality (two subjective states, one subjective state and one objective state, etc.). Examples are “meğerse” (in reality), “sanmak” (falsely believe), and “halbuki” (In fact).

[12] In reality, those were the antlers of the deer’s.

*Meğerse onlar geyiğin boynuzlarıymış.*

[13] In fact, the frog was not there.

*Hâlbuki, kurbağa orda da yokmuş.*

Mothers used mental state expressions not only to refer to the psychological states of the characters but also used these expressions to reference themselves and their children. Specifically, the uses that occurred outside the story frame included mental state word usage to:

(a) to express their own thoughts about the events in the story,

[14] I really wonder where the frog is.

*Ben çok merak ediyorum kurbağanın nerede olduğunu.*

(b) to ask their children about their thoughts or feelings,

[15] What do you think? Where is the frog in your opinion?

*Ne düşünüyorsun? Sence kurbağa nerede?*

(c) to ask them about whether they had observed or seen a particularly interesting or important detail in the pictures,

[16] Did you see that the boy fell into the water?

*Gördün mü? Çocuk suyun içine düşmüş.*

(d) to connect story events with their children's experiences,

[17] Do you remember you had a frog named John?

*Senin de John adında bir kurbağan vardı. Hatırlıyor musun?*

Based on previous research that looked at mental state usage that was either about the story or about the self (the storyteller) and/or the listener (the child) (Adrián et al., 2007) we grouped mental state word usage into two overarching categories:

1. MSW-SC: mental state word usage that was about the story characters
2. MSW-CMO: mental state word usage that was about the storyteller (mother), the listener (the child) or others

We should note that we did not code for proportions of mother's frequency of mental state words usage because of two reasons. One is that we believe that giving to all the mothers 24 pictures wordless book make almost constant the length in line with Slaughter et al. (2007). Second as compatible with Ruffman et al. (2002)' and Symons, Fossum, & Collins, (2006) each word usage by mothers may affect directly children's theory of mind abilities more than proportional discourse of those.

#### 2.4.2 Coding for diversity.

We coded for diversity at the word level using the same 7 subcategories of mental state words. We counted the number of different types of mental state words that were used as well as the frequency of usage. For instance whereas we coded as 2 for frequency, 1 for diversity of desire mental state word subcategory [18] and while we coded as 2 for frequency, 1 for diversity of affect mental state word subcategory [19]. It is because two mental state words were used with one type in the examples below.

[18] “Froggy, do you want to come with me or do you want to stay here? he told.

*“Kurbağacık benimle mi gelmek istersin burada mı kalmak istersin” demiş.*

[19] I miss my mom and dad, but I miss a lot playing with you too.

*Annemle babamı çok özlüyorum ama seninle oynamayı da çok özlüyorum.*

#### 2.4.3 The morph-syntactic level

The Turkish language allows for the expression of motivation and desire via two means: (1) the lexical units that carry the meaning of wishing, wanting, planning and intending to do something; (2) two types of modality conjugations *Modality for Volitional Wishes* (Dilek Kipi) to express desire and *Modality for Volitional Suggestions* to express intention. Modality for Volition is expressed through conjugating the verb with (-e, -a) and Modality for Volitional Suggestions is expressed through conjugating the verb with (-se, -sa). In Turkish, these conjugations indicate mental state information of desire and intention/motivation without the use of mental state words. While coding for lexical items would parallel research done with English speaking children, it would have presented an incomplete picture of mothers’ use of mental state expressions. Therefore, we coded for verbs that took on these modality markers and created aggregate scores with the usage of lexical items in these categories.

These conjugations exclusively appeared in mothers’ talk with their children and not in their telling of the story. These uses were added to mothers’ use of desire and motivation words that reference the child, the mother, or others.

[20] I want us to decide the child’s name.

*Çocuğun adına karar verelim birlikte.*

[21] I wish he lived with his mother. Right?

*Annesinin yanında yaşasaymış. Değil mi?*

#### 2.4.4 The level of clause

We coded for mothers' causal explanations for the 7 subcategories of mental state words (i.e., perception, physiological, desire, affect, cognitive, motivational, and contrastives). We observed that mothers' did not necessarily use causal connectives (e.g., because, so) when providing causal explanations. We observed that mothers also explained mental states through using consecutive sentences that were not connect with a causal connector. In order to capture the full profile of mothers' use of mental state causal explanations the data was coded in two categories: (1) Explicit Explanations (includes causal connectors) and (2) Implicit Explanations (consecutive sentences that explain the reason or causal effect of a mental state without a causal connector). Table 2 provides some examples including explicit and implicit explanations among subcategories of mental state words.

We observed that all mental state explanations (explicit and implicit) occurred when the mother talked about the story characters. Due to the exclusive occurrence of explanations in story talk, explanation categories represent talk about story characters only. Moreover, mothers' did not explain desire words and contrastives. These two categories were also removed from analysis.

#### 2.4.5 Mothers' language complexity

Mothers' language complexity was measured with Mean Length of Utterance (MLU) (Shatz & Gelman, 1973; Ege, Acarlar, & Güleriyüz, 1998). Mother's first 100 clauses was divided by the number of words in it to constitute the MLU scores. Repetitions and non-word expressions (e.g., "haha", "hmm", "aaa") were not counted as a word.

#### 2.5 Reliability

Table 2. Explicit and Implicit Explanations among the Subcategories of MSW

Code	Explicit Mental State Explanations Examples	Implicit Mental State Explanations Examples
Perception	He <u>looked</u> into the jar <u>because he is searching for his frog</u> . <i>O kavanozun içine <u>baktı çünkü kurbağasını arıyor.</u></i>	They <u>looked</u> into all pits and halls. <u>They started to search for their frog</u> . <i>Bütün deliklere, çukurlara <u>bakmışlar. Kurbağayı aramaya başlamışlar.</u></i>
Physiological	"Çilek" <u>woke up</u> in the morning <u>in order to look to her frog</u> . <i>"Çilek" sabahleyin <u>uyanmış kurbağasına bakmak için.</u></i>	It was night. They <u>Slept</u> . <i>Akşam oldu. <u>Uyudular.</u></i>
Motivational	-	All bees are chasing "Tom". "Tom" is <u>trying</u> to get rid of them. <i>"Tom" bütün arılardan kurtulmaya <u>çalışıyormuş. Hepsi "Tom'un" peşindeymiş.</u></i>
Affect	He got <u>scared</u> <u>because his dog might have injured</u> . <i>Korkmuş <u>çünkü köpeği yaralanabilirdi.</u></i>	He saw the owl. He got <u>scared</u> . <i>Baykuşu görmüş. <u>Korkmuş</u></i>
Cognitive	Did he <u>misunderstood</u> me? <u>For that reason I would like to say sorry</u> . <i>Beni <u>yanlış mı anladı? O yüzden özür dilemek istiyorum.</u></i>	They were <u>surprised</u> . They couldn't see "Minicik" in her jar. <i>"Minicik'i" kavanozunda <u>göremeyince şaşırılmışlar.</u></i>

We coded all levels of coding with 2 groups including three trained students per group as well as the experimenter. The experimenter took part in both groups. While the first group coded the word and the clause level, the second group coded the conjugation level. At the beginning of the coding, the groups coded 2 randomly selected transcriptions together in their own groups to reach an agreement. The thesis advisor also attended these initial discussion sessions. Then, all group members of the two groups coded transcriptions separately. Disagreements were determined and resolved in the discussion sessions. Each discussion session focused on a select number of transcriptions so that errors were not carried over to all of the data. In order to calculate reliability, 37.5% of the transcriptions were randomly selected and coded by the experimenter for the interrater reliability test. Cronbach alpha for the total mental state words were .86 and the alphas for the subcategories of mental state words ranged from .83 to .87.

## CHAPTER III

### RESULTS

This study aimed to investigate whether mothers' use of mental state expressions (lexical units and modalities of volition), the diversity of their mental state language, and their causal explanations of mental states are concurrently related to their children's theory of mind abilities in a story bookreading context. The results are presented in six main sections. First, we will present whether mothers' use of mental state language differs by children's age and gender. Second, we will present analyses that test for the expected relations between children's theory of mind performance and its relation to the control measures of language (receptive and expressive) and executive functioning. Third, we will report analyses that explores the relation between the frequency of mental state words (subcategory scores and the total frequency score) and children's theory of mind performance. We have also conducted a principal component analysis on mothers' use of mental state language to see if there were patterns of speech in which certain mental state word categories co-occurred. Fourth, we will present analyses that investigates the relation between the diversity of mothers' mental state word usage (subcategory scores and the total frequency score) and children's theory of mind performance. Fifth, we will describe the results of analysis that investigated the relation between mothers' use of mental state causal explanations (implicit and explicit) and children' theory of mind performance.

Lastly, we will present hierarchical regression analyses that investigated whether mothers' use of mental state language predicts their children's theory of mind performance.

### 3.1 Do Mothers' Talk with Their Children Show Differences Based on Their Children's Age and Gender?

Table 3 contains descriptive statistics of mothers' total mental state word usage: for total mental state words (MSW-Total), mental state words that reference the child, the mother or others (MSW-CMO), and mental state words that reference the story characters (MSW-SC) by children's age and gender. We should note that, the mental state words category in all analyses included the conjugations for desire and motivation as well as proper lexical units that express mental state information. To explore the effects of children's age and gender on mothers' MSW-Total, MSW-CMO, and MSW-SC usage, we conducted 3 separate two way between-groups analyses of variance with age (3 years, 4 years, 5 years) and gender (boys and girls) as independent variables.

Univariate analysis revealed that the interaction between age and gender on MSW-Total was not significant  $F(2, 26) = .11, p = .90; \eta_p^2 = .01$ . There was no main effect of age,  $F(2, 26) = 1.86, p = .18; \eta_p^2 = .13$  on MSW-Total. There was also no main effect for gender,  $F(1, 26) = .03, p = .86; \eta_p^2 = .00$  on MSW-Total. These results suggest that the frequency of mothers' total mental state word usage does not differ by children's age or gender.

Similarly, univariate analysis revealed that the interaction between age and gender on MSW-CMO was not significant  $F(2, 26) = .33, p = .72; \eta_p^2 = .03$ . There was no main effect of age,  $F(2, 26) = .82, p = .45; \eta_p^2 = .06$  on MSW-CMO. There was also no main effect for gender,  $F(1, 26) = .29, p = .59; \eta_p^2 = .01$  on MSW-CMO. These results suggest that the frequency of mothers' mental state word usage related to the storyteller and the story listener does not differ by children's age or gender.

