The Relationship between Metacognitive Vocabulary and Theory of Mind Development

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Abstract

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& Theory of Mind Development

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The aim of the present study was to investigate the relation between false belief understanding and the linguistic capacities of (i) mental verb comprehension, and (ii) complement sentence production and comprehension. The sample included 70 preschool children within the 3;0-6;6 age range with 10 children in each six-month period. The materials used to assess theory of mind development were Wimmer and Perner's (1983) first order false belief tests "the unexpected contents task" and "the unexpected location task". For the assessment of mental verb knowledge Astington and Pelletier's (2001) task was adapted, while knowledge of complement constructions was assessed by using picture-stories.

It was hypothesized that the linguistic capacities of comprehension and production of complement sentences, and understanding of mental verbs would have been established before false belief understanding.

The findings revealed that children start to establish some understanding about other minds starting around three years of age. Children's performance revealed highest level of understanding for the verb *sanmak* 'think with implication of false belief' as compared to other mental verbs, but understanding of mental verbs did not precede false belief understanding. Memory for false beliefs expressed in complement clauses with the verb *sanmak* 'think with implication of false belief' and age were found to be predicting factors for false belief understanding.

Özet

Zihinsel Durum Belirten Eylemler ile

Zihin Kuramı arasındaki İlişki

Teri Granti

Bu çalışmanın amacı, yanlış kanı atfını anlama ile dil becerileri (i) zihinsel durum belirten eylemleri (*sanmak, düşünmek, bilmek,* vb.) anlama, ve (ii) tümleç cümlelerini üretme ve anlama arasındaki ilişkiyi araştırmaktır. Araştırmaya 3;0-6;6 yaşları arasında, her altı aylık dönemde 10 çocuk olmak üzere, toplam 70 anaokulu çocuğu katılmıştır. Araştırmada zihin kuramı ölçümü için Wimmer ve Perner'ın (1983) birinci aşama yanlış kanı atfı testlerinden "umulmayan içerik testi" ve "umulmayan yer testi" kullanılmıştır. Zihinsel durum belirten eylemlere ilişkin bilginin ölçümü için Astington ve Pelletier'ın (2001) testi uyarlanmış, tümleç cümlelerin ölçümü için ise resimli hikayeler kullanılmıştır.

Bu çalışmanın denenceleri şunlardır: 1) Yaşla birlikte yanlış kanı atfı testlerindeki başarı da artacaktır. 2) Yanlış kanı atfı testlerini geçen çocuklar, zihinsel durum belirten eylemleri de (*sanmak, düşünmek, bilmek)* anlıyor olacaklardır. 3) Yanlış kanı atfı testlerini geçen çocuklar, tümleç cümlelerini üretme ve anlama ile ilgili testlerde de başarılı olacaklardır.

Bulgular çocukların, yanlış kanı atfı testlerinde 3 yaşından itibaren başarılı olmaya başladıklarını ancak bu becerilerinin tam olarak 4 yaş dolayında ortaya çıktığını göstermiştir. Çocukların zihinsel durum belirten eylemler arasında en erken

sanmak kelimesini anladıkları ortaya çıkmış, ancak zihinsel durum belirten eylemleri anlamanın yanlış kanı atfı problemlerini anlamak için belirleyici olmadığı görülmüştür. *Sanmak* fiili ile kurulan tümleç cümlelerde ifade edilen yanlış kanı önermelerini hatırlayabilme ve yaş, yanlış kanı atfını anlamanın en önemli belirleyicileri olarak bulunmuştur.

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1. Introduction

In the last 20 years specific cognitive abilities to understand others as intentional agents, called Theory of Mind, has emerged as a major issue in cognitive studies. Intentionality suggests a person's goal to perform an action (Nelson, 1996), and we interpret the mind of others in terms of intentional states such as desires, emotions and beliefs. It is claimed that theory of mind and language are related (Astington and Jenkins, 1999), and there are studies investigating the direction of this relation. One view is that theory of mind development is dependent on our linguistic abilities (Astington and Jenkins, 1999; De Villiers and De Villiers, 2000), and another view assumes possible effects of theory of mind on language development, particularly mental state verbs (Malle, 2001; Piaget, 1980 cited in Astington and Jenkins, 1999). Probably the nature of this relation depends on the period of development. After all, language provides us a representational medium for meaning and helps us describe other people's and our own actions in an intentional way. And, some capacities in the linguistic domain, particularly those relating to talking about mental representations and false beliefs of others, are said to be related to theory of mind. Acquisition of mental state verbs such as *think, know* and *believe* has been the focus of researchers who try to establish a relation between language and theory of mind.

The present study aimed to explore the relationship between metacognitive vocabulary knowledge and theory of mind development. The focus of the research was on children's understanding of the beliefs of others as measured by first order false beliefs rather than understanding emotions and desires. It is assumed that language influences theory of mind development, it was therefore hypothesized that

certain capacities in the linguistic domain such as the production of complement sentences and understanding of certain mental verbs would have been established before false belief understanding. Children start to acquire metacognitive verbs in naturalistic settings in the preschool years (Astington and Pelletier, 2001). However, children's knowledge of the semantics of these verbs takes time to develop (Nelson, 1996). To date, there were no studies that had investigated this question in a Turkish sample. We had, therefore, no information about when Turkish children acquire metacognitive terms, when they understand their semantics fully and how this relates to their theory of mind development. The present study, therefore, aimed to investigate the relationship between understanding of other's beliefs about reality and metacognitive vocabulary development. In the following sections, the literature on theory of mind development and the development of metacognitive vocabulary will be presented. Then, the relationship between theory of mind and metacognitive vocabulary development will be discussed. Finally, the problem of the study and the hypotheses will be introduced.

1.1. Theory of Mind Development

Theory of mind refers to the ability to represent, and reason about mental states (Malle, 2001). People have beliefs, desires, and intentions which constitute the underlying reasons of their behavior. However, a person cannot directly see, taste, smell, or hear mental states, but it is our everyday understanding that other people have them (Meltzoff, 1999). Theory of mind refers to the capacity to understand the internal states of others and attribute them beliefs, desires, intentions, and emotions in order to engage in social interaction (Astington and Jenkins, 1999). People's

mental states are always changing. As people learn more, their beliefs change, and as they get new ideas their perceptions change, and as their perceptions change, their ideas change. Experience plays an important role for people to acquire new information, which causes them to evaluate their perception about an event or an object. As a result, people's desires or intentions about an object may change even if the object remains the same. But these changes do not cause people to forget their past mental states, and they can still describe them. However, it is very difficult for children of three years of age to recognize that their perceptions or beliefs have changed (Astington and Gopnik, 1991).

When we think about children, in infancy they do not seem to be conscious of their own mental states and are not aware of the thinking abilities of others (Astington and Gopnik, 1991). Preschool children gain a fundamental understanding of human psychology that facilitates their interpretation of people's behavior in terms of mental states like intentions, emotions, desires and beliefs when they develop a theory mind (Flavell, 1999). What do children of different ages understand about the mind, and how does this understanding develop?

Children's daily lives are full of emotion, and routine events that they experience in their family life may have an affective significance (Dunn, 1999). Parents attribute intentions, feelings and desires to their baby's grimaces and crying. Parental interpretation of the states of the baby is mostly based on the baby's expression of emotion; his distress, anger, happiness and pleasure. From very early on, mostly in western cultures, parents engage children in conversations about inner states; emotions and desires, and this may facilitate children's understanding of mind and emotion. Several theorists proposed that family conversations about emotion play an important role in children's talk about emotions and for including feelings in

the representation of events (Welch-Ross, Fasig, and Farrar, 1999; Wang, 2001; Dunn and Hugh, 1998; Dunn, 1999).

At about 18 months, children begin to use terms such as "want" and "like", and to talk about desires. In their daily conversations, 2 year-olds attribute contrasting desires to different people for the same object and differentiate desires from behaviors and from outcomes (Wellman, Phillips and Rodriguez, 2000). When we consider emotions, 18 month-old children begin to talk about simple emotions using such terms as "happy, sad, and mad". In their daily conversations 2 year olds can distinguish emotions from pains, and 2-3 year olds can identify emotions commonly related to certain events such as happiness to birthday (Wellman et al, 2000). Thus, there is a claim that early understanding of internal states (emotions and desires) gives way to a mental representational understanding. The direction of theory of mind development is from desires and emotions to beliefs. Therefore, reasoning about desires and emotions may be supportive for young children's understanding about other minds (Wellman et al, 2000). In this study, in investigating the relations between theory of mind and language, we focused only on the understanding of beliefs of children, which requires mental representational capacity.

Children three years old have difficulty to understand that someone can believe something different from what they themselves know. Also, they do not understand that something can look different from what it really is. This means that young children do not have an adult like mental representation of the mind (Flavell, 1999). So false belief, belief change and appearance-reality tasks are used by researchers to examine the nature of young children's mental representations about the mind.

Researchers of theory of mind indicate that the young child's early understanding of the mind is non-representational. By the age of 3, children move into a transitional stage when they start to understand representational states like beliefs. However, this is based on direct causal links between the world and people's beliefs about it (Meins, 1997). As a result, 3-year-olds cannot understand beliefs that involve misrepresentations of reality; they therefore fail false belief tasks. On the other hand, 4 or 5 year-olds develop a representational model of mind, in which mental states are understood to be representations of reality (Nelson, 1996). These children can understand false beliefs, recognize the change in their own beliefs, deceive others, and distinguish between appearance and reality.

Attributing a false belief to another is achieved by understanding the other's mental representations and their causal connections to reality. Wimmer and Perner's (1983, cited in Astington and Gopnik, 1991) false belief task consists of a story which is acted out for the child. In this story a boy puts a chocolate bar in one place and goes away. Then, the chocolate is moved to another place in his absence. When they boy comes back, he wants to get his chocolate. The experimenter asks the child where the boy will look for the chocolate. Most 3-year-olds fail to predict that the boy will look in the first place where he put it and therefore thinks it is at. That is, they cannot look at the world from the other's perspective at the age of 3. However, children who have acquired the capacity to represent other minds and who understand the concept of false belief should expect the boy to act on the basis of his belief even if the belief is false. Thus, if children do not make a prediction based on false belief, then it indicates that these children do not possess a meta-representational capacity which would enable them to present the mental

representations of reality by others. Therefore, children must understand the relation between perception and belief to answer false belief tasks correctly.

Three year olds have difficulty not only with changed locations but also with unexpected contents (Astington and Gopnik, 1991). They do not recognize that their beliefs change when they find out they were wrong. When asked their prior beliefs about the content of a box, they do not remember their old beliefs and refer to the real content as their answer. In this task, a 3-year-old child is shown a familiar candy box and is allowed to find out that it contains pencils, not candy. Then, the pencils are put back and the child is asked what she thought was in box when she first saw it, she typically says 'pencils' not 'candy'. Furthermore, when we ask her what her friend who has not seen what is inside the box, will think what is inside it, she says the friend will think there are pencils in the box. Three year olds have difficulties in attributing false beliefs not only to others but also to themselves; that is they have problems in identifying representational change even in the case of their own mental states.