Table 3. Mean and Standard Deviations of Mothers' talk by Age and Gender

	3			4			5		
	B n = 4	G n = 9	T n = 13	B n = 5	G n = 6	T n = 11	B n = 3	G n = 5	T n = 8
MSW- Total	73.75 (35.89)	78.33 (39.97)	76.92 (37.31)	74.40 (20.77)	69.00 (14.55)	74.40 (20.77)	54.00 (5.00)	49.40 (10.90)	51.13 (8.98)
MSW- MCO	27.00 (20.70)	30.56 (24.88)	29.46 (22.86)	29.80 (13.22)	24.83 (8.04)	27.09 (10.44)	23.33 (16.07)	14.20 (4.49)	17.63 (10.38)
MSW-SC	46.75 (16.94)	47.78 (24.71)	47.46 (21.89)	44.60 (13.98)	44.17 (12.22)	44.36 (12.36)	33.67 (11.55)	35.20 (12.70)	33.50 (11.65)

Lastly, univariate analysis revealed that the interaction between age and gender on MSW-SC was not significant  $F(2, 26) = .04, p = .96; \eta_p^2 = .00$ . There was no main effect of age,  $F(2, 26) = 1.55, p = .23; \eta_p^2 = .11$  on MSW-SC. There was also no main effect for gender,  $F(1, 26) = .07, p = .80; \eta_p^2 = .00$  on MSW-SC. Taken together these results show that the frequency of mothers' mental state word usage related to the story characters does not differ by children's age or gender.

### 3.2 Do Children's Theory of Mind Performance Show Differences by Age and Gender?

Table 4 contains children's performances on ToM' subtests as well as total score: diverse desire (DD), diverse belief (DB), knowledge access (KI), explicit false belief (EFB), content false belief (CFB), apparent-real emotions (ARE), and ToM-Total. We should note that in the present results, ToM-Total score is constituted by aggregating 6 subscales of ToM. To explore the effects of children's age and gender on ToM-Total scores, we conducted a 3 x 2 way between-groups analysis of variance with age (3 years, 4 years, 5 years) and gender (boys and girls) as independent variables. The analysis also revealed that the interaction between age and gender on ToM-Total was not significant  $F(2, 26) = .22, p = .81; \eta_p^2 = .02$ . There was no main effect for age,  $F(2, 26) = 2.49, p = .10; \eta_p^2 = .16$  on ToM-Total. There was also no main effect for gender,  $F(1, 26) = 2.78, p = .11; \eta_p^2 = .10$  on ToM-Total. These results suggest that children's ToM performances does not differ by children's age or gender.

Table 4. Percentage of Children that Passed ToM Tasks by Age

Age	DD	DB	KI	EFB	CFB	ARE
3	69.23	58.85	46.15	15.38	15.38	0.00
4	10.00	63.64	81.82	-	36.36	27.27
5	75.00	50.00	75.00	25.00	50.00	25.00
Total	81.25	56.25	65.63	12.50	31.25	15.63

Children's performances on the subtest of EFB is low and also none of the 4-years-olds could pass the EFB task. Moreover, we observed that EFB has yielded inconsistent performance in other studies with typically developing children (Wellman & Liu, 2004). In line with previous work (e.g., Wellman & Liu, 2011; Mara, Tackett, & Chris Moore, 2010; Ameneh, Peterson, Slaughter, Wellman, 2011) that excluded EFB from the battery we decided to remove EFB from all subsequent analyses. In these analyses, ToM Total is constituted by the aggregate score of 5 subscales: diverse desire (DD), diverse belief (DB), knowledge access (KI), content false belief (CFB), and apparent-real emotions (ARE). To explore the effects of children's age and gender on ToM-Total scores (constituted by 5 subtests), we again conducted a 3 x 2 between-groups analysis of variance with age (3 years, 4 years, 5 years) and gender (boys and girls) as independent variables. The analysis showed that the interaction between age and gender on ToM-Total was not significant  $F(2, 26) = .37, p = .69; \eta_p^2 = .03$ . Importantly, the main effect of age was observed for this new aggregate score  $F(2, 26) = 3.87, p = .03; \eta_p^2 = .23$ . In line with previous analysis, we observed no main effect for gender,  $F(1, 26) = 2.07, p = .16; \eta_p^2 = .07$  on ToM-Total. These results suggest that children's ToM performances show difference by children's age, but does not differ by children's gender if we use the 5 subscale battery aggregate scores.

Our preliminary analyses indicated that, neither the frequency of mothers' mental state talk nor children's ToM-Total performance differed by children's gender. Based on the fact that we have no hypothesis that involve gender, so we removed gender from all subsequent analyses.

To explore the effect of age on children's performances on the ToM battery in depth, we investigated whether there were age related difference on each of the 5 subtests of the ToM-Total. We conducted a one way between-groups MANOVA with age (3 years, 4 years, 5 years) as an independent variable. The dependent variables were: (1) diverse desire, (2) diverse belief, (3) knowledge

access, (4) content false belief, and (5) apparent-real emotions. The analysis revealed that the effect of age on combined dependent variables was not significant  $F(10, 50) = 1.29, p = .26$  Wilks' Lambda = .63;  $\eta_p^2 = .21$ . These results suggest that children's performances on subtests of ToM does not differ by children's age.

Tests of between subject effects showed that the effect of age on subtests of theory of mind was not significant: diverse desire  $F(2, 29) = 2.06, p = .15$ ;  $\eta_p^2 = .12$ , diverse belief  $F(2, 29) = .18, p = .83$ ;  $\eta_p^2 = .01$ , knowledge ignorance  $F(2, 29) = 1.94, p = .16$ ;  $\eta_p^2 = .12$ , content false belief  $F(2, 29) = 1.48, p = .24$ ;  $\eta_p^2 = .09$ , and apparent-real emotions  $F(2, 29) = 2.12, p = .14$ ;  $\eta_p^2 = .13$ . These results suggest that children's performances on subtests of theory of mind was not differ by their age.

### 3.3 Is There a Relation between ToM-Total and Potential Control Variables (Children's Age, Language and Executive Function)?

We should note that children's age in terms of months instead of years were used in the subsequent partial correlation and regression analyses because of the small sample size. Additionally, in contrast to broad classifications of age in 12 month terms, age in month as a variable has the power to convey the difference in age with more precision.

#### 3.3.1 Bivariate correlation

Control variables were age (in months) of children, standardized scores for expressive and receptive language, and executive functioning. We ran bivariate correlations between the control variables and ToM total score. Consistent with previous research there was a relation between ToM and each of these control variables. ToM was positively correlated with children's age in months ( $r = .51, p < .001$ ), receptive language ( $r = .51, p < .001$ ), expressive language ( $r = .41, p = .02$ ), and executive functioning ( $r = .48, p = .01$ ). In order to investigate the relations between the maternal mental state talk and ToM, we

included age in months, receptive language, expressive language, and executive function as control variables in the following partial correlations (See Table 5 for descriptive statistics of the control variables).

Table 5. Descriptive Statistics of the Control Variables

	3	4	5	Total
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
ToM-Total	1.85 (.99)	3.09 (1.14)	2.75 (1.16)	2.50 (1.16)
Receptive Language	122.23 (9.10)	125.82 (8.28)	123.00 (16.66)	123.66 (10.93)
Expressive Language	125.54 (9.26)	124.55 (10.93)	125.13 (11.48)	125.09 (10.09)
Executive Function	2.38 (2.50)	5.36 (1.80)	4.88 (2.23)	4.03 (2.56)

### 3.4 Is There a Relation between the Frequency of Mothers' Mental State Use and Children's Theory of Mind?

An aggregate score of 7 subcategories of mental state words constituted mental state words total score. To analyze if there was any relation between the frequency of mothers' mental state usage and theory of mind, we conducted both bivariate and partial correlations (Table 6). In the partial correlation analysis we controlled for children's age in months, as well as their standardized language scores for receptive and expressive language and their executive functioning scores. Results revealed that mothers' total MSW usage is significantly correlated with children's ToM-Total score ( $r = .43, p = .02$ ). This finding provided support for our first hypothesis which proposed that mothers' use of mental state language in story bookreading would be related to children's theory of mind abilities after controlling for other variables (age, language abilities, and executive functioning).

Table 6. Correlations and Partial Correlations across Frequency of Mental State Words and ToM-Total

Table 6 (cont'd)	<i>R</i>	<i>pr</i> <sup>a</sup>
MSW-Total	.16	.43*
Perception-Total	.20	.62**
Physiological-Total	-.15	-.07
Desire-Total	.18	.31
Motivational-Total	.25	.28
Affect-Total	.04	-.07
Cognitive-Total	.10	.20
Contrastive-Total	-.11	.03
MSW-CMO		
Perception	.05	.53**
Physiological	-.15	-.10
Desire	.25	.29
Motivational	.20	.26
Affect	.20	.11
Cognitive	.28	.41*
Contrastive	.14	.26
Total	.18	.54**
MSW-SC		
Perception	.42*	.46*
Physiological	-.12	-.05
Desire	-.02	.13
Motivational	.21	.08
Affect	-.01	-.10
Cognitive	-.01	.04
Contrastive	-.13	-.02
Total	.08	.13

<sup>a</sup> Partial correlation after controlling for children’s age, receptive and expressive language, and executive function scores

Note. \*p, .05, \*\*p, .01, (All significance tests are two-tailed)

### 3.4.1 Is there a relation between the frequency of total mental state subcategories and ToM?

To analyze the relation between total subcategories of MSW and ToM ability, we aggregated subcategories of MSW (perception, physiological, desire, motivational, affect, cognitive, and contrastive) expressing both MSW-CMO and MSW-SC. Then we computed a composite score for total perception MSW, total physiological MSW, total desire MSW, total motivational MSW, total affect MSW, total cognitive MSW, and total contrastive MSW. Table 7 presents the mean and standard deviations of these variables.

We conducted bivariate and partial correlations to examine the relation between Total subcategories of MSW and ToM total (Table 6). Results from partial correlation analyses showed that only mothers’ total use of perception words and ToM total score were significantly correlated ( $r = .62, p < .001$ ). This finding did not support our first hypothesis. We had expected that there would be a significant correlation between mothers’ use of cognitive MSW and children’s ToM total score. The correlation between total cognitive MSW and ToM total remained nonsignificant before and after control variables were controlled for ( $r = .20, p = .30$ ).

Table 7. Descriptive Statistics of Frequency of Mothers’ MSW

	Mean	SD	Range
MSW-Total	68.59	27.57	32-140
Perception-Total	27.31	13.00	11-69
Physiological-Total	4.47	3.54	0-13
Desire-Total	1.91	1.78	0-6

Table 7 (cont'd)	Mean	SD	Range
Motivational-Total	6.56	4.17	1-17
Affect-Total	7.14	4.74	0-25
Cognitive-Total	19,72	10.05	7-44
Contrastive-Total	1.41	1.68	0-6
MSW-CMO			
Perception	13.38	11.21	2-42
Physiological	.31	.74	0-3
Desire	1.09	1.40	0-4
Motivational	5.78	4.13	0-16
Affect	.88	1.26	0-4
Cognitive	4.16	4.07	0-22
Contrastive	.09	.30	0-1
Total	25.69	16.89	5-79
MSW-SC			
Perception	13.91	4.88	4-29
Physiological	4.16	3.53	0-13
Desire	.81	1.20	0-5
Motivational	.78	1.13	0-4
Affect	6.38	4.82	0-23
Cognitive	15.56	8.44	3-33
Contrastive	1.31	1.66	0-6
Total	42.91	17.25	18-98

3.4.2 Does the reference of the MSW matter? Is there a relation between the frequency of mental state words about the mother, child or others (MSW-CMO) and ToM?

In order to analyze the relation between the subcategories of MSW-CMO and ToM, we summed mothers' subcategories of MSW-CMO to create the total MSW-CMO variable. This variable was computed from the aggregate of perception MSW-CMO, physiological MSW-CMO, desire MSW-CMO, motivational MSW-CMO, affect MSW-CMO, cognitive MSW-CMO, contrastive MSW-CMO scores (See Table 7 for means and standard deviations).

We conducted bivariate correlations and partial correlations to analyze the relationship between ToM-Total score and perception-CMO, physiological-CMO, desire-CMO, motivational-CMO, affect-CMO, cognitive-CMO, contrastive-CMO, and CMO-Total scores (Table 6). Results from partial correlation analyses showed that children's ToM ability was significantly correlated with mothers' use of perception-CMO ( $r = .53, p < .001$ ), cognitive MSW-CMO ( $r = .41, p = .03$ ), and total MSW-CMO ( $r = .54, p < .001$ ). The relations that were found between ToM and mothers' use of perception words and total mental state words were mirrored in the analysis that focused only on those words that were used in reference to the mother, the child or others. Importantly, the analysis also revealed a relation between mothers' use of cognitive mental state words and ToM. This finding provided partial support for the first hypothesis which predicted that there would be a significant correlation between mothers' use of cognitive MSW and ToM total score. It is important to emphasize that it was only in the context of reference to the child, the mother or others that cognitive words were significantly correlated with ToM.

### 3.4.3 Does the reference of the MSW matter? Is there a relation between the frequency of mental state words about the story characters (MSW-SC) and ToM?

To analyze the relation between subcategories of Total MSW-SC and ToM, we summed mothers' use of subcategories of MSW-SC (perception-SC, physiological-SC, desire-SC, motivational-SC, affect-SC, cognitive-SC, and contrastive-SC). Table 7 presents means and standard deviations of MSW-SC variables.

We conducted bivariate and partial correlations to analyze the relationship between children's ToM total score and mothers' use of perception-SC, physiological-SC, desire-SC, affect-SC, cognitive-SC, motivational-SC, contrastive-SC, and Total-SC scores (Table 6). The results revealed a significant relation only for mothers' use of perception words about the story characters ( $r = .46, p = .02$ ). We had expected that mothers' use of cognitive mental state words would be significantly related to children's theory of mind abilities. While previous analyses showed that use of cognitive words about the child, the mother and others were related to children's ToM performance after including the control variables, analyses with cognitive words that referenced the story characters failed to show the same relationship ( $r = .04, p = .86$ ).

### 3.5 Are There Different Patterns of Mental State Word Use that Underlie Mothers' Storytelling Discourse?

The previous analysis revealed perception words to be consistently related to children's theory of mind abilities. This was a surprising finding and was not supported by previous literature. Most of the existing work on mental state language has either excluded perception words (e.g., Ruffman et al., 2002; Adrián et al., 2007) or did not analyze it separately (e.g., Symons et al., 2005). Furthermore, work that has analyzed and failed to find a relation between theory of mind and mothers' use of perception words were carried out with English-speaking mother-child dyads (e.g., Salughter et al., 2007). Since there

could be cross cultural differences in the patterns of mothers' speech and no work up to date has examined this relation with Turkish-speaking dyads, we decided to conduct a principal factor analysis on mothers' usage of mental state words. This analysis was exploratory in nature. There seems to be no consensus on the number of participants required to run a principal factor analysis (Field, 2000). One view states that principal component analysis requires a minimum of 300 participants (Tabachnick & Fidell, 2007; as cited in Field, 2000) while another states that up to 5 to 10 participants per variable (Kass & Tinsley, 1979; as cited in Field, 2000). Given that we have 7 variables (i.e., physiological, perception, motivation, desire, affect, cognitive, contrastive), this would mean that we would need a minimum of 35 participants to carry out this analysis. Our data was short of this very lenient rule. Given that, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) equaled .58 which is deemed acceptable for factor analysis (Field, 2000) we proceeded with the analysis. We used Varimax rotation since it makes constant of larger loadings larger and the smaller loadings smaller. Therefore, complexity of components decrease and interpretation of factors becomes easier as compared to quartimax rotation. However, we should note that using oblique rotation did not result in different number of factors or a different pattern in factor loadings.

Results from the factorial analysis revealed three main factors in mothers' total number of mental state word usage (See Table 8 for factor loadings of variables). Factor 1 explained 26.08% of the variance, and included two of the seven variables: total desire mental state words and total motivational mental state words. Factor 2 explained 25.98% of the variance, and included three of the seven variables: total perception mental state words, total cognitive mental state words, and total contrastive mental state words. Factor 3 explained 25.54% of the variance, and included two of the variables: total physiological mental state words and total affect mental state words. Total contrastive words loaded similarly on both Factor 2 and Factor 3. We included it in Factor 2 since not only bivariate ( $r = .68, p < .001$ ) but also partial correlation ( $r = .58, p <$

.001) analysis showed high correlation between total contrastive mental state words and total cognitive mental state words. In addition, contrastives are used to indicate a contrast between two states of the world (e.g., objective vs. subjective, real vs. imaginary) which is a distinction shared by cognitive lexicon (e.g., think, remember, forget). We can construe these three factors as representing three distinct (yet related) aspects of psychological reality: Volition: Desires and Motivation words (factor 1), Attention and Cognition: Perception, Cognition and Contrastive words (factor 2), and Physiological and Affective States: Physiological and Affect words (factor 3).

Table 8. Factor Analysis for Mothers' Use of Mental State Words

Category	Factors		
	1 26.08% of variance	2 25.98% of variance	3 25.54% of variance
Motivational-Total	0.88	0.18	0.16
Desir-Total	0.82	0.05	0.13
Perception-Total	0.14	0.91	-0.09
Cognitive-Total	0.47	0.66	0.46
Affect-Total	0.23	-0.21	0.88
Contrastive-Total	-0.13	0.62	0.66
Physiological-Total	0.26	0.33	0.57

### 3.6 Does the Diversity of Mothers' Talk with Their Children Show Differences Based on Their Children's Age?

Although we did not have a hypothesis that directly addressed the diversity of mothers' MSW usage, we decided to carry out an analysis with the number of different words mothers used to express mental states in order to investigate the quality of mother's language, and its possible relation with children's ToM development. Table 9 contains descriptive statistics for: diversity of total mental state words (MSW-Total), diversity of mental state words that reference

the child, the mother or others (MSW-CMO), and diversity of mental state words that reference the story characters (MSW-SC). To explore the effects of children's age on diversity of mothers' MSW-Total, MSW-CMO, and MSW-SC usage, we conducted a one way between-groups MANOVA with age (3 years, 4 years, 5 years) as an independent variable.

The analysis revealed no significant difference by age on any of the dependent measures: MSW-Total  $F(2, 29) = 1.97, p = .16; \eta_p^2 = .12$ ; MSW-CMO  $F(2, 29) = 1.32, p = .28; \eta_p^2 = .08$ , and MSW-SC  $F(2, 29) = 1.24, p = .31; \eta_p^2 = .08$ . These findings show that mothers showed similar levels of diversity in their mental state word usage when referencing the story characters or the child, themselves or others that was not dependent on children's age.

Table 9. Descriptive Statistics of Diversity of Mothers' MSW

	Mean	SD	Range
MSW-Total	23.56	6.17	12-42
Perception-Total	4.16	.95	2-6
Physiological-Total	1.41	.71	0-3
Desire-Total	.66	.48	0-1
Motivational-Total	.50	.62	0-2
Affect-Total	4.44	2.06	0-10
Cognitive-Total	8.66	2.79	5-16
Contrastive-Total	.94	1.16	0-5
MSW-CMO			
Perception	2.25	.95	1-4
Physiological	.22	.49	0-2
Desire	.34	.48	0-1
Motivational	.03	.18	0-1
Affect	.63	.94	0-4

Table 9 (cont'd)	Mean	SD	Range
Cognitive	2.72	1.92	0-8
Contrastive	.09	.30	0-1
Total	6.28	3.01	1-13
MSW-SC			
Perception	3.69	1.06	1-6
Physiological	1.28	.68	0-3
Desire	.50	.51	0-1
Motivational	.47	.57	0-2
Affect	3.91	2.18	0-10
Cognitive	6.59	2.98	2-15
Contrastive	.84	1.14	0-5
Total	17.28	6.23	6-36

### 3.7 Is There a Relation between the Diversity of Mother's MSW and Children's ToM?

Bivariate and partial correlations were conducted with the ToM total and total number of MSW type used (Table 10). Result revealed that mothers' total MSW type use is not significantly correlated with children's ToM score ( $r = .10, p = .61$ ).

#### 3.7.1 Are there any interrelation between mothers' diversity of total mental state word usage?

The previous findings failed to reveal correlation between mothers' diversity of total subcategories of MSW usage and children's ToM-Total scores. Based on this finding we conducted bivariate and partial correlation analyses to analyze the relationship among total subcategories of MSW diversity usage by mothers.

Results showed that diversity of cognitive words was correlated with motivational words ( $r = .42, p = .03$ ) and contrastive words ( $r = .46, p = .01$ ), marginally correlated with physiological words ( $r = .36, p = .06$ ), desire words ( $r = .37, p = .05$ ), and affect words ( $r = .37, p = .05$ ). These results showed that the richness of mothers' cognitive talk is not only related to their diversity of mental state words usage (contrastive, motivational, desire, affect, and physiological) but also frequency of that usage.

Table 10. Bivariate Correlations and Partial Correlations across Diversity of Mental State Words and ToM-Total

	<i>r</i>	<i>pr</i> <sup>a</sup>
MSW-Total	.17	.10
Perception-Total	-.13	-.36
Physiological-Total	.10	.07
Desire-Total	.32	.26
Motivational-Total	.31	.15
Affect-Total	.12	-.07
Cognitive-Total	.20	.24
Contrastive-Total	-.19	.01
MSW-MCO		
Perception	-.23	-.14
Physiological	-.25	-.21
Desire	.37*	.26
Motivational	.24	.15
Affect	.24	.09
Cognitive	.31	.39*
Contrastive	.14	.26
Total	.24	.29
MSW-SC		

Table 10 (Cont'd)	<i>r</i>	<i>p</i> <sup>a</sup>
Perception	.16	-.14
Physiological	.06	.12
Desire	.06	.07
Motivational	.27	.12
Affect	.03	-.09
Cognitive	.06	.01
Contrastive	-.23	-.07
Total	.05	-.03

<sup>a</sup> Partial correlation after controlling for children's age, receptive and expressive language, and executive function scores

Note. \*p, .05, \*\*p, .01, (All significance tests are two-tailed)

### 3.7.2 Are there relations between word diversity in MSW subcategories in mother's discourse that reference the child, the mother or others and children's ToM?