Three year olds also do not understand how something can look different from what it really is, in other words they have difficulty in distinguishing between appearance and reality (Astington and Gopnik, 1991). When they are shown an object that has a deceptive appearance such as a sponge that looks like a rock, children think that it is a rock when they look from a distance. They realize that it is a sponge after they touch it. When asked what it looked like before they touched it and what it really is, 3 years old say that it looks like what it really is, a sponge. The children in this age group cannot distinguish between phenomenal appearance and actual reality.

Gopnik and Astington (1988) investigated the developmental relation between the ability to understand representational change (own false belief) and appearance-reality and false belief problems. Results indicated that understanding of representational change develops between 3 and 5 years of age. 3-year-olds consistently described their current thoughts as if these were also their previous thoughts, however 5-year-olds recognized their initial wrong impressions. Gopnik and Astington (1988) expressed that two conflicting representations of the same object is required for understanding representational change (i.e. change in one's own belief), false belief and appearance-reality distinction, but attributing false belief to another was found to be easier than understanding change in one' own beliefs. Astington and Gopnik (1988) suggested that understanding another person's different representation of the world has practical utility in terms of explaining other's behaviors.

Gopnik and Slaughter (1991) examined the importance of representational understanding in reporting past mental states such as beliefs, emotions, images, perceptions and intentions. Results indicated that 3-year-olds have little difficulty in recalling mental states that do not require a representational model of mind. That is, young children easily reported their past pretenses, images, perceptions and what they saw in the past. However, they failed to recall their past beliefs. Reporting past desires and intentions were found to be easier than beliefs but harder than reporting past pretenses, images, perceptions and what they saw in the past. The results support the view that 3-year-old children lack the understanding of representational change. Moreover, results indicated that failure of young children in false belief tasks was not due to memory problems, because 3-year-olds easily remembered other past mental states. Flavell (1999) states that children younger than 4 do not realize that people

think and act in similar to the way they represent the world mentally rather than the outside world actually is.

To summarize, the developments occurring during preschool period is in children's ability to deal with first order false beliefs involving appearance-reality distinctions, unexpected contents and unexpected locations. Children cannot understand beliefs that involve misrepresentations of reality at the age of 3, they cannot look at the world from the other's perspective, they do not recognize that their beliefs change when they find out they were wrong, and do not understand how something can look different from what it really is. With age their correct performance on these tasks increase and they can more correctly speculate about other people's mind and their behavior (Astington and Gopnik, 1991). In the last years of preschool, 4 or 5-year-olds can understand false beliefs, recognize the change in their own beliefs and acquire the ability to deceive others.

1.2. Metacognitive Vocabulary Development

Children begin to acquire language between the ages of 18 months and 2 years, and by the age of 3 they start to acquire abstract terms to talk about their world (Nelson, 1996). They use the verbs "think" and "know" to refer to their mental states. If it is language, as it is claimed, that facilitates children's abilities to understand others' minds, in particular, their beliefs, then what kind of developments in language may contribute to the development of theory mind? Acquisition of mental terms may indicate an understanding of mental states and therefore may reflect the development of the concept of mind in children (Moore, Bryant, and Furrow, 1989). Olson (1988, cited in De Villiers and De Villiers, 2000) proposed that theory of mind

development requires a language for talking about the mind, and the metalinguistic capacity for understanding the semantics of terms such as "think" and "know".

The verbs *think* and *know* were first studied by Johnson and Maratsos, (1977) because of their common use and contrasting implications. These terms are distinctive in their reference to internal mental states rather than external events. Johnson and Maratsos investigated when young children understand the semantics of these terms, that thinking can be false, that knowing presumes truth, and that thinking is not equivalent to saying. The participants were 32 preschoolers who were equally divided into groups of 3 and 4 year olds. Four "Hider and Seeker" stories were told to each subject. The results indicated that 4 year-olds understand that *thinking* may be false and *knowing* must be true, and therefore understand that *know* presupposes truth. Four year-olds did not tend to confuse mental states with external events, and they clearly differentiated thought from what was said and what was actual fact. However, 3 year-olds did not present much evidence that they distinguished these terms. They showed a better performance on questions about hider than about seeker by simply judging the truth of the complement clauses (Where would the hider look to find the item?) and ignoring the mental verbs. Thus, we can say that a sophisticated understanding of mental verbs emerges in 4 year-olds, which corresponds to a better performance on false belief tasks.

Although researchers have investigated children's ability to understand the mental world, little is known about the beginning of such understanding. Shatz, Wellman and Silber (1983) investigated the early use of mental terms in the natural speech of children of very young age. They made a longitudinal examination of one child's speech from 2;4 to 4 years of age. There were 157 samples of speech through a 20-month period. Each sample consisted of 20-30 minute conversations collected

twice a week. In addition, for further study they collected samples from 30 additional children of 2 to 3 years of age. They modified Gelman and Shatz method of analyzing naturally occurring speech. Results indicated that variety and frequency of mental verbs increased from the use of 2 different mental verbs to 11 different verbs in the last month of the 20 month period. There was evidence that children's first use of mental verbs involve either the idiomatic phrase "I don't know" or pragmatic social routines. It was found that mental verbs begin to appear in the child's speech during the third year of life. From this age onwards, the frequency of these verbs increased. Mental verbs were not first used to refer to internal mental states, rather they served the function of directing the interaction. Therefore, subsequent studies focused on the measurement of the semantic as well as the pragmatic functions of these verbs.

Abbeduto and Rosenberg (1985) investigated the development of knowledge about presuppositions of cognitive verbs that take sentential complements. They used comprehension and verb choice tasks, and the verbs included factives and non-factives. Twenty four subjects at each of the chronological ages of 3, 4 and 7 and also twenty four adults were included in this study. It was found that children of 4 years and older were aware of the factive status of *know*, *forget*, and *remember*. By the age of 4, most children were also aware that *think* does not presuppose the truth of its complements. Only the adult group had mastered the presuppositional properties of *believe*, which has both factive and nonfactive properties. 'Believe' is not acquired until age 7. Before they have mastered believe, children treat it as a factive.

Mental terms that are most commonly used in research are 'know' and 'think', which appear in children's speech by the end of age three. Moore and

Davidge (1989) noted that understanding the semantics of different mental terms is later than the appearance of these terms in children's vocabulary. The most commonly studied semantic property is presupposition. Factive verbs, such as *know* and *remember*, presuppose the truth of their complements while non-factive verbs, such as *think* and *believe*, do not. Presupposition refers to the beliefs held by the subject of the mental verb. The term 'know' is differentiated from 'think' by virtue of the fact that the former verb implies that the subject has unambiguous evidence for the truth value of the complement, however the verb 'think' does not imply such an evidence. It is assumed that children do not distinguish the verbs on the basis of their presuppositions until the age of 4 to 5 (Moore and Davidge, 1989).

In their study Moore and Davidge (1989) examined whether children's understanding of mental verbs is first in terms of speaker's certainty/uncertainty or in terms of event factivity/non-factivity. They tried to distinguish the certainty and factivity level of verbs, such as *know* (factive-high certainty) and *think* (nonfactive-low certainty) and *sure* (nonfactive-high certainty). With these contrasts they tried to differentiate the semantic and pragmatic functions of these verbs. There were a total of 60 children within the 3-6 age range, who were told to play a hiding game, in which they would find a hidden candy. The experimenter manipulated the game by using various mental verbs. It appeared that with age children had a better performance in distinguishing *know-think* and *sure-think*, but in the case of *know-sure* they could not make a distinction. It is clear that children start to distinguish *know, think* and *sure* with respect to the expression of certainty at around 4 years of age. It is claimed that instead of the factive and non-factive distinction, children differentiate mental terms on the basis of their function for expressing degrees of certainty, that is, their pragmatic function.

Moore, Bryant and Furrow (1989) designed an experiment to further investigate the pragmatics of mental verbs. They wanted to see if young children recognize that speakers use mental terms to indicate differential degrees of certainty, and if they can respond appropriately on the basis of this information. Sixty nine children between the ages of 3;1 and 8;11 were examined with contrasting pairs of statements by 2 puppets. All the possible combinations of the terms *know, think* and *guess* were used in different trials. Children were required to find an object hidden in one of two places on the basis of instructions. The results provide evidence that comprehension of the use of mental terms to express 'certainty' or 'uncertainty' develops over the preschool years. By 4 years of age, children can distinguish between *know* and *think*, *know* and *guess*, and they can understand that they can rely on the statements with *know* better than the statements with *think* or *guess*. This understanding appears to be complete by 5 years of age. However, the distinction between *think* and *guess* was not well understood at any age studied in this experiment. The studies indicate that understanding of the semantic difference between *think* and *know* appear between 4 and 5 years of age. They argue that before age 4, *think*, like *know*, is treated as a factive. Therefore, semantic and pragmatic understanding seems to emerge together.

Why children treat *think* as a factive is an interesting question. Until age 4, children are mostly exposed to their parents' conversations, and for children what their parents say is always true, so it would be unlikely for a word which their parents use to be a nonfactive. However, by experiencing this word in different settings, such as in school, they may extract the meaning from its use in discourse by recognizing the relevance of the word within the context. Therefore, children's understanding of the pragmatic function of expressing relative certainty might be

based on the semantic understanding of factive and nonfactive mental verbs (Moore, Bryant and Furrow, 1989).

1.3. The relation between mental verbs and theory of mind development

The relation between language and theory of mind development is one of the most important topics for researchers to deal with even if the existence of a connection is not debated. The direction of the relationship, whether theory of mind depends on language or language depends on theory of mind development, is being questioned. The first view argues that certain linguistic abilities are crucial for the representation of mental states (Astington and Jenkins, 1999; De Villiers and De Villiers, 2000; Dunn, 1999). According to this position, language development, which includes syntactic and semantic ability, may promote the understanding of false-beliefs. The second view that language depends on theory of mind (Malle, 2001; Leslie, 1988; Piaget, 1980 cited in Astington and Jenkins, 1999) argues that children first acquire some understanding of false beliefs, and then their language abilities, semantic and syntactic, improve and reflect these developments in false belief. According to this view, theory of mind is not dependent on linguistic representation.

Theory of mind development (false belief understanding) and mental verb knowledge seem to be related because both require the same representational capacity (Flavell, 1999). False belief understanding depends on the ability to recognize that people think and behave according to the way they represent the world mentally, rather than the real world situation. So, people should have a representational conception of the mind to make inferences in hypothetical situations

(Flavell, 1999). Furthermore, mental verb knowledge promotes the understanding of mental world and discussing mental events by use of complement sentences. Therefore, with this knowledge we can represent someone's mental state, which may be different from ours. Thus, mental verb knowledge provides the necessary tool for representing false beliefs (De Villiers and De Villiers, 2000).

Language provides us a representational medium for meaning and intentionality with its pragmatic, semantic and syntactic aspects (Astington and Jenkins, 1999). And, each one of these components plays a different role in theory of mind development. Pragmatic ability is to use and interpret language appropriately in social situations by paying attention to speakers' beliefs, intentions, desires, states of knowledge and ignorance. As discussed earlier, using certainty and noncertainty markers is related with pragmatic ability. Semantics is related to word-meaning; it is crucial to learn words that refer to mental states such as *think*, *remember*, *believe*, *forget* and *know* in order to develop an understanding of these states experienced by the self and by others. Syntactic ability is the ability to make sequences and combinations of words in the formation of sentences and phrases. It is important to have the syntactic ability to comprehend and produce complex constructions (complement sentences) (de Villiers and Pyers, 2002, p.1056).

Sentences containing mental state verbs require an embedded proposition, which is called a *complement* in linguistics (He thought it was red). Complements are used with verbs of desire (want), communication (say, ask) and mental state (know, think, forget). Some of these verbs can take a simple noun phrase (She wants a ride) but they can also take a whole embedded proposition expressed in complement clauses (We forgot that he lost the key). Complements also provide a basis to talk about lying or mistakes: *He said he had salad for lunch* (*but he really had pizza*); *He*

thought he left the door open (De Villiers and De Villiers, 2000). De Villiers and De Villiers (1995, cited in Astington and Jenkins, 1999) argue that forming a sentence with mental verbs requires the usage of embedded propositions and that is what is implied in first order false beliefs. Acquisition of such complement constructions might provide the representational format that is needed for false belief understanding (Astington and Jenkins, 1999, p.1313).

Astington and Jenkins (1999) investigated the direction of the relationship between language and theory of mind development, and examined the contributions of semantic and syntactic abilities to this relation. Regression analyses indicated that language at an earlier point in time (children at the mean age of 40 months) predicted theory of mind performance, that improvement of linguistic abilities increases children's theory of mind performance, but not vice versa. They found that syntax i.e- the ability to control complement clauses, made an independent contribution to the prediction of theory of mind but semantics made no additional contribution. Thus, they suggest that object complements promote false belief understanding because the structural features of language provide the necessary tools to represent false beliefs. Both Astington and Jenkins (1999) and de Villiers and Pyers (2002) provided evidence to the relation between language and theory of mind, by showing that performance on linguistic tasks is a precursor of successful false belief performance, but the reverse is not true.

Regarding the role of language Lohmann (1999) examined whether knowledge of metacognitive verbs and complement sentence understanding in 3-8 year olds would predict their theory of mind performance. She investigated the development of semantics of mental verbs and syntax of embedded sentences, and looked at the relation between these and theory of mind performance. It was found

that metacognitive verb understanding develops over time and there is progress in understanding of *know, understand* and *forget* after 4 years of age. Most terms are well differentiated before 8 years, but there are still difficulties with *predict, deny* and *guess*. The analyses indicated that embedded sentence competence is the primary predictor of theory of mind performance. The direction of the relationship between first order false belief and embedded sentence production is that embedded sentence precedes correct false belief performance. Therefore, acquisition of grammatical structure of embedded sentences may be a prerequisite for acquisition of mental verbs, because their use requires use of embedded clauses. Thus, syntax plays a significant role in development of theory of mind.

De Villiers and De Villiers (2000) also argued that children who have mastery of complement sentences (embedded propositions) might have already acquired the capacity to represent the belief states of other people in his own mind. Complex syntactic structures that are used for explaining mental events facilitate representational changes, which allow for understanding false beliefs. The embedded propositions are necessary for a language for discussing mental events, thus complementation provides a tool for representing other's mental world, which may be different from ours.

Perner (1991) investigated children's comprehension of the word *know* and their understanding of knowledge. He discusses the concept of knowledge and suggests that correct mental representation of information is acquired by a reliable evidence, which provides us to make a correct action. Access to information is necessary for the existence of knowledge, however children lack the understanding of the necessity of access to information for acquiring knowledge. According to Perner, episodic information requires metarepresentational interpretation of how

information was obtained. There is an important distinction between semantic and episodic cues. Semantically retrieved information is experienced as known, however information obtained through episodic cues is experienced as remembered (Perner, 1991). Then, the reason for the inability of children younger than 4 years to form episodic cues may be the lack of metarepresentational capacity. Therefore, acquisition and use of the verb 'know' becomes essential to conceptualize knowledge as a representational state of mind.

Metacognitive terms are used to refer to the mind, differentiating cognition (perception and communication) from other types of mental state, such as desire, intention, and emotion. Studies on theory of mind development generally focus on the preschool years, with a few exceptional studies investigating children during school years (Astington and Pelletier, 2001).

In one study Moore, Pure and Furrow (1990) examined children's understanding of the expression of speaker certainty and uncertainty and its relation to theory of mind development. They conducted two experiments and in the first study 80 children between 3 and 6 years of age were presented with a task in which they had to guess the location of an object hidden in one of two boxes. The children were presented with contrasting pairs of statements by 2 puppets as clues for location. Different trials consisted of either the modal verbs *must*, *might*, and *could*, or the modal adjuncts *probably*, *possibly*, and *maybe*. The results indicated that the terms expressing relatively high degrees of certainty started to be differentiated from the terms expressing lower degrees of certainty at about 4 years of age. Between 3 and 4 years, children's understanding of the difference between *must-might*, *must-could*, and *probably-maybe* improved significantly. By 5-6 years, the *probably-possibly* distinction improved.

In the second experiment, they also examined whether the competence on modal terms was related to competence on mental terms, and whether performance on a certainty task was related to their understanding of beliefs. Twenty six four-year olds were presented with the certainty task, testing both modal and mental verbs, and the false belief, representational change, and appearance reality tasks. It was found that children's performance with modal terms and mental terms was highly correlated. This result shows that 4 year-olds develop an understanding of mental state verbs expressing relative certainty. Children who could make use of modal and mental terms to find the hidden object also performed better on false belief tasks. Therefore, these results imply that performance on all of these tasks are intercorrelated, and understanding of the nature of mental states is related to understanding mental terms and expressions of degrees of certainty. These two experiments show that children start to understand that people may have beliefs with differing degrees of certainty at 4 years of age, and this understanding basically depends on understanding of the nature of beliefs. Children need to understand that beliefs and other mental states refer to a world outside the mind, and need to recognize that mental states are representational (Perner, 1991). Therefore, children who understand the nature of mind are able to recognize the existence of false beliefs in others and changes in their own beliefs, and also others can hold beliefs with differing degrees of certainty.

The discrepancy between children's natural language data and their failure in false belief tasks led researchers to focus on children's language ability. For instance, children's understanding of modal verbs was investigated in different languages. Modal verbs are necessary for considering hypothetical situations and also for thinking, making predictions and expressing intentions and desires (Wakefield,

1997). Considering possible alternatives is an important capacity for making decisions and for logical reasoning, such as making abstractions and deductions, which are also necessary for false belief understanding. Wakefield (1997) assessed children's understanding of modal verbs and speaker's certainty while making inferences. She differentiated between modals of necessity (must, should) and modals of possibility (may, might, could, would) in English. Then, she asked children to make inferences and to assess speaker's certainty in sufficient and insufficient information conditions. Findings demonstrated that using modal concepts of necessity and attributing certainty to speaker in sufficient information conditions developed earlier than using modal concepts of possibility and attributing uncertainty to speaker in insufficient information conditions. It was found that attributing certainty appears early on, while attributing uncertainty is established more slowly.

Aksu-Koç (1988) studied Turkish children's knowledge of the modal distinction between inferential past and the past of direct experience as expressed by the tense- aspect- modality marking inflections. In Turkish, particle *-dı* refers to past of direct experience whereas particle *-mış* refers to situations of indirect experience. A speaker who reports an event by using *-mış* indicates that s/he has not witnessed the event, but is making an inference from its observable results or is reporting hearsay. In her research, Aksu-Koç (1988) studied the acquisition of evidential markers indicating indirect evidence and direct past markers in Turkish children. She found that *–dı* emerged first and was followed by *–mış,* and that a sharp developmental improvement just after the age of 4. At the age of 3, children's use of *-dı* and *-mış* seemed to be unreliable, because they seemed not to be aware of what the semantic/pragmatic differences between the two forms are. This finding supports the assumption that children lack the understanding of the requirement for a source

of evidence for acquiring knowledge. However, by the age of 4, they have a clear understanding that these markers give information about speaker's source of evidence and, thereby, degree of certainty.

Aksu-Koç and Mersin-Alıcı (2000) investigated the developmental relations between Turkish children's understanding of representational change, false belief and the acquisition of the *–DIr* particle, another modal form. The use of the *–DIr* particle, is based on the speaker's prediction, with less than full certainty, of a situation on basis of what is known to be a habitual behavior. That is, this particle requires deduction from prior experience in the absence of evidence. In one of its uses, it thus indicates uncertainty/nonfactivity. The results of Aksu-Koç and Alıcı's study indicated that children who were successful in false belief tasks used formal markers of noncertainty significantly more than those who failed it. Turkish children showed the capacity to hold a theory of mind between 3 to 4 years when they were also productively using noncertainty markers. There seems to be a close relationship between false belief understanding and use of noncertainty markers; however, this relationship does not immediately display itself in children's performance on language tasks that require reflective awareness. With an increase in age, children displayed a higher level of awareness for noncertainty markers. Children need to experience different settings to make pragmatic operations on these evidential markers and they are required to have metarepresentational understanding of the implication of alternative and possible realities. This metarepresentational capacity seems to emerge at about 6 years (Aksu-Koç and Mersin-Alıcı, 2000). Therefore, around 6 years, children start to reorganize their understanding of the pragmatics of noncertainty/nonfactivity markers.

Vinden (1996) examined Junin Quechua children's vocabulary and their understanding of mind in comparison with Western children. The study indicated that on appearance vs. reality tasks they performed similar to Western children, however, on representational change and false belief tasks they performed poorly in comparison. Vinden (1996) suggests that language must be a factor that prevents them from performing correctly on false belief and representational change tasks since there is no explicit mentalistic vocabulary in Junin Quechua, but mental verbs are essentially verbs of saying. Therefore, Quechua children do not look for mental basis of behavior and do not reflect on their thoughts but they just express on the basis of action.

Lee, Olson and Torrance (1999) tried to observe whether the same developmental pattern of false belief understanding exists with Chinese speaking children between 4 and 5 years old and the effect of Chinese language on children's performance in false belief tasks. In Chinese language there are several verbs for talking about true and false beliefs and appearance vs. reality. The study showed that when the verb implies that the belief referred to may be false, children's performance on false belief tasks is better than when the verb used is neutral. Therefore, availability of such mental verbs in their language may have facilitative effects on development of false belief understanding.