To analyze the relationship between children's ToM ability and mothers' subcategories of MSW diversity, bivariate correlations and partial correlations were conducted between the ToM-Total score, diversity of perception-CMO, motivational-CMO, physiological-CMO, desire-CMO, affect-CMO, cognitive-CMO, and contrastive CMO scores (Table 7). Results showed that there was correlation between ToM-Total and diversity of cognitive-CMO ( $r = .39, p = .04$ ). In line with the previous findings, this result showed that mothers who used more diverse cognitive mental state language to reference the characters in the story had children who showed higher ToM performance.

### 3.7.3 Are there relations between word diversity in MSW subcategories in mother's discourse that reference the story characters and children's ToM?

To analyze the relationship between children's ToM ability and diversity of mothers' MSW-SC use, bivariate correlations and partial correlations between the ToM-Total score and diversity of perception-SC, motivational-SC, physiological-SC, desire-SC, affect-SC, cognitive-SC, and contrastive SC scores (Table 10) scores was conducted. There were no significant correlations between children's ToM scores and any of the subcategories of diversity of MSW-SC.

### 3.8 Do Mothers' Use of Mental State Explanations Show Differences Based on Their Children's Age

Table 11 contains descriptive statistics of causal explanations for mental state words by mothers: total explanations, explicit explanations, and implicit explanations. We should remind that all mental state causal explanations took place when mothers talked about the story characters, so explanations in the present category reflect talk about the story characters only. Furthermore, mothers did not explain desire and contrastive words. Therefore, these two subcategories also removed from the analysis. The two general subcategories of mental state causal explanations includes explicit explanations (requires a causal connector) and implicit explanations (consecutive sentences that explain the reason of a mental state without a causal connector).

Table 11. Descriptive Statistics of MSW Causal Explanations

	Mean	SD	Range
Explanation-Total	7.25	4.32	0-18
Perception-Total	1.53	1.22	0-4

Table 11 (cont'd)	Mean	SD	Range
Physiological-Total	1.06	1.16	0-4
Desire-Total	.00	.00	0-0
Motivational-Total	.09	.30	0-1
Affect-Total	3.09	2.13	0-8
Cognitive-Total	1.47	1.46	0-6
Contrastive-Total	.00	.00	0-0
EXPLICIT			
Perception	.75	.95	0-3
Physiological	.19	.40	0-1
Desire	.00	.00	0-0
Motivational	.00	.00	0-0
Affect	.88	1.19	0-5
Cognitive	.50	.88	0-4
Contrastive	.00	.00	0-0
Total	2.31	2.13	0-9
IMPLICIT			
Perception	.78	.83	0-2
Physiological	.88	1.10	0-4
Desire	.00	.00	0-0
Motivational	.09	.30	0-1
Affect	2.22	1.43	0-5
Cognitive	.97	1.06	0-4
Contrastive	.00	.00	0-0
Total	4.94	3.07	0-13

To explore the effects of children’s age on mothers’ use of total MSW explanations, total explicit explanations, and total implicit explanations, we conducted a one way between-groups MANOVA with age (3 years, 4 years, 5 years) as an independent variable.

The analysis revealed no significant difference by age on any of the dependent measures: total explanations  $F(2, 29) = .59, p = .56; \eta_p^2 = .04$ ; explicit  $F(2, 29) = 1.84, p = .18; \eta_p^2 = .11$ , and implicit explanations  $F(2, 29) = .33, p = .72; \eta_p^2 = .02$ . These findings revealed that mothers’ explicit and implicit causal explanations showed similar levels that was not dependent on children’s age.

### 3.9 Is There a Relation between Mothers’ Use of Total Causal Explanations and Children’s ToM?

In order to analyze the relation between mothers’ total causal explanations on children’s theory of mind scores, bivariate and partial correlations were conducted (see Table 12). Results from partial correlation analysis revealed that mothers’ total causal explanations of MSW was not significantly correlated with children’s ToM score ( $r = -.06, p = .76$ ). This finding did not support our third hypothesis. We had expected that there would be a significant correlation between mothers’ use of causal explanations for MSW and children’s ToM-Total score. The correlation between total causal explanations for MSW and ToM total remained nonsignificant before ( $r = -.06, p = .78$ ) and after including the control variables.

Table 12. Bivariate Correlations and Partial Correlations across Causal Explanations and ToM-Total

	<i>r</i>	<i>pr<sup>a</sup></i>
Explanation-Total	-.06	-.10
Perception-Total	-.03	-.06
Physiological-Total	-.14	.22

Table 12 (cont'd)	<i>r</i>	<i>pr<sup>a</sup></i>
Motivational-Total	.23	-.04
Affect-Total	.03	-.09
Cognitive-Total	-.14	-.27
EXPLICIT		
Perception	-.09	-.13
Physiological	.00	0.30
Affect	-.05	-.06
Cognitive	-.09	-.22
Total	-.10	-.13
IMPLICIT		
Perception	.05	.07
Physiological	-.15	.13
Motivational	.23	-.04
Affect	.09	-.08
Cognitive	-.12	-.19
Total	-.02	-.05

<sup>a</sup> Partial correlation after controlling for children's age, receptive and expressive language, and executive function scores

Note. \*p, .05, \*\*p, .01, (All significance tests are two-tailed)

### 3.9.1 Does the content of the mental state explanation matter?

Investigating the relation between mothers' causal explanations that belong to different mental state categories and children's theory of mind performance?

To analyze the relationship between total subcategories of mental states' causal explanations and children's theory of mind ability bivariate correlations and partial correlations between the ToM total score and total perception explanations, total physiological explanations, total motivational explanation,

total affect explanation, total cognitive explanations, were conducted (Table 12). There were no significant correlation between ToM total score and any total score of subcategories in mental state's causal explanations. This finding did not support our second hypothesis. We had expected that there would be a significant correlation between mothers' use of causal explanations for cognitive words and children's ToM-Total score. The correlation between total causal explanations for cognitive mental state words and ToM-Total revealed similar results with the previous findings and remained nonsignificant before ( $r = -.14, p = .44$ ) and after including the control variables ( $r = -.27, p = .16$ ).

### 3.9.2 Does the use of causal connectors matter? Investigating the relation between use of explicit causal explanations and theory of mind

To analyze the relationship between subcategories of mental states' explicit causal explanations and children's theory of mind ability bivariate correlations and partial correlations between the ToM total score and explicit perception explanations, explicit physiological explanations, explicit affect explanations, and explicit cognitive were conducted. There were no significant correlation between ToM total score and any subcategories of mental state's explicit causal explanations. This finding related to the second hypothesis. We had expected that there would be a significant correlation between mothers' use of causal explanations for cognitive words and children's ToM-Total score. In line with previous findings the correlation between explicit causal explanations for cognitive mental state words and ToM-Total remained nonsignificant before ( $r = -.09, p = .61$ ) and after strong predictors of ToM were controlled for ( $r = -.22, p = .26$ ).

### 3.9.3 Does the absence of the causal connector matter? Investigating the relation between the use of implicit causal explanations and theory of mind

To analyze the relationship between subcategories of mental states' implicit causal explanations and children's theory of mind ability bivariate correlations and partial correlations between the ToM total score and implicit perception explanations, implicit physiological explanations, implicit motivational explanations, implicit affect explanations, and implicit cognitive were conducted. There were no significant correlations between ToM total score and any subcategories of MSW' implicit causal explanations. This finding is related to the second hypothesis. We had expected that there would be a significant correlation between mothers' use of causal explanations for cognitive words and children's ToM-Total score. The correlation between explicit causal explanations for cognitive mental state words and ToM-Total revealed similar results to the previous findings and remained nonsignificant before ( $r = -.12, p = .52$ ) and after including the control variables ( $r = -.19, p = .34$ ).

### 3.10 Does Mothers' Use of Cognitive Mental State Words and Cognitive Explanations Predict Children's ToM?

We hypothesized that mothers' use of cognitive mental state words and causal explanations for cognitive mental state words would predict children's ToM abilities after controlling for children's age, language and EF abilities. Since the sample size is relatively low, we summed up the highly correlated and conceptually related language scores (receptive and expressive) and entered them as one variable. While this does not solve the problem of sample size, it relieves some of the burden on the models, by decreasing the number of factors the model strives to handle. Preliminary analyses were conducted to ensure no violations of normality, linearity, multicollinearity, and homoscedasticity. Age in months, aggregate score of language standard scores, and EF scores were entered at step 1 (Table 13). The first model explained 54% of the variance in ToM-Total. After entry of total cognitive mental state words and explanations for mental state words at step 2, the total variance explained by the model

increased to 65.1%,  $F(5, 26) = 9.71, p < .001$ . The two independent variables explained an additional 11.1 % of variance in ToM-total, after controlling for age, language, and executive function,  $R$  squared change = .11,  $F$  change =  $(2, 26) = 4.15, p = .03$ . In the final model, total cognitive mental state words positively predicted ToM-Total ( $\beta = .39, p = .03$ ), causal explanations for cognitive state words negatively predicted ToM-Total ( $\beta = -.39, p = .02$ ). These results show that the frequency of mothers' use of cognitive mental state words predicted children's theory of mind performance above and beyond the influence of the control variables. This provides support for the third hypothesis. Interestingly, mothers' cognitive explanations were negative predictors of children's theory of mind performance. This finding may reflect mothers' sensitivity to their children's abilities to understand others' beliefs. Those mothers whose children were low ToM performers may have used more explanations in order to support their children's understanding of the story while mothers who have a sense that their children do not struggle with understanding others' beliefs would not make excessive use of cognitive explanations.

Table 13. Summary of Regression Statistics Predicting Children's ToM Performance by Mothers' Use of Total Cognitive MSW and Cognitive Explanations

	B	SE B	$\beta$	t	Sig
Step 1					
Constant	7.87	2.28		-3.45	.002
Age	.04	.02	.37	2.48	.020
Total Standardized Language Scores	.03	.01	.47	3.58	.001
Executive Function	.09	.07	.19	1.26	.216
Step 2					
Constant	6.66	2.12		3.14	.004
Age	.04	.02	.30	2.17	.039
Total Standardized Language Scores	.02	.01	.37	2.83	.009
Executive Function	.19	.07	.41	2.60	.015
TotalCognitive	.04	.02	.39	3.38	.025
TotalCognitiveExp	-.31	.12	-.39	-2.66	.013

$R^2 = .54$  for Step 1, Adjusted  $R^2 = .11$  for Step 2

### 3.11 Do the Different Patterns of Mental State Word Usage that Underlie Mother's Storytelling Predict Children's ToM?

We had previously explored the underlying patterns in mothers' mental state discourse through principal component analysis which has yielded three factors: Factor 1-Volitional States (desire and motivation), Factor 2- Attention and Cognition (perception, cognitive and contrastive words), and Factor 3- includes Physiological and Affective States. We conducted a hierarchical multiple regression to analyze whether these discourse patterns predicted ToM, after controlling for age (in months), aggregate score of language standard scores, and executive function scores (Table 14). Age in months, aggregate standardize scores of language, and executive function scores were entered in step 1 explaining 54% of the variance in ToM-Total. After entry of factor 1 (desire and motivation words), Factor 2 (perception, cognitive, and contrastive words), and Factor 3 (physiological and affect words) at step 2, the total variance explained by the model 68.6%,  $F(6, 25) = 9.10, p < .001$ . The three independent variables explained an additional 14.6% of variance in ToM-Total, after controlling for age, language, and executive function,  $R$  squared change = .15,  $F$  change =  $(3, 25) = 3.87, p = .02$ . In the final model, only Factor 2 was significant ( $\beta = .39, p = .02$ ), while Factor 1 ( $\beta = .14, p = .31$ ) and Factor 3 ( $\beta = -.19, p = .14$ ) were not significant. In line with the previous findings, only mothers' use of mental state words related to attention and cognition that referenced children's or their own or story characters' predicts children's theory of mind abilities.