Doherty and Perner (1998) tried to find a common factor between metalinguistic awareness in the domain of semantics and the ability to understand the representational nature of mind. They assumed that metalinguistic awareness will appear at the same time that children begin to succeed on the false belief tasks, at about 4 years of age. Four year olds were shown items in a picture (e.g., a rabbit) and were asked to name them with a common noun. Then, another person or a puppet

named the same picture with a synonym ("This is a bunny") or with a wrong label ("This is an elephant"). The child was told that the puppet's task was to label the item correctly (same meaning) but using a different name (different form) than the child. Then the child was asked if the puppet did what it was supposed to do; the correct response was to say "yes" if the puppet used the synonym. In order to pass the synonym task, the child is required to realize that something can be represented in different ways. Thus, there is a close relationship between false belief tasks and synonym tasks, both of which require the same representational capacity. The results indicated that metalinguistic awareness emerged at around the age of 4, and that there was a strong relation between the metalinguistic awareness task, (synonym task), and false belief tasks. Research on the acquisition of word meaning has shown that children tend to arrange words into mutually exclusive categories (Doherty and Perner 1998). Between the ages of 2 to 6 years, they tend to map novel words onto novel objects more frequently than onto objects for which they already know a name. They tend to reject novel labels for an object with a known label, that is, they have a bias that an object can have only one label. This means that children show a resistance to learning synonyms. Flavell (1988, cited in Doherty and Perner, 1998) suggested that theory of mind tasks and mutual exclusivity tasks both require an understanding that objects can be represented in more than one way. Therefore, both tasks share a common conceptual basis. Children's representational capacity allows them to pass both the false belief and synonym tasks. In addition, the synonym task, used in that study, requires the most basic features of language (same and different meaning of words) not complex grammatical characteristics. As a result, children succeeded on this task and showed that they develop metalinguistic awareness at the age of 4, although there is contradictory view that this awareness in general develops

between 5 to 8 years (Gombert, 1992, Tunmer and Herriman, 1994, cited in Doherty and Perner, 1998). Consequently, this study made an association between the false belief tasks and metalinguistic synonym tasks that both require the same representational capacity. And, the results support the prediction that metalinguistic awareness can develop at around 4 years and underlying reason for the ability to understand beliefs is same with the development of understanding representations.

1.4. Aims of the study

The first aim of this study was to investigate the development of the understanding of metacognitive vocabulary in a Turkish sample. The development of metacognitive vocabulary has been examined in French and English but not in Turkish. Since the grammatical structure of the Turkish language is different and it contains evidential markers such as the verb inflections *–dı*, *–mış* and *–dır* as well as a specialized false belief verb *sanmak*, we were interested to study this issue in Turkish. The inflection *–dı* indicates direct experience, *–mış* indicates the speaker's indirect experience based on inference or hearsay, and the nonfactive *–dır* indicates the speaker's deduction on the basis of past experiences. Studies show that Turkish speaking children begin to use these evidential markers, which do not exist in Indo-European languages, as early as 2-3 years of age (Aksu-Koç, 1988). Therefore, they may be sensitized to the possibility that people's mental representations may be linked to reality in different ways (through direct experience, through inference from indirect experience and through inference from previous knowledge), and this may facilitate their understanding of metacognitive verbs which encode mental states at an earlier age. Furthermore, the semantics and pragmatics of metacognitive verbs in Turkish might show some differences from those in other languages and it was

uncertain when children construct a full understanding of the functions of these verbs.

A second research aim is to look at the relationship between knowledge of metacognitive vocabulary and theory of mind development. In line with the studies in the literature we expected to find a relation between the two lines of development, because understanding and use of metacognitive verbs such as *think, know* and *believe* in certain types of complement constructions rests on the same kind of representational capacity required in understanding false beliefs. For this purpose, understanding of false beliefs was also assessed with the same sample of children. It was expected that majority of the children who pass false belief tasks would also pass mental verb items *sanmak* 'think with implication of false belief in past tense', *bilmek* 'to know' and *düşünmek* 'to think' since these verbs were used in the administration of false belief tasks and the concepts they encode were expected to be accessible to children. Thirdly, as was discussed above, mental verbs serve a metarepresentational function when they are used as main verbs taking complement clauses that describe the mental states of others (which may be true or false representations of reality) "I think she will look in the cupboard to find the candy" (De Villiers and De Villiers, 2000). False belief understanding also requires metarepresentational capacity since it necessitates the representation of the representation of another mind in a situation where that representation does not match reality. It was therefore expected that understanding of certain mental verbs would be closely related to the understanding of others' beliefs. For this reason, the relationship between children's use of mental verbs in complement constructions and their understanding of false beliefs were also investigated. It may be that it is the use of mental verbs with false complements which facilitates the ability to maintain

different representations of reality that is required for understanding representational change and false beliefs (Lohmann, 1999; De Villiers and De Villiers, 2000).

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1.5. Hypotheses

On the basis of the theoretical assumptions stated above, the following hypotheses were put forward:

Hypothesis 1: Correct performance on false belief tasks will increase by age.

Hypothesis 2: Children who pass false belief tasks will also have passed mental verb items *sanmak* 'think with implication of false belief in past tense', *bilmek* 'to know' and *düşünmek* 'to think'.

Hypothesis 3: Children who pass false belief tasks will also have passed complement sentence tasks.

No hypothesis is stated for the development of the semantics of mental verbs. Since this issue has not been investigated in Turkish, an exploratory study was carried out to discover when the understanding of the semantics of mental verbs appears in children's vocabulary.

2. Method

2.1. Sample

Preschool children between 3;0-6;6 years of age were included in the sample. The sample consisted of 20 children (10 boys, 10 girls) in each age group, with 10 children in each six-month period. There were a total of 70 children and all of the children cooperated with the experimenter. Participants were selected from various preschools and elementary schools in middle income residential areas.

2.2. Materials

2.2.1. Theory of Mind Tasks

Wimmer and Perner's (1983) first order false belief tests were used to assess children's theory of mind.

a) The unexpected contents task

The child was presented with a familiar box, which typically contains candies (bonibon box). She/he was shown the box and asked what she/he thinks is inside the box. Then the box was opened and the child was allowed to discover the unexpected contents; pencils, in the box. During the test phase the child was asked, *Ben kutuyu açmadan once sen içinde ne var sanmıştın?* "What did you think was in the box before you looked inside?" to assess his/her representational change (own false belief) ability and asked, *Arkadasın X... gelince bu kutuda ne var sanır?* "What will your friend X... think is in the box?" to assess his/her understanding of other's false belief.

b) The changed location task

One puppet named Minny was presented to the participants. Minny put some chocolate in one place and went away. In his absence, not to be soften, the chocolate had been moved to a refrigerator by the experimenter. Then Minny came back to take his chocolate and the subject was asked, *Minny çikolatayı almak için ilk nereye bakacak?* "Where will Minny first look for the chocolate?" This task only assessed children's understanding of other's false belief.

For a child to be considered as passing the false belief task, s/he had to perform correctly on both the unexpected contents and the changed location tasks. That is, if the false belief questions of both tasks ("*Arkadasın X... gelince bu kutuda ne var sanır*?" 'What will your friend X.. think is in the box?' and "*Mini çikolatayı almak için ilk nereye bakacak?*" 'Where will Minny first look for the chocolate?') were answered correctly, then the child received a score of 1, otherwise s/he received a score of 0.

Representational change was assessed only in the unexpected contents task with the question *"Ben kutuyu açmadan önce sen icinde ne var sanmıştın?"* 'What did you think was in the box before I opened it?' If this question was answered correctly, the child received a score of 1, otherwise s/he received a score of 0.

2.2.2 Language tasks

a) Measurement of understanding and production of complement constructions

Syntactic ability was assessed with pictures including familiar cartoon characters "Edi and Büdü". There were eight stories and each story consisted of 2-3 pictures and at the end of each story, the child was required to produce embedded sentences using the mental verb *sanmak* 'think with implication of false belief in past

tense'. Half of the stories included false belief statements and subjects were asked to report the characters belief (De Villiers and De Villiers, 2000). The other half, on the other hand, did not include false belief statements. The first set of items measure memory for false beliefs (type-A items henceforth) whereas the second set was designed to assess children's ability to produce the syntax of complementation (type-B items henceforth).

Ex (1): Item for memory for false beliefs

(Resim1) *Edi ile Büdü resim dersindeler. Edi, gizlice Büdü'nün boya kalemlerini çantasından alıp sıranın içine koyuyor.*

(Resim 2) *Öğretmenleri "Hadi bakalım kalemlerinizi çıkartıp resimlerinizi boyayın" diyor.*

Büdü kalemlerinin çantada olduğunu sanıyor ama aslında kalemler sıranın içinde!

Şimdi söyle bakalım, Büdü ne sanıyor?

(Picture 1) Edi and Büdü are in art lesson. Edi takes Büdü's pencils out of his bag while he is not looking and puts them inside the desk.

(Picture 2) The teacher says "Come on, take your pencils out and paint your pictures".

Büdü thinks that his pencils are inside the bag however his pencils are inside the desk!

Now, tell me, what does Büdü think?

In this story the target sentence is *Büdü kalemlerinin çantada olduğunu sanıyor* 'Büdü thinks that his pencils are inside the bag'. The clause that expresses a false belief using a complement construction is underlined. In this set of items the expected response is modeled to the child by the experimenter.

Ex (2): Item for syntax of complementation

(Resim 1) *Bak Edi yatağına yatmış, Büdü de ona kitap okuyor.*

(Resim 2) *Edi'nin gözleri kapanmış. Büdü de "Aa Edi uyudu" deyip okumayı bırakıyor.*

Şimdi söyle bakalım, Büdü ne sanıyor?

(Picture 1) Look, Edi is in his bed and Büdü reads a book to him.

(Picture 2) Edi's eyes are closed. Büdü says that "Hm Edi slept" and finishes reading the book.

Now, tell me, what does Büdü think?

In this story the target sentence is *Büdü, Edi'nin uyuduğunu sanıyor* "Büdü thinks that Edi is sleeping". In this set of items the expected response is not modeled to the child.

Correct response to the type-A items designed to evaluate memory for false belief statements expressed by complement clauses, implies that the child comprehends and can keep in mind the meaning of the complement clause as well as its syntax. On these items children were scored on the basis of both their syntactic and semantic knowledge. On the type-B items designed to test the child's ability to produce the syntax of complement clauses with *sanmak* 'think with implication of false belief in past tense' children were scored for their syntactic knowledge. Both sets of items were scored in a similar fashion for correct syntax. Children who used the verb *sanmak* 'think with implication of false belief in past tense' with *–dık* or *–ecek* complements (*uyuduğunu sandı* 'thought that he fell asleep', *yıkayacağını sandı* 'thought that he was going to wash') were given a score of 2, those who used the verb *sanmak* with finite verb forms (*uyumuş sandı* 'thought that he fell asleep', *yıkayacak sanmış* 'thought that he was going to wash') were given a score of 1 and those who used ungrammatical forms got a score of 0. As noted above, type-A items were also scored on semantic grounds, that is, for memory for the false belief

statements. Children who repeated the false belief statement were given a score of 1, those who gave a wrong response by referring to the reality condition were given a score of 0. For example, when asked "*Edi ne sanıyor?*" (What does Edi think?) after the statement "*Edi, Büdü'nün pasta alacağını sanıyor, ama Büdü dondurma getiriyor*" (Edi thinks Büdü will buy a cake but he brings an ice-cream) a child who responds "*Edi, Büdü'nün dondurma getireceğini sanıyor*" (Edi thinks Büdü will bring an ice-cream) gets a 0 for his/her wrong answer. In order to be able to compare the syntax and semantics scores, syntax scores of type-A items were adjusted so that a child who used used *–dık* or *–ecek* complements were considered to have produced correct syntax and were given a score of 1, otherwise they were given a 0.

b) Measurement of Mental Verb Knowledge

Children's mental verb knowledge was assessed by an adaptation of Astington and Pelletier's (2001) test to Turkish. The children were told stories about a brother and a sister and they were shown 3-4 pictures for each of the stories. There were a total of 9 different stories that assess the understanding of different mental verbs.