### 3.12 Does the Reference of Mothers' Mental State Language (Reference to The Child, The Mother or Others vs. The Story Characters) Predict Children's Theory of Mind?

Previous findings revealed the importance of cognitive words used by mothers on children's ToM abilities. We conducted hierarchical multiple regression

analyses to investigate whether the referent of mothers' cognitive state words have differential impact on children's theory of mind abilities after controlling

Table 14. Summary of Regression Statistics Predicting Children's ToM Performance by Mothers' Use of Total Cognitive MSW and Cognitive Explanations

	B	SEB	$\beta$	t	Sig
Step 1					
Constant	7.87	2.28		-3.45	.002
Age	.04	.02	.37	2.48	.020
Total Standardized Language Scores	.03	.01	.47	3.58	.001
Executive Function	.09	.07	.19	1.26	.216
Step 2					
Constant	7.34	2.00		-3.66	.001
Age	.05	.02	.41	3.05	.005
Total Standardized Language Scores	.02	.01	.35	2.76	.011
Executive Function	.16	.07	.36	2.50	.019
Factor 1	.03	.03	.14	1.05	.305
Factor 2	.02	.01	.39	2.47	.021
Factor 3	-.03	.02	-.19	-1.53	.140

$R^2 = .54$  for Step 1, Adjusted  $R^2 = .15$  for Step 2

for the control variables (Table 15). The first model with age in months, aggregate score of language standard scores, and executive function as predictor variables explained 54% of the variance in ToM-Total. After entry of cognitive-CMO and cognitive-SC at step 2, the total variance explained by the model increased to 61.7%,  $F(5, 26) = 8.36, p < .001$ . The two independent variables explained an additional 54.4% of variance in ToM-Total, after controlling for age, language, and executive function,  $R$  squared change = .08,  $F$  change =  $(2, 26) = 2.62, p = .09$ . In the final model, while cognitive-CMO was significant ( $\beta = .32, p = .03$ ) cognitive-SC was not significant ( $\beta = -.01, p = .94$ ). These results showed that mothers' use of cognitive mental state words that referenced their children, themselves or others, instead of cognitive mental state words that referenced the story characters predicted children's theory of mind abilities as opposed to fourth hypothesis that we had expected to find that

maternal cognitive words that reference the story characters would predict children's theory of mind abilities.

Table 15. Summary of Regression Statistics Predicting Children's ToM Performance by Mothers' Use of Cognitive-MCO and Cognitive-SC

	B	SE B	$\beta$	t	Sig
Step 1					
Constant	-7.87	2.28		-3.45	.00
Age	.04	.02	.37	2.48	.02
Total Standardized Language Scores	.03	.01	.47	3.58	.001
Executive Function	.09	.07	.19	1.26	.216
Step 2					
Constant	-6.56	2.24		-2.92	.007
Age	.04	.02	.29	1.96	.061
Total Standardized Language Scores	.03	.01	.38	2.77	.010
Executive Function	.16	.07	.35	2.20	.037
Cognitive-CMO	.09	.04	.32	.29	.031
Cognitive-SC	0	.02	-.01	-.07	.942

$R^2 = .54$  for Step 1, Adjusted  $R^2 = .08$  for Step 2

## CHAPTER IV

### DISCUSSION

Our aim was to investigate the effects of mothers' mental state language on Turkish speaking children's theory of mind abilities as they were telling a story from the picture book, "Frog, Where Are You?". We explored this effect in children who were 3 to 5 years of age since previous studies showed that a major milestone in theory of mind development takes place in this period (Miller, 2012; Wellman & Liu, 2004). Towards 5 years of age, children begin to understand that people's actions are systematically related to their desires, beliefs, and emotions. Furthermore they come to appreciate that different people can have different desires, beliefs, and emotions. Importantly, during this period children also come to understand that individuals who have false beliefs will behave in ways that do not conform to the real state of the world (e.g., Jenkins et al., 2003; Wellman, 1990; Wellman & Liu, 2004). Many studies with Western children have shown relations between the quality of maternal mental state talk and children's developing theory of mind abilities (e.g., Ruffman et al., 2002; Symons et al., 2005). The present study, was a first effort to investigate whether there is a similar concurrent effect of maternal mental state talk for Turkish-speaking children's theory of mind development.

In order to investigate both the frequency and diversity of mental state language, we implemented a 3-tier coding scheme for mental state expressions:

at the morphological level, at the lexical level, and at the level of clause. At the lexical level mental state words were coded in 7 subcategories: perception, physiological, desire, motivational, affect, cognitive, and contrastive.

On the basis of previous research that examined mental state word usage during story telling with referential state that referenced to story teller (the child) and the story listener (the child) and referenced to the story characters (Adrián et al., 2007; Peterson, et al., 2007), we classified maternal mental state word usage into two categories (1) mental state word usage that reference to story characters (MSW\_SC) and (2) mental state word usage about the storyteller (mother), the listener (the child) or others. Second, we coded for conjugations of modality for volitional wishes (-se, -sa) that corresponds to desire mental state words and modality for volitional suggestions (-e, -a) that corresponds to motivational mental state words. These are part of the Turkish language and express the mental state information about desires and motivations without making use of mental state verbs. In our data, these conjugations appeared only in mothers' talk when they refer to their children and themselves. In other words, mothers' did not make use of these conjugations when expressing the motivations of the story characters. Accordingly, these uses were added to mothers' use of desire and motivation words that referenced the child, the mother or others. Third, we coded for mothers' use of causal explanations for the 7 subcategories of mental state words. We observed that mothers did not only use causal connectors when they were explaining the mental state words, but they also explained those through the use of consecutive sentences that did not indicate causal connectors. In line with this appearance, we coded mental state causal explanations in two categories: (1) Explicit explanations (includes causal connector and (2) Implicit explanations (consecutive sentences that explain the cause of mental state

explanations (explicit and implicit) for mental state words when they were talking about the story characters. Due to this exclusive occurrence of explanations about the story characters, all explanations refer to story characters' mental states. Furthermore, desire and contrastive explanations were removed from the analyses since mothers did not explain those.

In order to investigate whether the frequency of mothers' mental state language differs by their children's demographic characteristics, we investigated whether mothers' use of total mental state words (MSW-Total), mental state words that referenced the child (MSW-CMO), and mental state words that referenced the story characters (MSW-SC) differed by children's age and gender. We found that MSW-CMO, MSW-SC as well as total MSW usage by mothers did not differ by the children's age and gender. These findings are consistent with the previous studies such that longitudinally investigates effects of mental state discourse parents and children (Jenkins et al., 2003). The present findings suggested mothers of 3-year-old children did not talk less about the mind because their children had not yet acquired competency in theory of mind reasoning. While not statistically significant, the means showed a trend towards decreasing frequency of mental state use with children's age. This might be because mothers try to facilitate their children's understanding of different minds to prepare them to the social world regardless of children's age and gender (Nelson, 2005).

Mothers' talk about the mind was found to be in a similar level with their 3-, 4-, and 5- years of age children. This may be surprising given what we know about how adults appropriate their speech to support their children's language acquisition. Infant-directed speech or motherese as it is more commonly termed, refers to mothers' use of simpler syntax and exaggerated intonations (Nelson & Pasek, 1989; Kuhl, 2004). Whether mothers' use more simple or complex vocabulary as their children grow into preschoolers and later school children is a matter of empirical debate (e.g., Hayes & Ahrens, 1988). However

what seems to be less of a debate is the fact that there are differences in vocabulary diversity and type by socioeconomic differences (Hart & Risley, 1995). It is plausible to think that mothers operate within a 'zone of proximal development that allows for mothers to introduce and explain mental concepts even before their children fully appreciate this content. Support for that comes from studies conducted on maternal mind-mindedness that showed longitudinal relation between mother's talk about mental state talk to their 8- month-olds and their theory of mind development at 51 months of age (Meins et al., 2013). Furthermore, the education level of mothers which can be considered as an index of SES may explain the current finding. There may be less variability in how highly educated mothers talk to their 3 versus 5 year olds with regard to the mind. The success rates for each of the subtests were more or less in the expected direction with older children showing better performance as compared to younger children with one notable difference. In the current study, children's performances on explicit false belief (EFB) was observed to be extremely low with 12% of the total sample passing the task, and developmentally inconsistent as evidenced by the fact that no 4-year-old but a few 3 and 5-year-olds passing the task. A careful revisit of the literature, revealed that several studies had also revealed similar problems of developmental inconsistency and had excluded the task from the battery (e.g., Wellman, Fang, & Peterson, 2011; Mar, Tackett, & Moore, 2010; Shahaecian, et al., 2011). Accordingly, we decided to remove EFB from the following analysis to better investigate the developmental profile of theory of mind. A correlational analysis showed lent support to the well-established finding that there was a correlation between children's age (in months) and their theory of mind abilities (e.g., Wellman, 2001; Perner et al., 1987; Wimmer & Perner, 1983). A complementary analysis that compared age groups showed a significant developmental progression from that 3 years of age to 4 years of age. In line with the previous analysis no gender differences were observed on children's performance with the 5 subtask scale. (Wellman & Liu, 2004).

Interestingly, we did not observe a significant difference between the performances of 5- year-olds with that of 4- or 3-year-olds. Given the small sample size in each of the age groups, it is plausible to assume that individual differences may have had greater impact on the group average of 5-year-olds.

Due to the fact that the observed findings so far showed no gender effect and none of our hypothesis involved gender, gender was not included in any of the primary analyses. Further, we investigated whether there were developmental difference within each of the 5 subtests of the theory of mind scale (i.e., diverse desire, diverse belief, knowledge ignorance, content false belief, and apparent reality emotion). The results did not show difference in children's performances by age on any of the subscales. This is contrary to Wellman's (1990) conceptual and empirical work. According to Wellman (1990), children began to understand others' desires as a simple way of understanding of mind at around 2- years of age while at age four, they come to appreciate the difference between beliefs and false beliefs which is a construed to be a more complex ability. From this point of view, theory of mind battery was sequenced from simpler to more complex tasks (Wellman & Liu, 2004; Wellman, 2001). Previous studies demonstrated that children in US and Australia mastered in the following order: DD, DB, KI, CFB, and ARE (Peterson & Wellman, 2009; Peterson, Wellman, & Liu, 2005). While not statistically significant, both 4- year olds and 5-year-olds showed higher rates of accuracy on the KI task which measures children's understanding that perception leads to knowledge, as compared to the DD task which measures children's ability to appreciate that different people may hold different beliefs about the same event. However, the small sample size did not allow us to test for whether there is a difference in the sequencing of the theory of mind battery. This would be an important area of inquiry for the future since similar sequence differences have been observed with Chinese children and Iranian children (Shahaeian et al., 2011; Wellman, Fang, Liu, Zhu, and Liu, 2006). Etel and Yağmurlu (2014) have examined the ordering of Wellman's theory of mind battery with institutionalized children,

and have found a sequence that fits with the Western profile. However, as they also acknowledge, institutionalized children may be showing a profile that is the product of their institutionalization (e.g., constant interaction with a large number of peers). Future studies that look at the sequencing of theory of mind tasks with children who come from traditional family environments would add to our understanding of Turkish children's theory of mind development.