Ex:

Sınıf yarın hayvanat bahçesine gidecek. Selin "Yağmurluklarımızı getirmemize gerek var mı?" diye soruyor. Emre "Yağmur yağmayacak. Yarın bütün gün güneşli olacak." diyor.

Söyle bana: Emre yarın havanın güneşli olacağını ***biliyor mu*** *yoksa havanın güneşli olacağını* ***düşünüyor mu****? (doğru cevap = düşünüyor)*

Their class is going to go to the zoo tomorrow. Selin asks "Do we have to bring our raincoats". Emre says that "It is not going to rain. Tomorrow it will be sunny".

Tell me: Does Emre **know** that it will be sunny or does he **think** that it will be sunny? (correct response = think)

Thus, at the end of each story the child was presented with a forced choice question contrasting two metacognitive verbs only one of which was a correct representation of the mental process described in the preceding story. Although for half the items the correct response was the first member of the forced choice pair and for half the items it was the second member, unfortunately, this ordering was not counterbalanced for each verb. Each verb therefore appeared either as the first or the second member of the forced choice-question, and it is possible that certain verbs got a higher proportion of correct responses because they were heard last by the children, that is, due to a recency effect. For this reason separate total scores were obtained for items where the correct response came first (Order I) and items where the correct response came second (Order II).

Position of the verbs in forced choice questions; the correct response is underlined.

1st	2nd
sanmak 'think with implication of fb in past tense'	*bilmek* 'know'
anlamak 'understand'	*açıklamak* 'explain'
bilmek 'know'	*hatırlamak* 'remember'
hatırlamak 'remember'	*sanmak* 'think with implication of fb in past tense'
düşünmek (think)	*sanmak* 'think with implication of fb in past tense'
göstermek 'show'	*kandırmak* 'deceive'
hatırlamak 'remember'	*unutmak* 'forget'
bilmek 'know'	*tahmin etmek* 'guess'
bilmek 'know'	*düşünmek* 'think'

Correct responses to the 9 items of the mental verbs task were scored +1 and incorrect responses were scored -1. This is because there was a 0.5 probability of being correct by chance; in this way scores for random responses simply cancel one another. Scores for individual items were summed to give the total mental verb score,

which can range from -9 to +9. If a child responded just randomly then his/her score is either +1 or -1.

2.3. Procedure

Each child was tested individually in one session on a single day, in a private room in the preschool. There were seven preschools which served children from middle class families. It took approximately 20 minutes for one child to perform all tasks.

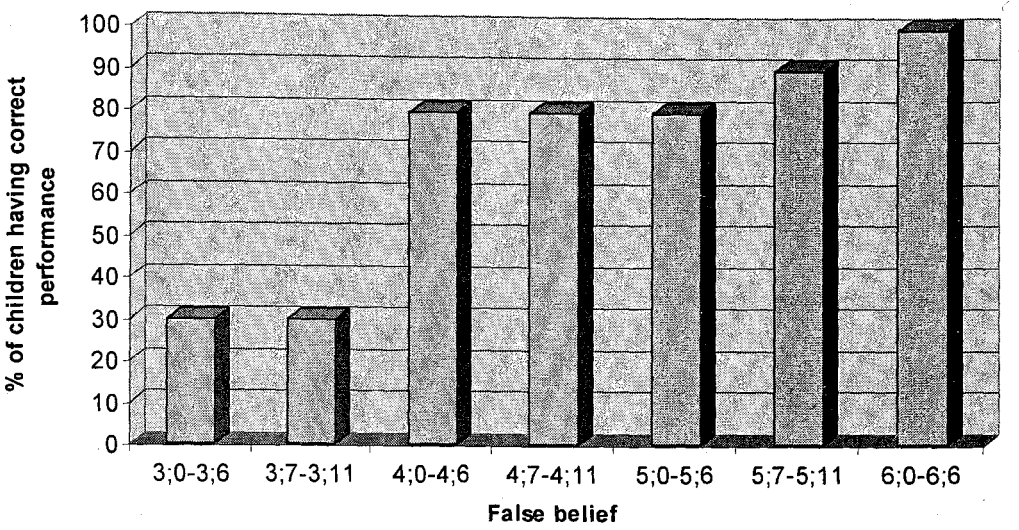
All tasks were given in a random order and task items were randomized among themselves. Therefore, no child received the same order of questions.

3. Results

3.1 Analyses for False Belief Tasks

Hypothesis 1 predicted that correct performance on false belief tasks would increase by age. In order to see the distribution of children who showed correct performance on both false belief tasks by age a chi-square analysis was conducted. The proportion of children who passed the false belief tasks increased significantly with age, (χ^2 (6, N=70) = 22.857, p< .001). The analysis indicated that while 30% of the children between 3;0–3;6 and 30% of the children between 3;6-3;11 years of age succeeded on both false belief tasks, 80% of those between 4;0-4;6 years showed correct performance. As can be observed in Figure 1 below, there is a major jump around 4;0 years of age. Thus, hypothesis 1 is supported by the data.

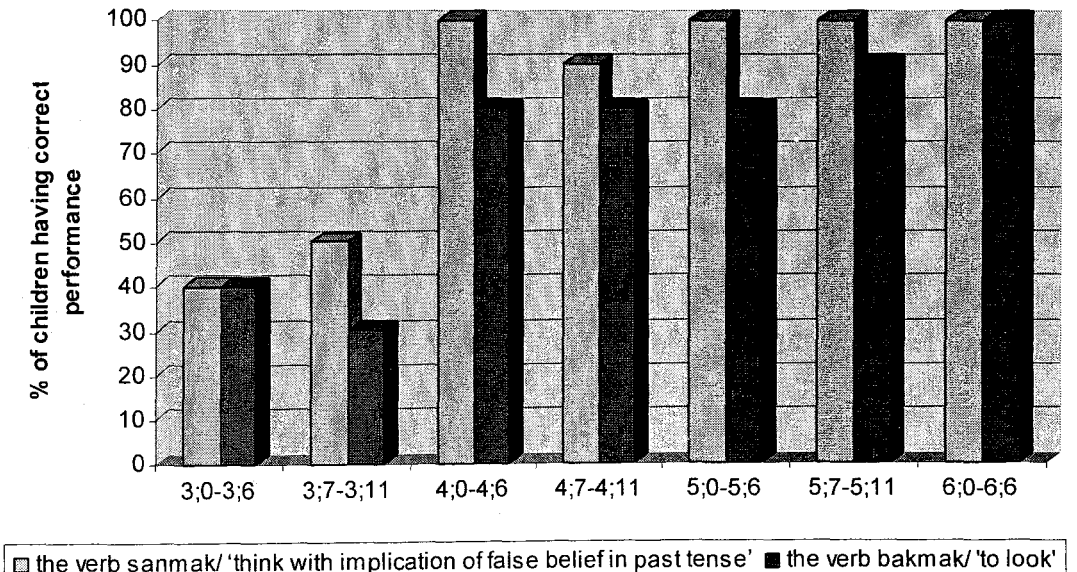
Figure 1: Percent distribution of children who showed correct performance on both false belief tasks by age



In the unexpected contents task the question was posed using the verb *sanmak* 'think with implication of false belief in past tense', and in the changed location task the question was posed using the verb *bakmak* 'look'. In order to see whether the use of these verbs made a difference two separate chi-square analyses were conducted. The analysis indicated that the percentage of children who passed the unexpected contents task in which the question was asked by the verb *sanmak* 'think with implication of false belief in past tense' increased significantly with age χ^2 (6, N=70) = 29.167, p< .001. For the changed location task in which the question was asked by the verb *bakmak* 'look', the analysis also revealed a significant result χ^2 (6, N=70) = 20.020, p< .01. While 40% of the children between 3;0-3;6 years of age succeeded on each of the two tasks, this percentage is 50% in the task in which the question was asked by the verb *sanmak* 'think with implication of false belief in past tense' and 30% in the task in which the question was asked by the verb *bakmak* 'look' between the ages 3;6-3;11. As can be observed in Figure 2, performance of children is better in the task in which the question was asked by the verb *sanmak* 'think with implication of false belief in past tense' for all ages when compared to

the task in which the question was asked by the verb *bakmak* 'look'. There was a ceiling effect between 6;0-6;6 year-olds, therefore, a chi-square analysis was conducted on the whole sample excluding the six year-olds to compare performance on the two false belief tasks. The analysis revealed that a significantly higher percentage of children passed the false belief task in which the question was asked by the verb *sanmak* 'think with implication of false belief in past tense' than with the verb *bakmak* 'look' χ^2 (1, N=60) = 22.969, p< .001. We can conclude that children performed better when they were exposed to the question asked with the verb *sanmak* 'think with implication of false belief in past tense' compared to the verb *bakmak* 'look'.

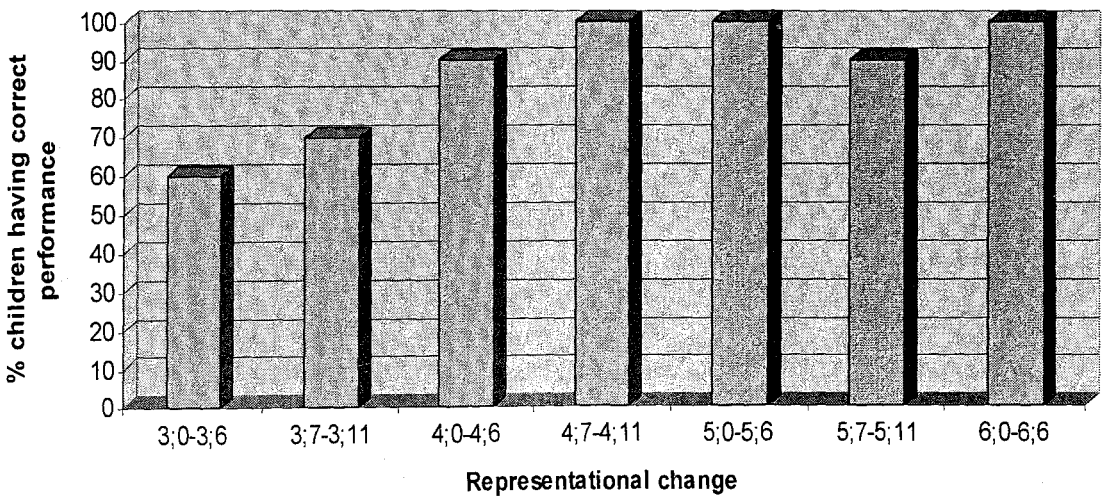
Figure 2: Percent distribution of children who showed correct performance on the two false belief tasks using two different verbs in the question, by age



Another chi-square analysis was conducted to examine performance on the representational change (RC) item on the unexpected contents task by age. The analysis revealed that there was a significant difference in the percentage of children

who passed the representational change question by age χ^2 (6, N=70) = 13.77, p< .05). It was observed that 60 % of the children between 3;0–3;6 years and 70 % of those between 3;6-3;11 succeeded on the representational change question. After the age of four, 90 % of children succeeded on the representational change question (see Figure 3). A further chi-square analysis was conducted for the age intervals 3;0-3;11 and 4;0-4;11 to examine performance on representational change question. The analysis revealed a significant difference χ^2 (1, N=40) = 5.625, p< .05) indicating that children between 4;0-4;11 years-old performed better than the children between 3;0-3;11 years-old. Again, the major change in performance appears around 4 years, however this change is not as sharp as in false belief tasks, and at all ages higher percentages of younger children are able to answer the representational change question correctly than the false belief question.