#### 4.1 The Relation between Theory of Mind and Potential Control Variables (Children's Age, Language and Executive Function)

Our findings showed the expected relations for common predictors of children's theory of mind ability. Paralleling the well-documented findings in the literature (Adrián et al., 2007, Astington & Jenkins, 1999, Symons et al., 2005), theory of mind was found to be highly correlated with standard scores on receptive language and expressive tasks. These results highlight the strong contribution of children's language ability to their theory of mind development (Astington & Baird, 2005). In addition, children's performance on an executive functioning task which assessed children's cognitive flexibility and inhibition was found to be correlated with their theory of mind ability. These findings were consistent with previous studies that investigated longitudinally effects of executive functioning on theory of mind between 3 and 5 years of age (Marcovitch et al., 2015), the effects of individual differences in inhibitory control on children's theory of mind abilities (Carlson & Moses, 2001). Based on these findings, we used age (in month), standardized scores of receptive and expressive abilities, and executive functioning as control variables in the present study.

#### 4.2 The Relation between the Frequency of Mental State Words and Theory of Mind Abilities

Further, we examined the relationship between the frequency of mothers' use of mental state words and children's theory of mind abilities. We found that there was a relation between mothers' use of MSW-Total and children's theory

of mind abilities which is consistent with the previous studies (e.g., Ruffman et al., 2002). This finding provided support for the first hypothesis which predicted that there would be a relation between mothers' use of mental state language and children's Theory of mind abilities.

In addition, we found that the frequency of mothers' total number of mental state word uses that referenced the child, the mother, and others instead of total mental state usage that referenced story characters was related to children's theory of mind development. In contrast to our finding, Symons and colleagues (2005) had previously documented a relation between the frequency of mothers' character mental state word usage and children's theory of mind abilities with 5- to 7-year-old children. Two possible explanations are plausible. One explanation could be that, children only come to benefit from character references after they have reached a certain level of theory of mind competence. This may explain the discrepancy between the results of the current study and Symons and colleagues' finding may be due to the difference in the age groups under scrutiny that while we investigated 3- to 5- years of age children, they explored 5- to 7- years of age children. It is plausible to think that mothers' references to children's mental states during book reading can be more important when they are younger, since these children are still in the process of theory of mind development. References to children's own mental states may help to build a foundation, for understanding the mental states of the self, before it can be applied to others (in this case, story characters). Mothers' use of mental state words that reference their children may serve to facilitate better or deeper engagement with the story, comprehension of the story events, and the causal links between events in the story. Older children who have already developed a certain competence in theory of mind may be better able to benefit from references to story characters.

Another plausible explanation, may be that the positive contribution of exposure to mental state language about story characters was observed

longitudinally. In other words, mental state language about story characters has a cumulative effect on children's later theory of mind competence. Partial support for this explanation comes from Adrián and colleagues' (2007) longitudinal study with Spanish-speaking 3- to 5 year old children who were tested twice, with a year in between testing sessions. This study revealed a relation between mothers' early cognitive word usage that not only referenced the child but also the story characters and children's later theory of mind development when they controlled for children's early theory of mind abilities, verbal ability, and maternal education, and children's age. Relevant to the argument here is their finding that there was only a trend between cognitive words that referenced the story characters and theory of mind within time 1 and within time 2 concurrently. In line with our findings, they also noted a significant relation between mothers' cognitive references to the child and children's theory of mind abilities at time 1. The significant contribution of cognitive mental states that referenced story characters and theory of mind only emerged when the data was analyzed longitudinally. In other words, while concurrent relations between mental state references to story characters within time points were not observed, mothers' reference to story characters' cognitive mental states at time 1 predicted their children's theory of mind abilities at time 2. Given that the scope of the present study is limited to cross-sectional relations, the fact that no significant correlation was found between theory of mind and references to story characters may thus be expected.

Perhaps one of the most interesting findings of the current study is the relation between mothers' use of perception words and children's theory of mind abilities. This relation was observed consistently both with mental state words that refer to the child, the mother, and others, and also the story characters. Previous literature on mothers' mental state language for perception has received peripheral attention. Some studies opted to exclusively focus on cognitive mental state words (Ruffman, et al. 2002; Adrián, et al., 2007) with special emphasis on the terms 'think' and 'know'. Another study focused

exclusively on emotion words (Racine, et al., 2007). Even when a study included perception words, separate analyses that investigated frequencies of mental state types was not included. For example, Symons et al. (2005) coded for different subcategories of mental state words but their analyses only included the total number of mental state word uses when exploring the effects of mothers' mental state language children's theory of mind abilities during book reading (Study 1).

The results of the current study highlight the importance of perception words on the development of children's Theory of mind abilities especially in the early years. We observed that perception words mostly consisted of the words of 'see' and 'look'. We believe that when mothers' used these perception words in reference to the child, the mother, and others, they did so with two purposes. First, they used these in order to redirect their children's attention to the book when children were distracted. This purpose may speak to mothers' attempts to modulate their children's attention to the task at hand. Use of perception words with this purpose may serve to elucidate the relation between seeing and knowing, or attending and knowing. This may facilitate the theory of mind ability of children at younger ages who have are in the process of mastering the concept of knowledge, belief and false belief. Due to the fact 40.63% of the present sample was constituted by three-year-old children it is plausible that in our data the effect of perception words was more pronounced. Decreasing the amount of perception word uses from 3- year-olds to 5-year-olds with a marginal significance level ( $p = .07$ ) in the present data supports this argument.

Second, mothers also used perception words in order to emphasize the pictures and the events in the book even when their children were adequately paying attention to the story. This type of use may serve a more complex function as compared to redirecting children's attention to the task. Such uses would aim to communicate to the child, that an important point is being made in the story

that deserves special attention, possibly drawing the child's attention to key events in the book. In the current study, the coding of perceptual words did not distinguish between these two functions. This may be an interesting avenue to pursue in the future if we wanted to get a better understanding of how the different functions of perceptual words contribute to children's theory of mind abilities.

Perceptual words that referenced the story characters were also correlated with children's Theory of mind abilities. These words were predominantly related to visual perception. It is important to emphasize once more that perception is one of the gateways for knowledge acquisition. By drawing the child's attention to what the character saw or where the character look at mothers' inadvertently lay the groundwork for their children to understand what the character knows and does not know. For example, the boy in the story must look in the jar and see that the frog isn't there to know that the frog has escaped. Therefore, mothers' use of perceptual information about the story characters can thus help children understand characters' beliefs which would facilitate Theory of mind abilities. A recent study may provide clues into the underlying neural mechanisms that aid in understanding others' mind. Koster-Hale, Bedny, and Saxe (2014) conducted a study on sighted and blind adults to investigate whether their neural processing of different perception modalities (i.e., vision and auditory) were localized in brain regions that also processed mental state understanding. The authors found that temporo-parietal junction was important for both processing information about others' minds but also for processing perceptual information. More importantly, this result did not vary between the blind versus sighted participants. The results of this study suggest that visual perception may hold a privileged position with regard to the processing of mental state information.

While visual perception and mental state information was processed at the same area in the brain, one could possible state that the genre of the book

prompts visual perception words (i.e., to see, to look) since it was a wordless picture book. However, it can be also thought that a bookreading context regardless of its being wordless or not have similar effects on the use of perception words. That is because all have perceptual source and mothers' tend to generate a narrative by showing the pictures in order to make the narrative more comprehensive for their children. If it was only a story telling context without any perceptual scaffold, the use of perception words may decrease.

A principal component analysis lent further support to the finding that perceptual words may play an important role in children's developing theory of mind abilities, similar to cognitive mental state words. We conducted a factor analysis on mothers' usage of mental state words' in different subcategories. The results from the factorial analysis revealed three main factors in mothers' mental state word usage: (1) volition (desires and motivation expressions), (2) attention and cognition (perception, cognition and contrastive words), and (3) physiological and affective states (physiological and emotion words). As compatible with the previous finding, factor analysis also demonstrated the same pattern for the frequency of mothers' use of perception and cognitive words emphasizing the importance of knowing by seeing.

One of the goals of the current study was to develop a coding scheme for mental state language that included Turkish morpho-syntactic structures expressing desires and intentions. However, we did not find any relation between desire and motivational words which were computed by adding Turkish morpho-syntactic structures and children's theory of mind abilities. This result demonstrated that although Turkish language have rich morpho-syntactic characteristics in terms of desires and intentions, Turkish children are not privileged for the abilities of understanding others' mind. Consistently, morphology as a source monitoring was found not to provide privileged situation for theory of mind abilities (Papafragou, Li, Choi, & Han, 2007). One reason for this might be that before children arrive at a certain level of

cognitive competence they will not be able to appreciate the cues in their language that signal such mental state or source of knowledge information. This study, thus adds to the research that shows language markers alone cannot push children into higher levels of reasoning about the mind.

#### 4.3 The Relation between the Diversity of Mental State Words and Theory of Mind Abilities

Preliminary analysis for the diversity of maternal total mental state words (MSW-Total), mental state words that reference the child (MSW-CMO), and mental state words that reference the story characters (MSW-SC) revealed that these did not differ by children's age. These results showed consistency with the frequency of mental state data suggesting that mothers of 3-year-old children did not talk less diverse about the mind when referencing the story characters or the child, themselves or others because their children had not yet reached competency in theory of mind reasoning.

In order to gain an in-depth understanding of mothers' mental state talk, we also examined the relationship between the diversity of mothers' use of total mental state words. The relation that we found between the frequency of mothers' mental state use and children's theory of mind was not observed with the diversity of total mental state words mothers used. In addition, correlations of subcategory-specific diversity demonstrated that mothers may hold broader or more limited diversity ranges. This was evidenced by the finding that there were positive correlations between diversity of cognitive state words and diversity motivational and contrastive words. Furthermore, diversity of cognitive state words were also marginally correlated with physiological, desire, and affect words. In other words, the diversity of cognitive mental state words showed no correlation only with perception words. The natural scarcity of perception words in language may account for the lack of relation between the diversity of cognitive and perception words. Mothers' use of perception words were mostly limited to the words "look", "see".

When we explored whether the diversity of mental state subcategories that were used with different referential purposes were related to theory of mind, we found that the diversity of the cognitive words mothers used when referencing the child, the mother, or others was correlated with children's theory of mind abilities. There was no significant relation between the diversity of mental state use that referenced the character and children's theory of mind abilities. This result paralleled the lack of meaningful relationships previously reported between the frequency of mental state uses (both total and subcategories) and theory of mind. However, concluding that diversity of mental state language about the story characters has no role in children's theory of mind development is not warranted due to the cross-sectional nature and small sample size of the current study.