Figure 3: Percent distribution of children who showed correct performance on the representational change question on the unexpected contents task by age



These results are interesting considering the ages reported in the literature for the major shifts in false belief understanding. Figure 4 shows that the percentage of

Turkish speaking children who pass both the representational change and the false belief questions of the unexpected contents task is much higher than the percentage of English speaking children reported by de Villiers and Pyers (2001) at all ages.

Figure 4: Percent distribution of Turkish speaking and English speaking children who pass both the representational change and the false belief questions on the unexpected contents task by age

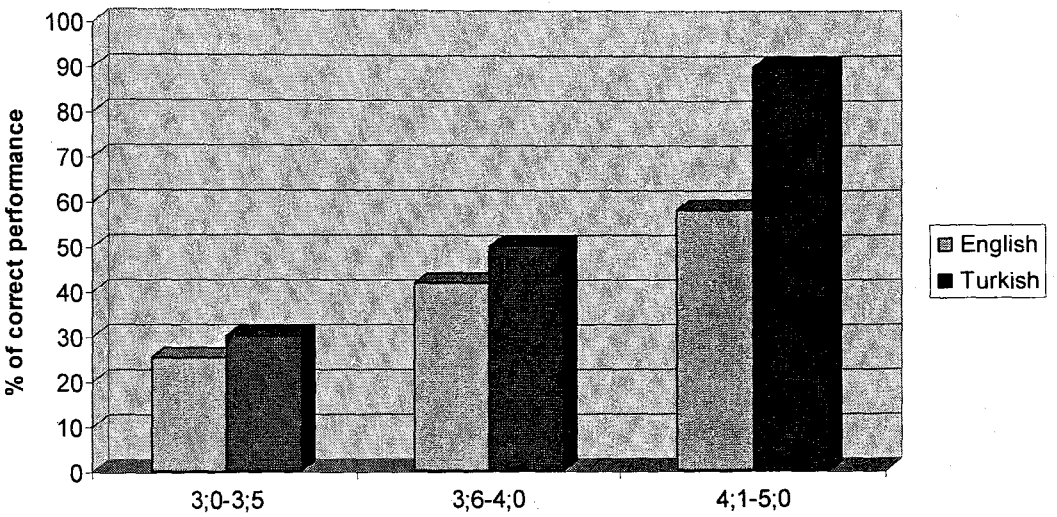


Table 1 shows the cross-tabulation of the younger subjects in terms of their performance on the representational change and false belief tasks. A chi-square analysis indicated that there was a significant difference in the number of children who passed the representational change question and false belief questions between 3;0-3;11 years of age (χ^2 (1, N=20) = 4.615, p< .05) and 4;0-4;11 years of age (χ^2 (1, N=20) = 4,211, p< .05). It is observed that there are no children who passed the false belief items but failed on the representational change item.

Table 1: Distribution of 3 and 4 year olds in terms of their performance on representational change and false belief questions

		FB			
		3;0-3;11		4;0-4;11	
		Fail	Pass	Fail	Pass
RC	Fail	7	0	1	0
	Pass	7	6	3	16

3.2. Analyses for Mental Verbs Task:

The aim of the present analysis was to examine how children acquiring Turkish come to build the semantic domain of a set of mental verbs in their language. More specifically, in what order do they show correct understanding of the meaning of mental verbs. No specific predictions were made in this regard.

To see whether correct responding was a function of the position of the verb in the forced choice question (whether it came first or second) a paired samples t-test was conducted. The analysis yielded a significant difference between the total scores obtained on the two sets of mental verbs ($t(69) = -6.18$, $p < .001$), indicating an order effect. There were a higher proportion of correct responses on the list where the correct choice came second in the forced-choice pair (Order II). This suggests that if children did not know the response, they tended to repeat the verb that the experimenter had mentioned last in her question. The verbs that were presented as the first of the pair in the forced choice question (Order I) were *sanmak* 'think with implication of false belief in past tense', *hatırlamak* 'remember', *bilmek* 'know', *düşünmek* 'think', and *anlamak* 'understand'; the verbs that were presented as the second of the pair in the forced choice question (Order II) were *kandırmak* 'deceive', *unutmak* 'forget', *tahmin etmek* 'guess', *düşünmek* 'think'.

In view of this order effect two separate 2 (gender) x 7 (age) ANOVA's were carried out for the two sets of mental verbs. The ANOVA for Order I revealed that both age ($F_{(6,56)} = 10.337$, $p < .01$), and gender had a main effect on total mental verb scores ($F_{(1,56)} = 12.814$, $p < .05$). The means for the analysis are presented in the Table 2. A child could obtain a maximum total score of 5 and a minimum total score of -5 from five mental verbs in order 1. Older children performed better than younger ones on the mental verbs *sanmak* 'think with implication of false belief in past tense',

hatırlamak 'remember', *bilmek* 'know', *düşünmek* 'think', *anlamak* 'understand' and females had more correct responses on these verbs (M= .94) than males (M= -.26). The analysis did not yield any interaction effect. Scheffe post hoc comparisons between age groups showed that 3;0-3;6 year olds differed significantly from 6;0-6;6 year olds ($p < .05$).

Table 2: Mean total scores and standard deviations by gender and age for mental verbs in order 1

Order 1	Gender	Mean	Standard deviation
3;0-3;6	Male	-1.8	2.28
	Female	-1.0	3.74
	Total	-1.4	2.95
3;7-3;12	Male	-1.4	1.67
	Female	1.0	2.00
	Total	-0.2	2.15
4;0-4;6	Male	-0.6	2.61
	Female	1,38	3
	Total	-0.3	2.67
4;7-4;12	Male	-0.6	2.19
	Female	1.0	2.83
	Total	0.2	2.53
5;0-5;6	Male	0.2	2.28
	Female	-1.38	1.73
	Total	0.1	1.91
5;7-5;12	Male	-0.2	3.03
	Female	1.8	3.63
	Total	0.8	3.33
6;0-6;6	Male	2.6	2.19
	Female	3.8	1.79
	Total	3.2	1.99
Total	Male	-0.26	2.52
	Female	0.94	2.92
	Total	0.34	2.78

The 2 (gender) x 7 (age) ANOVA for Order II revealed that age and gender had no main effect or interaction effect on total mental verb scores. A child could obtain a maximum total score of 4 and a minimum total score of -4 from four mental verbs in order 2. The means for the analysis are presented in the Table 3. Correct

responses showed an increasing trend with age on the mental verbs *kandırmak* 'deceive', *unutmak* 'forget', *tahmin etmek* 'guess', *düşünmek* 'think', and females had slightly more correct responses on these verbs (M=2.97) than males (M= 2.77). However, these differences were not significant.

Table 3: Mean total scores and standard deviations by gender and age for mental verbs in order 2

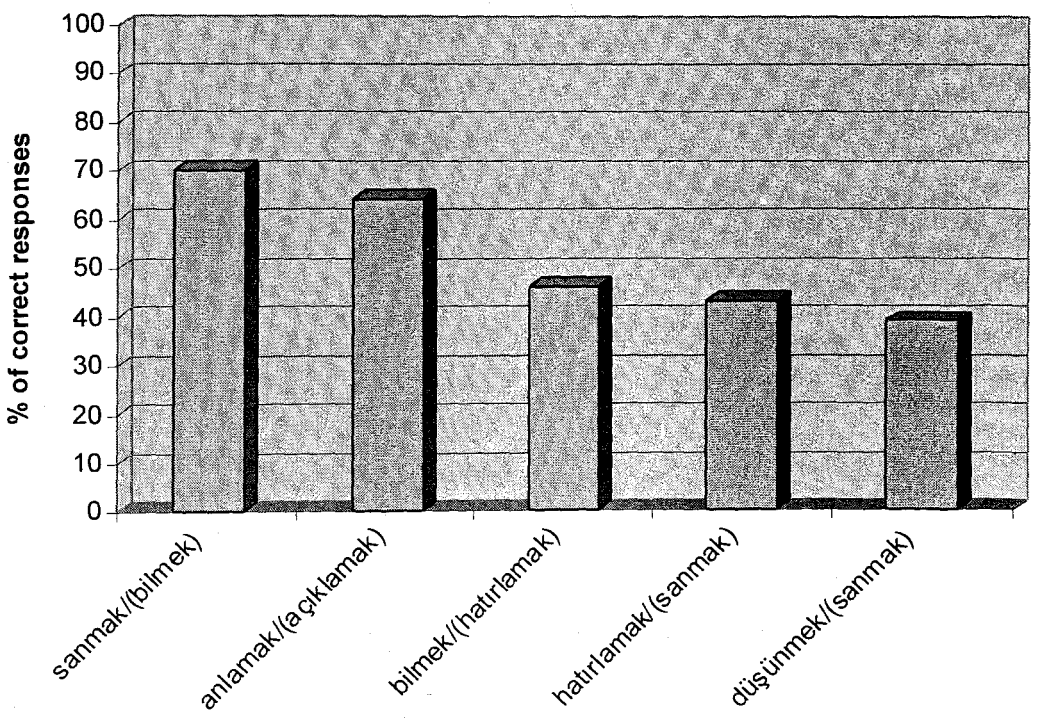
Order 2	Gender	Mean	Standard deviation
3;0-3;6	Male	0.4	2.61
	Female	2.0	2.0
	Total	1.2	2.35
3;7-3;12	Male	2.4	3.58
	Female	3.2	0.84
	Total	2.8	2.49
4;0-4;6	Male	3.6	0.89
	Female	2,4	1.67
	Total	3.0	1.41
4;7-4;12	Male	3.2	1.1
	Female	2.0	2.0
	Total	2.6	1.65
5;0-5;6	Male	3.8	0.45
	Female	3.6	0.89
	Total	3.7	0.67
5;7-5;12	Male	3.6	0.89
	Female	3.6	0.89
	Total	3.6	0.84
6;0-6;6	Male	2.4	1.67
	Female	4.0	0.0
	Total	3.2	1.4
Total	Male	2.77	2.06
	Female	2.97	1.46
	Total	2.87	1.78

As it is evident from a comparison of Tables 2 and 3, the total scores for mental verbs in order 2 (M=2.87) is much higher than total score of mental verbs in order 1 (M=0.34).

The proportion of correct responses to individual mental verbs for order 1 ranged from 70 % (for *sanmak* 'think with implication of false belief in past tense') to 38,6 % (for *düşünmek* 'to think'). The percentages of correct response to mental

verbs for order 1 are presented in Figure 5. In this order *sanmak* 'think with implication of false belief in past tense' was paired with *bilmek* 'know', *anlamak* 'understand' was paired with *açıklamak* 'explain', *bilmek* 'know' was paired with *hatırlamak* 'remember', *hatırlamak* 'remember' was paired with *sanmak* 'think with implication of false belief in past tense', and *düşünmek* 'think' was paired with *sanmak* 'think with implication of false belief in past tense'. The low percentage of correct responses on *düşünmek* 'think', *bilmek* 'know' and *hatırlamak* 'remember' items may indicate that the meanings of these verbs for the children are not fully differentiated from the verbs they are paired with. This issue will be taken up in the discussion.

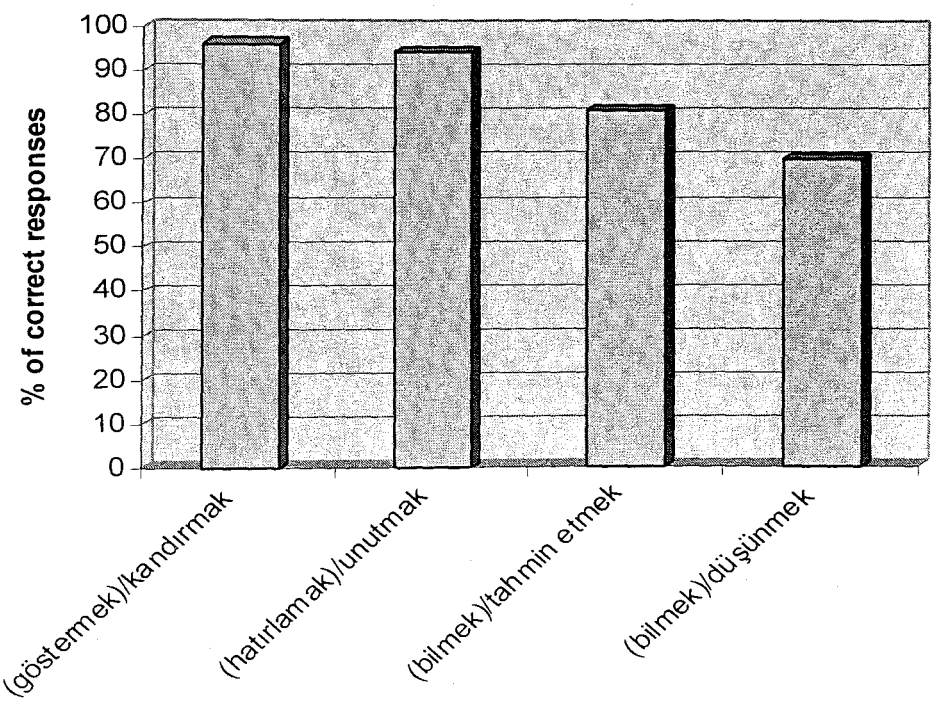
Figure 5: Percent distribution of children who gave correct responses to each mental verb for order 1 for all ages combined[1]



[1] Verbs are given in their order of presentation in the forced choice question. The verb in the ( ) is the incorrect response. *Sanmak* 'think with implication of false belief in past tense'/*bilmek* 'know', *anlamak* 'understand'/*açıklamak* 'explain', *bilmek* 'know'/*hatırlamak* 'remember', *hatırlamak* 'remember'/*sanmak* 'think with implication of false belief in past tense', *düşünmek* 'think'/*sanmak* 'think with implication of false belief in past tense'

Figure 6 shows the percentages of correct responses to individual mental verbs for order 2. The percentage of correct responses to different items ranged from 95,7 % (for *kandırmak* 'deceive') to 70 % (for *düşünmek* 'think'). In order 2 *kandırmak* 'deceive' was paired with *göstermek* 'show', *unutmak* 'forget' was paired with *hatırlamak* 'remember', *tahmin etmek* 'guess' was paired with *bilmek* 'know', and *düşünmek* 'think' was paired with *bilmek* 'know'. The high percentages of correct responses on these items again do not clearly indicate if the meanings of paired verbs are fully differentiated or if it is the consequence of the order effect.

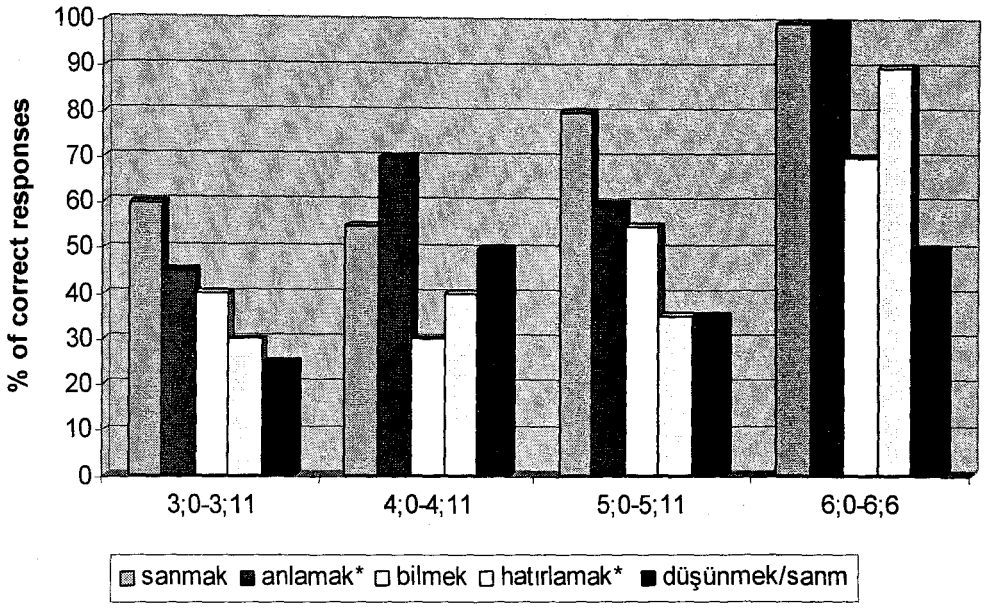
Figure 6: Percent distribution of children who gave correct responses to each mental verb for order 2 for all ages combined



Mental verbs in order 1 and 2 were also examined across age groups which were combined to represent full 12 months. Chi-square analyses for each mental verb in order 1 by age revealed significant results for the verb *anlamak* 'understand' (χ^2 (3, N=70) = 9.240, $p < .05$) and for the verb *hatırlamak* 'remember' (χ^2 (3, N=70) =

10.996, p< .05). There is a major increase in correct responses between 4;0-4;11 years for the verb *anlamak* 'understand' but then a decrease is seen between 5;0-5;11. For the verb *hatırlamak* 'remember' there is a slight increase in 4;0-4;11 year olds, however a major jump is seen in 6;0-6;6 year olds. The percent distribution of correct responses by age for each verb is presented in Figure 7.

Figure 7: Percent distribution of children who gave correct responses for each mental verb for order 1 by age



* p< .05

Figure 8 shows the percentages of correct responses to individual mental verbs for order 2 in each age group which were combined to represent full 12 months. A chi-square analysis did not reveal any significant difference (p> .05), that is the percentage of children who gave correct responses to the verbs do not differ significantly across age groups. Children's correct responses to individual mental verbs increase with age, however, correct responses to the mental verb *düşünmek* 'think' are lower in the 6-year-old group.

Figure 8: Percent distribution of children who gave correct responses for each mental verb for order 2 by age

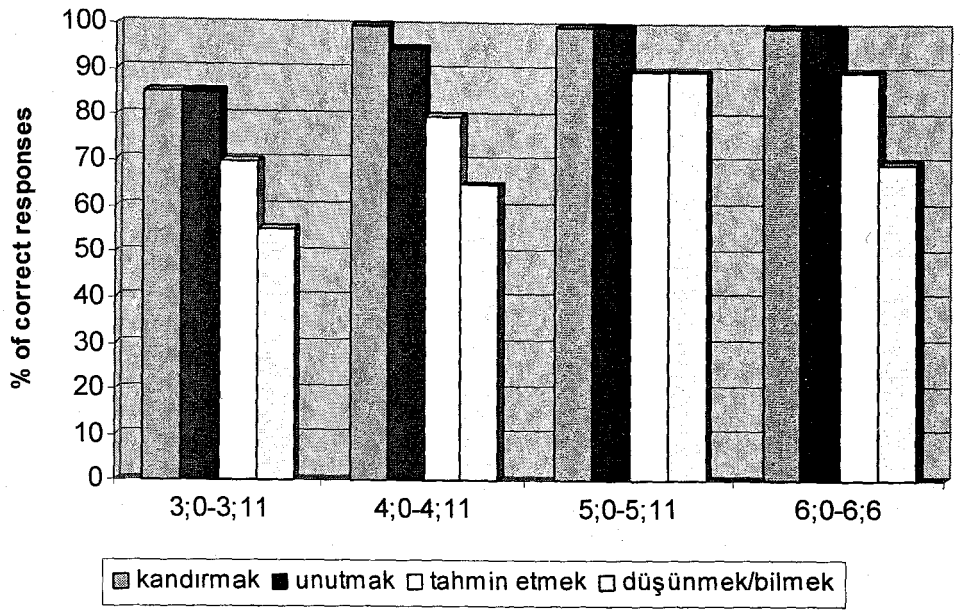


Figure 9 shows the mean scores for mental verbs in order 1 in rank order. The maximum mean score for a verb can be +1 or minimum can be -1. We can say that comprehending *düşünmek* 'think' paired with *sanmak* 'think with implication of false belief in past tense', *hatırlamak* 'remember' and *bilmek* 'know' is more difficult than comprehending *anlamak* 'understand' paired with *açıklamak* and *sanmak* 'think with implication of false belief in past tense' paired with *bilmek* 'know', respectively. *Sanmak* 'think with implication of false belief in past tense' appears to be easily understood by children. The nonfactive verb s*anmak* 'think with implication of false belief in past tense' was paired with a factive verb *bilmek* 'know' which might have helped children to distinguish them easily. Children had difficulties to differentiate *hatırlamak* 'remember' and *düşünmek* 'think' when either were paired with *sanmak* 'think with implication of false belief in past tense', possibly because all these verbs imply different degrees of less than full certainty.