#### 4.4 The Relation between Causal Explanations for Mental State Words and Theory of Mind Abilities

Previous research has focused not only one mental state word usage but also whether there is a relation between mothers' explanations of mental state words and their children's theory of mind abilities. This type of analysis supports socio-cultural views of children's acquisition of theory of mind abilities as children benefit from more able conversation partners highlight and explain the links between mental states and their behavioral, emotional, situational precursors or consequences. Our results showed that mothers' explicit and implicit explanations showed similar frequencies that was not dependent on children's age.

Contrary to our expectations, we did not find relation between mother's total explanations for mental state words, and children's theory of mind abilities. These null results remained even when we investigated potential relation between explicit explanation that included causal connectives and implicit explanations that provided rationale in consecutive sentences with no causal connectors.

The discrepancy between our findings and others reported in the literature may stem from methodological differences. For example, Peterson and Slaughter (2003) previously documented a relation between the mother's mental state explanations and 4- to 5-year-old children's theory of mind abilities. However, they used a self-report questionnaire to assess mothers' use of mental state explanations, namely Maternal Mental State Input Inventory (MMSII). This questionnaire asked mothers to select their preferences under 4 different choices and one containing explanation when describing 12 vignettes to their children. It is also worth noting that their category of explanations was confounded with elaborations. The fact that our study used a natural language sample instead of self-report data and the fact that we strived for an exclusive category that only included explanations make the results of the current study and that of Peterson and Slaughter (2003) incomparable. Ruffman and colleagues (2002) showed a relation between mothers' causal talk at time 1 and their 3- to 4-year-old-children's theory of mind at time 2 and a marginally significant relations from time 1 to time 3. However, unlike the present study, they did not specifically focus on causal talk about mental states. They included all causal talk in their analysis that implied that mothers who elucidate the causality behind physical and psychological reality had children who showed higher theory of mind performance.

We also investigated whether mothers' causal explanations that belong to individual subcategories (e.g., desire, emotion, cognition) were related to children's theory of mind. Based on previous research (Adrián, et al., 2007; Slaughter et al., 2007) we expected to see relations between mothers' cognitive explanations and their children's theory of mind. However, we found no significant relations between any of the subcategories of mental state explanations and children's theory of mind abilities.

This finding is in contrast to the findings of Slaughter et al. (2007) and Adrián, et al. (2007). Slaughter and colleagues (2007) found evidence for a concurrent

relation between mothers' cognitive explanations and their 3-year-old children's theory of mind abilities both in bivariate correlation and partial correlations when controlled for children's age and mother's verbosity. They did not observe this relation for affect explanations and perception explanations. Similarly, Adrián, et al. (2007) found both concurrent (both in zero order and partial correlations when controlled for children's age and language and mother's education) and longitudinal relations (both in zero order and partial correlations when controlled for children's theory of mind score, verbal ability, and maternal education at time 1 and children's age at time 2) between mother's causal explanations for cognitive state words and 3- to 5-years of age children's theory of mind abilities. The lack of support for this relation for English- and Spanish-speaking mother-child dyads may be due to measurement differences for the theory of mind measure. We opted to use the Wellman and Liu (2004) theory of mind scale with the idea that it would provide us with a nuanced and comprehensive understanding of children's theory of mind abilities. However, the explicit theory of mind task which actually corresponds to the standard change of location task yielded inconsistent results. This task was included in a narrative format in the studies mentioned. Importantly the unexpected contents that we administered and saw the expected age progression conformed to the traditional way of administering this task in the literature. While we tried to accommodate for the inconsistent results from the change of location (Explicit False Belief) task by excluding it, a more comparable analysis would only be possible if we could include a standard change of location task.

It is also plausible to think for the null results between causal explanations for mental state words and theory of mind abilities stem from the narrative of the book as a genre such that it did not provide a basis and space for explanations. However, we believe that the genre of the book was adequate for explanations. That is because its story plot in nature captured the boy's sadness due to escaping of the frog, his happiness of the frog's discovery and the boy's and

the dog's misadventures in the forest. In order to create a proper narrative from the picture book, mothers should have explained why he was sad and happy, or the reason of the boys and the dogs misunderstanding of antlers as trees branches. Thus the genre of the story book is not a plausible reason of the null results between mental state causal explanations and theory of mind abilities and contradicts results found in the literature using the same genre (e.g., Slaughter & Peterson, 2007; Adrián et al, 2007). However one might argue that, the presence of the pictures provide with enough visual cues for the child to make explanations redundant in storytelling. This could only be empirically investigated if mothers' were asked to tell stories without picture prompt.

While the concurrent correlations did not provide support for the hypothesis, a hierarchical regression analysis that controlled for the effects of the known predictors looked at the added effect of mothers' use of cognitive language (cognitive mental state words and cognitive explanations). The results showed that children's age (in month), standardized language scores and executive functioning significantly predicted children's theory of mind abilities. When we entered mothers' cognitive mental state word usage and their cognitive explanations both predicted significant variance in theory of mind performance. Interestingly, we found mothers' use of cognitive mental state words to be a positive predictor of theory of mind abilities, whereas mothers' explanations was a negative predictor of theory of mind. We had expected cognitive mental state word use to be a positive predictor, and hence this finding fit with our hypothesis. However, the negative relation between cognitive explanations and theory of mind abilities warranted a reconsidering of our assumptions. We assumed that the more cognitive explanations mothers provided, the more children would benefit in theory of mind understanding. This may still be the case, as our data has no way of answering this question due to its cross-sectional nature. It may however be that those mothers who know that their children do not yet appreciate cognitive mental states may make more of an effort to explain them to their children. This relation does not

imply that mothers' cognitive explanations affect their children's theory of mind adversely. It does however imply that mothers who are sensitive to their children's theory of mind competence and know that their children do not have prerequisite competence to understand cognitive mental state may make more effort to explain these in the context of a story. In other words, this may be an indirect manifestation of mothers' sensitivity to their children's lack of competence in cognitive mental state understanding.

Although we did not initially have specific hypotheses regarding perception words, the results revealed a role for perception expressions in young children's theory of mind development that was consistent across different analyses. In fact, a principal component analysis yielded 3 factors that could characterize mothers' mental state use: Factor 1 (desire and motivation words), Factor 2 (perception, cognitive, and contrastive words), and Factor 3 (physiological and affect words). We ran a regression analysis to investigate whether these components significantly predicted the variance in children's theory of mind scores. This analysis revealed that of the three factors, only the factors that included perception, cognitive, and contrastive words predicted children's theory of mind abilities after controlling for known predictors of theory of mind. In line with the previous findings from the present study, only mothers' use of mental state words related to attention and cognition referenced to children or themselves or story characters predicted children's theory of mind abilities. These results underscores the importance of perception expressions along with cognitive expressions and expressions that compares two states of realities in contributing to children's appreciation of the mind.

Finally, we further investigated whether mothers' use of cognitive states in reference to the story characters versus their use of cognitive expressions that referenced the child, the mother or others to explain the variance in theory of mind differently. A hierarchical regression analysis showed that mothers' use

of cognitive mental state words that referenced their children, themselves or others, instead of cognitive mental state words that referenced the story characters predicted children's theory of mind abilities. In line with the previous findings of the present study, references to children's cognitions during book reading may be more important when children are younger due to their current process of theory of mind development. References to children's own cognitions may help them to form a basis for understanding of the mental states of the self, before children benefit from references directed to story characters. In other words, reference to story characters' cognitive states may have an important role for older children's theory of mind competence.

As stated previously, the current study could not differentiate between different theories and their specific ways of viewing the significance of language for theory of mind development. However, if we were to explore how the results could speak to any of the theories, we would tentatively state that it would side with the socio-cultural view. This is mainly because socio-cultural theory views theory of mind development as embedded in dynamic relations where both children and parents appropriate their language according to one another. The fact that the results showed mothers' cognitive mental state explanation to be a negative predictor of theory of mind indicates that mothers' are sensitive to their children's weaknesses and as agents of culture, use more explanations to support the development of theory of mind in their children. This is in contrast to theory theory accounts that view children as active recipients of mental state talk who use this input to arrive at better conceptual understandings of what it means to know, to think or to believe. A study that aims to distinguish between theory theory and socio-cultural theory should ideally include a mental state comprehension task for children in a longitudinal design to see whether it is children's initial mental state knowledge, or the initial environmental input that promotes theory of mind development.

#### 4.5 Limitations

The limitations of the study can be grouped under three headings. Those that related to assessment tasks (the theory of mind battery), procedure (effect of context), and the design (cross-sectional). We will first discuss these limitations before making informed suggestions for future research.

#### 4.5.1 Assessment tasks-theory of mind battery

As noted in the discussion of our results, we opted for using the Wellman and Liu (2004) theory of mind battery in order to gain a nuanced understanding of children's theory of mind development. However, the fact that the explicit false belief task revealed inconsistent results. Specifically, none of the 4-year-olds passed the task and 3- and 5-year-olds performed at similar levels. Given that our sample came from a high SES background as evidenced by mothers' education and children's language abilities, it is more plausible to think that the task did not assess false belief understanding in an age-appropriate way. That is, our presentation of this task involved minimal scaffolding (i.e. only having a picture of the backpack and a picture of the cabinet) that may have made the working memory demands too difficult for preschool aged children.

Another concern with theory of mind could be the presentation of the subtests in a fixed order. We opted to present the tasks from easier to more difficult tasks based on the finding of previous research (Wellman & Liu, 2004). However, recent studies revealed inconsistencies due to cultural differences (Wellman, Fuxi, & Peterson, 2011; Shahaeian et al., 2011). For example, sequence differences have been observed with Chinese children and Iranian children (Shahaeian et al., 2011; Wellman et al., 2006) where children found the diverse belief task to be more difficult than the knowledge ignorance task. In our choice of fixed order presentation, we were influenced by Etel and Yağmurlu (2015) who investigated the ordering of Wellman's Theory of mind battery with Turkish institutionalized children, and found an order that fits with the Western profile. However, as Etel and Yağmurlu (2014) also acknowledge the atypical environment of these children where they have constant interaction

with a group of peers may have yielded a pattern that may not be representative of Turkish children's theory of mind development in general. Nevertheless, future studies should present these tasks in counterbalanced order and investigate whether order matters.

A last concern about the measurement of theory of mind is related to the way that we opted to score the task. We adopted a strict scoring scheme for the subscales where children only got points when they answered both the control and false belief questions correctly. If any of these two were incorrect children received no points on the tasks. A survey of the relevant literature shows that, previous studies adopted more generous scoring schemes that awarded points to control questions (e.g., Slaughter et al., 2007; Peterson & Slaughter, 2003). We believe that the control questions test for children's memory, understanding of language but not their theory of mind reasoning hence we find the use of a stringent scoring scheme more appropriate in this investigation.

#### 4.5.2 Procedural-effect of the context

An important procedural limitation concerns the context in which mothers and children participated in shared bookreading. In our study, we invited mothers and children to the laboratory where mothers' engaged in bookreading interactions in a room fitted with cameras. Studies that investigated similar research questions either carried out the data collection at the preschool or home settings (e.g., Slaughter et al., 2007) or audiotaped the interaction rather than videotaping it (e.g., Adrián et al., 2007; Slaughter et al., 2007). The physical context, and the presence of cameras may have motivated all mothers in our study to show an elevated performance since these mothers also knew as per the consent form that we were interested in mothers' language use. While the lab setting provides a level of control (e.g., the absence of distraction) during testing, mothers who are aware that the study is going to be analyzing their language and are aware of being videotaped may show atypical language

use. Future studies that are conducted in the lab, should also include less structured contexts that are rich in perspectival language where mothers' may feel less self-conscious. These could be free play or problem solving tasks (e.g., puzzles). In addition, it may also be beneficial to investigate mothers' bookreading language in home settings.

#### 4.5.3 Design

An important design limitation pertains to the fact that in our study there was only one bookreading session. This is congruent with similar studies in the literature that investigated the effect of mothers' bookreading language on children's theory of mind. However, we believe that mothers' language may change from one reading to the next as their children progress from understanding the barebones of the plot to making connections between the 'landscape of action' and the 'landscape of consciousness' (Bruner, 1996). Specifically, mothers may ask more "what" and "where" questions and might use more perceptual language as "look" and "see" in order to introduce the book and the pictures in it to the child. If the book was reread mothers may focus more on the relations between the actions and thoughts of the characters through using more cognitive mental state words. Previous longitudinal studies did not investigate the relation between maternal mental state language and children's theory of mind abilities by using the same book repeatedly over short period of time (e.g., Adrián et al. 2007; Ruffman et al., 2002). To the best of our knowledge Taumoepeau and Ruffman (2006) when investigating the relation on infants used the same books in both time points one year apart. Their results showed that mothers used more cognitive words and less desire and emotion words in time 2. However, since the readings were one year apart, it is impossible to say whether the change in the frequency of desire, emotion and cognitive words were due to the increase in the age of the child or the repeated reading.

Another limitation of the current study is that it included a limited number of children ( $N=32$ ), especially for 5-year-olds ( $n=8$ ). While the sample was quite homogeneous with regard to children's backgrounds and their mothers' education levels, it would be ideal to have a larger sample to catch small but significant effects.

Finally, the cross-sectional design limits our interpretation of the results. The study cannot answer the question of whether mothers' language promotes children's theory of mind since all found relations were of concurrent nature. It is plausible to think that mothers' language input shows effects over time that may not be concurrently detectable. Future studies should utilize a longitudinal design in order to answer questions of causality.

#### 4.6 Future Directions

Future studies may be conducted by taking into consideration these limitations under three general headings. In order to overcome the concern with presentations of theory of mind subscales, giving the subtasks in counterbalanced order can be interesting if we would like to get deeper understanding whether order matters. In addition, supplementing Wellman and Liu's (2004) theory of mind scale with standard change of location, deception and appearance-reality tasks would also be advised. These tasks have been used more prevalently in the literature and would allow for better comparability across studies.

As an important procedural concern, in order to construe the effect of context, future studies conducted in the lab may be free play and problem solving tasks. That is because these proposed contexts can possibly not only be rich in perspectival language but also be less structured in terms of mothers' self-consciousness of their language. Alternatively, a study investigating maternal language in book reading context at home settings should be conducted.

In order to solve concerns about the design of the study, investigating the effect of the same book on the ongoing time points may be suggested as a future direction. An important contribution to the existing literature would also be a longitudinal study that investigates the effects of mothers' language input on children's theory of mind development over time. A longitudinal study that asks mothers to read the books several times at each time point would result in a deeper and more comprehensive understanding of the proposed relation.

Additionally, uniformity in distribution of different age groups and an increase in the number of participants may be important to solve the limitations about study design. Besides the aforementioned limitations, based on the results of the current study, a careful consideration of the function of perception words is warranted. We observed two functions for the use of perception words: (1) modulate their children's attention and (2) communicate with their children. We did not code the differential functions of the perception words. This may be interesting for future studies if we want to get deeper understanding for the contributions of perception words to children's theory of mind abilities.

#### 4.7 Conclusion

To the best of our knowledge, this is the first study that investigated the effect of mothers' mental state words usage on children's theory of mind abilities in a Turkish-speaking population. Taken together, our results revealed that mothers' mental state word usage was related to 3-, 4-, and 5- year-olds theory of mind abilities after controlling for known predictors of theory of mind. The frequency of mothers' mental state word and cognitive word use that referenced the child, the mother, or others were correlated with children's theory of mind abilities. Moreover, the frequency of maternal perception words that referenced the child, the mother, or others and that reference to the story characters as well as total perception word usage were related with children's theory of mind abilities. These results highlight the importance of a semantic category (i.e., perceptual words) that have received little attention in the

literature. Another feature of mothers' language that has received little to no attention concerns the diversity of their mental state use. In fact, several studies have limited their coding of cognitive words to "think" and "know" which limits their ability to consider diversity. The results of the current study indicated that this may be a relevant feature to investigate in relation to children's theory of mind since the use of different types of cognitive words that referenced the child, the mother, or others were correlated with children's theory of mind abilities.

The present results did not show a relation between mothers' mental state explanations and children's theory of mind abilities. A regression analysis revealed that while maternal cognitive words positively predicted children's theory of mind abilities, explanations for cognitive words negatively predicted children's theory of mind abilities which may point to differences in the different functions of these two categories of expressions. In line with correlational results that underscored the role played by perception words, an analysis that investigated the effects of perception, cognitive, and contrastive words found that the aggregate frequency of these categories concurrently predicted children's theory of mind abilities above and beyond the effects of children's age, executive function and language abilities. Importantly, neither mothers' use of motivation and desire or their use of physiological and affect words concurrently predicted children's theory of mind abilities. Lastly, only mothers' mental state words that referenced the child or the mother were related to children's theory of mind abilities. This was in contrast to our prediction that mothers' mental state talk about characters would be key to their children's theory of mind abilities. This result possibly reveals concurrent relations between mental state talk in the here-and-now as being central to children's theory of mind development, however leaves unanswered the question as to whether mothers' mental state talk about there-and-then (i.e., the story characters with in a story reality) longitudinally affects children's theory of mind development.

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## APPENDICES

### APPENDIX A: DEMOGRAPHIC FORM FOR PARENTS

#### Ebeveyn Demografik Bilgi Formu

Tarih:

ID:

1. Adınız ve soyadınız:
2. Yaşınız:
3. Cinsiyetiniz:  Kadın  Erkek
4. Çocuklarınız/çocuğunuzla olan yakınlığınız:  
 Anne  Baba  Diğer:  
Öz / Üvey
5. Çocuk sayısı:  1  2  3  Diğer:
6. Çocuğunuzun (çocuklarınızın) adı: Çocuğunuzun/çocuklarınızın doğum tarihi:  

_____	_____
_____	_____
_____	_____
_____	_____
7. Eğitim durumunuz nedir?  

<input type="checkbox"/> Okuryazar değil (1)	<input type="checkbox"/> Üniversite (5)
<input type="checkbox"/> İlköğretim (2)	<input type="checkbox"/> Yüksek Lisans (6)
<input type="checkbox"/> Ortaokul (3)	<input type="checkbox"/> Doktora (7)
<input type="checkbox"/> Lise (4)	<input type="checkbox"/> Diğer:
8. İşiniz:  
 Tam zamanlı çalışmaktayım (1)

- Yarı zamanlı çalışmaktayım (2)  
 Evden yürütmekteyim (3)  
 Su anda çalışmamaktayım (4)  
 Okula devam etmekteyim (5)

9. Eşinizin yaşı:

10. Eşinizin eğitim durumu nedir?

- Okuryazar değil (1)  Üniversite (5)  
 İlköğretim (2)  Yüksek Lisan (6)  
 Ortaokul (3)  Doktora (7)  
 Lise (4)  
 Diğer:

11. Eşinizin İşi:

- Tam zamanlı çalışmakta (1)  
 Yarı zamanlı çalışmakta (2)  
 İşlerini evden yürütmekte (3)  
 Su anda çalışmamakta (4)  
 Okula devam etmekteyim (5)

12. Evinizin aylık gelir düzeyi:

- 1.000 TL`den az (1)  
 1.000 TL- 3.000 TL (2)  
 3.000 TL-5.000 TL (3)  
 5.000 TL- 7.000 TL (4)  
 7.000 TL`den fazla (5)

13. Evinizin aylık gelir düzeyini nasıl değerlendirirsiniz?

- Düşük (1)  Orta Seviyede (2)  İyi seviyede (3)  Çok iyi seviyede

## APPENDIX B: BOOK READING HABIT SURVEY

Çocuğunuzun:

Adı:

Soyadı:

Doğum Tarihi:

Formu Dolduran Kişinin:

Adı:

Soyadı:

Çocuğa Yakınlık Derecesi:  Anne

Baba

1. Çocuğunuz ilk anlamlı kelimesini kaç aylıkken/kaç yaşında söyledi?

—

2. Çocuğunuza resimli kitaplar okunur mu?

Evet

Hayır

Cevabınız “hayır” ise lütfen 8. soruya geçerek devam ediniz.

3. Kaç yaşından itibaren çocuğunuza hikâye kitapları okumaya başladınız?

6 ay- 12 ay

1 yaş

2 yaş

3 yaş

4 yaş

5 yaş

4. Çocuğunuza ne sıklıkta hikâye kitabı okursunuz?

Her gün

1-2 günde bir

3-4 günde bir

Haftada bir

Ayda bir-iki kere

- Diğer
5. Çocuğunuz hikâye kitaplarının resimlerine bakarak kendisi hikâye anlatmaya çalışır mı?
- Evet
- Hayır
6. Çocuğunuzun çok sevdiği, kendisine okunmasından bıkmadığı, sürekli okunması için ısrar ettiği bir hikâye var mı?
- Evet Hikayenin adı: \_\_\_\_\_
- Hayır
7. Çocuğunuzun ezbere bildiği ve bakarak anlattığı bir hikâye kitabı var mı?
- Evet Hikayenin adı: \_\_\_\_\_
- Hayır
8. Çocuğunuza masal anlatılır mısınız?
- Evet
- Hayır
9. Kaç yaşından itibaren çocuğunuza masal anlatılmaya başladınız?
- 6 ay- 12 ay
- 1 yaş
- 2 yaş
- 3 yaş
- 4 yaş
- 5 yaş
10. Çocuğunuza ne sıklıkta masal anlatıyorsunuz? Her gün
- 1-2 günde bir
- 3-4 günde bir
- Haftada bir
- Ayda bir iki kere
- Diğer

11. Çocuğunuzun çok sevdiđi, kendisine anlatılmasından bıkmadıđı, sürekli anlatılması için ısrar ettiđi bir masal var mı?

Evet

Masalın adı: \_\_\_\_\_

Hayır

12. Çocuğunuzun ezbere bildiđi bir masal var mı?

Evet

Masalın adı: \_\_\_\_\_

Hayır