Figure 9: Mean scores for mental verbs[2] in order 1

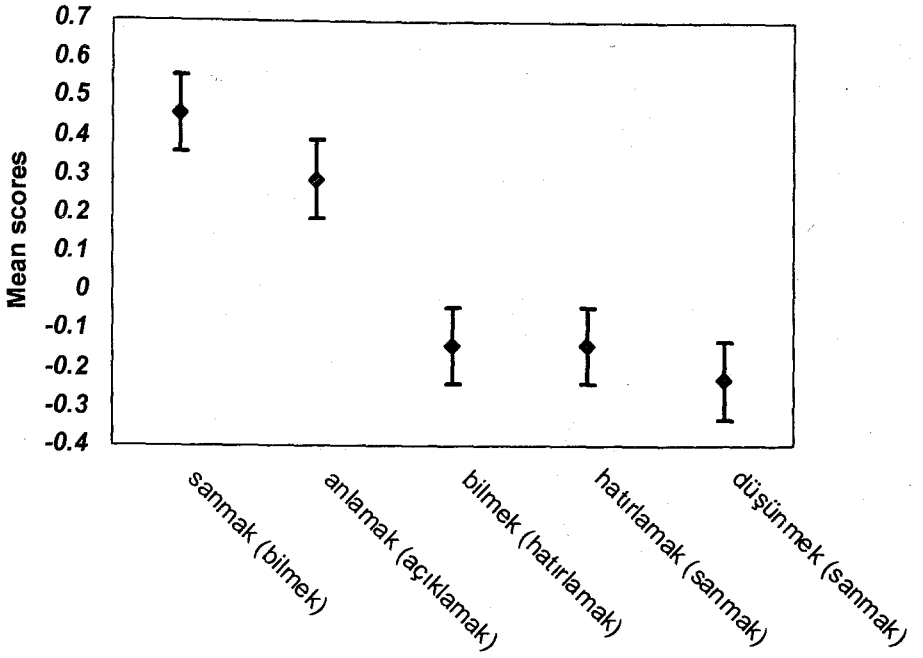
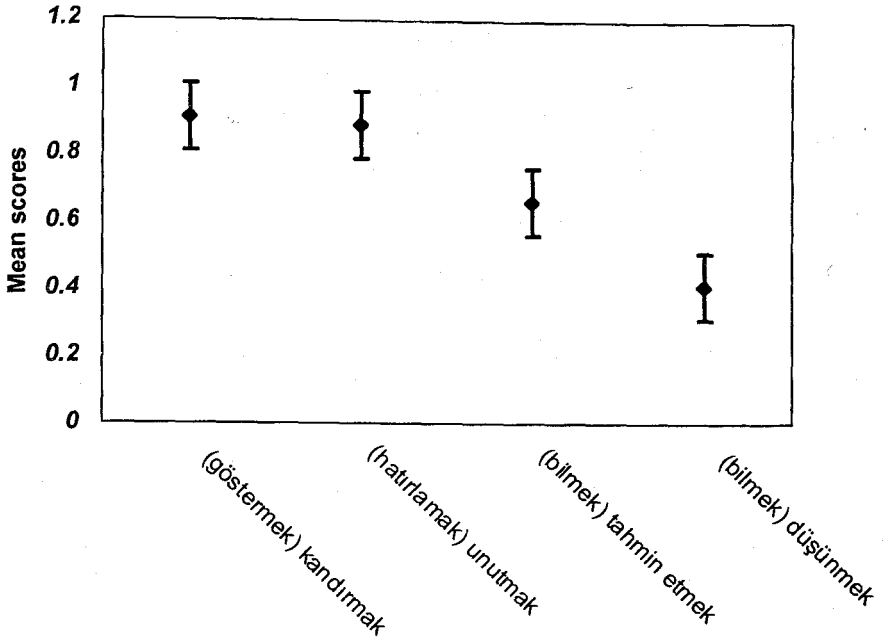


Figure 10 shows the mean scores for mental verbs in order 2 in rank order. The maximum mean score for a verb can be +1 or minimum can be -1. We can say that comprehending *düşünmek* 'think' paired with *bilmek* 'know' and *tahmin etmek* 'guess' paired with *bilmek* 'know' is more difficult than comprehending *kandırmak* 'deceive' paired with *göstermek* 'show' and *unutmak* 'forget' paired with *hatırlamak* 'remember'.

[2] Verbs are given in their order of presentation in the forced choice question. The verb in the ( ) is the incorrect response.

Figure 10: Mean scores for mental verbs in order 2



3.3. The relations between false belief and mental verbs:

Children's correct responses to the two false belief tasks were computed and a total score that could range between 0-2 was obtained. Pearson correlations between false belief scores and total mental verb scores indicated significant results for the two orders. There is a moderate relation between false belief understanding and mental verbs in order 1 ($r_{(68)} = .311$, $p < .01$) and mental verbs in order 2 ($r_{(68)} = .323$, $p < .01$).

Hypothesis 2 stated that children who pass false belief tasks will also pass mental verb items *sanmak* 'think with implication of false belief', *bilmek* 'know' and *düşünmek* 'think'. In order to test this hypothesis a cross-tabulation of children's scores on the false belief tasks (children who gave correct answers to both of the false belief tasks received a score of 1) and each of the three mental verbs (*sanmak* 'think with implication of false belief in past tense', *bilmek* 'know', *and düşünmek* 'think'/*sanmak* 'think with implication of false belief in past tense') was obtained.

Separate chi-square analyses were carried out for each verb. The chi-square analyses did not indicate association between passing false belief tasks and any one of the three verbs ($p > .05$). As shown in Table 4, the percentage of children who passed the false belief tasks but failed the mental verb *sanmak* 'think with implication of false belief in past tense' was 22.4 %, *bilmek* 'know' was 49 %, and *düşünmek* 'think' paired with *sanmak* 'think with implication of false belief in past tense' was 55 %. These verbs were all presented in order 1. In order to confirm the hypothesis, the data should have shown less than 20 % of the children to fail these verbs. Therefore, hypothesis 2 was not supported. However, the number of the children who failed the mental verb *sanmak* 'think with implication of false belief' among the children who passed the false belief tasks is negligible as compared to those who failed on the items for the mental verbs *bilmek* 'know' and *düşünmek* 'think'. Therefore, this verb appears to have a special status when compared to the other two mental verbs (See the appendices for full presentation of cross-tabulation tables for mental verb items).

Table 4: Distribution of children who passed the false belief questions by performance on the mental verb items for *sanmak* 'think with implication of false belief', *bilmek* 'know' and *düşünmek* 'think' for all ages combined

	Sanmak				Bilmek				Düşünmek/Sanmak		
	Fail	N.A	Pass	Total	Fail	N.A	Pass	Total	Fail	Pass	Total
FB Pass	11 22.4%	3 6.1%	35 71.4%	49/70 100%	24 49.0%	3 6.1%	22 44.9%	49/70 100%	27 55.1%	22 44.9%	49/70 100%

Percentages of children who passed the false belief tasks but failed the mental verbs *sanmak* 'think with implication of false belief in past tense', *bilmek* 'know', and *düşünmek* 'think' in each age group are displayed in Table 5. The chi-square

analysis for correct performance on the false belief questions and the mental verb *bilmek* 'know' for the 4;0-4;11 age group revealed a significant relation (χ^2 (1, N=20) = 4.821, p< .05), showing that a significantly higher percentage of the children who passed the false belief tasks failed the item for this verb. However, in other age groups the analysis did not indicate any significant differences. The results which show the children who failed the mental verb items assessing understanding of *sanmak* 'think with implication of false belief', *bilmek* 'know' and *düşünmek* 'think' among those children who passed false belief tasks do not support hypothesis 2 which stated understanding mental verbs would be precondition for correct performance on false belief tasks.

Table 5: Distribution of children who passed the false belief questions by performance on the mental verb items for *sanmak* 'think with implication of false belief', *bilmek* 'know' and *düşünmek* 'think' for each age

FB Pass	Age	Fail	N.A	Pass	Total
			Sanmak		
	3;0-3;11	2 (33 %)	1 (16.7 %)	3 (50 %)	6/20
	4;0-4;11	6 (37.5 %)	1 (6.3 %)	9 (56.3 %)	16/20
	5;0-5;11	3 (17.6 %)	1 (5.9 %)	13 (76.5 %)	17/20
	6;0-6;6	0	0	10 (100 %)	10/10
			Bilmek		
	3;0-3;11	3 (50 %)	1 (16.7 %)	2 (33.3 %)	6/20
	4;0-4;11	13 (81.3 %)	0	3 (18.8 %)	16/20
	5;0-5;11	5 (29.4 %)	2 (11.8 %)	10 (58.8 %)	17/20
	6;0-6;6	3 (30 %)	0	7 (70 %)	10/10
			Düşünmek/ Sanmak		
	3;0-3;11	4 (66.7 %)	0	2 (33.3 %)	6/20
	4;0-4;11	7 (43.8 %)	0	9 (56.3 %)	16/20
	5;0-5;11	11 (64.7 %)	0	6 (35.3 %)	17/20
	6;0-6;6	5 (50 %)	0	5 (50 %)	10/10

3.4. Analyses for complement sentence task:

Type-A items were designed to evaluate memory for false belief statements. Children may correctly produce the syntactic structure of complement sentence but may not fully understand the semantic implications of it, particularly when a false belief is at issue. A multivariate analysis of variance (MANOVA) was conducted on two dependent variables; memory for false belief statements and syntax of complementation (with the complement construction modeled) for type-A items with age as the independent variable. The score that a child can obtain on either dimension of this task can range from 0 to 4. The analysis indicated that age was significantly related to memory for false belief ($F_{(6,63)} = 5.08$, $p < .001$, $\eta^2 = 6.524$) as well as to the syntax of complementation ($F_{(6,63)} = 9.004$, $p < .001$, $\eta^2 = 9.590$). Scheffe post hoc comparisons between age groups showed that 3;0-3;6 year-olds performed significantly differently from children older than 4;6 in the syntactic domain of complement clauses. However, for memory for false belief statements a significant difference was found between 3;0 year-olds and 5;0 year-old children (See Table 6 for mean scores of type-A items). Results show that children's competence for both memory for false belief and syntax of complementation improve with age. It appears that children's memory for a false belief statement expressed in a complement clause becomes consolidated at a later age than their capacity to control the complex syntax involved.

Table 6: Mean scores and standard deviations for type-A items for each age group

	Age	Mean	Std.dev
Syntax of complements	3;0-3;6	1,20	1,40
	3;7-3;12	2,60	1,35
	4;0-4;6	2,80	1,55
	4;7-4;12*	3,30	,82
	5;0-5;6**	3,80	,63
	5;7-5;12**	3,90	,32
	6;0-6;6**	3,90	,32
Memory for false belief statements			
	3;0-3;6	1,90	1,29
	3;7-3;12	2,10	1,60
	4;0-4;6	2,80	1,40
	4;7-4;12	2,70	1,25
	5;0-5;6*	3,80	,42
	5;7-5;12*	3,80	,42
	6;0-6;6	3,70	,95

* $p < .05$

** $p < .001$

A one-way analysis of variance (ANOVA) was conducted to examine the effects of age on correct performance regarding the syntax of complementation on type-B items where the syntactic construction was not modeled. There was a significant difference between age groups in terms of their syntactic performance ($F_{(6,63)} = 5.287$, $p < .001$). Scheffe post hoc comparison between age groups showed that 3;0 year-olds performed significantly worse than children older than 5;6 years ($p < .01$) (See Table 7 for mean scores of type-B items).

Table 7: Mean scores and standard deviations for type-B items for each age group

	Age	Mean	Std.dev
Syntax of complements	3;0-3;6	1,40	1,43
	3;7-3;12	2,70	1,42
	4;0-4;6	2,70	1,57
	4;7-4;12	2,90	1,52
	5;0-5;6	3,20	1,32
	5;7-5;12*	4,00	,00
	6;0-6;6*	4,00	,00

* $p < .01$

A paired samples T-test was conducted to test the difference between two types of performance in relation to the syntax of complement clauses. The concern was to observe if children's syntactic abilities differ based on different question formats of complement constructions on type A and B items. That is, if presentation of false belief statements by the experimenter in type-A items makes a difference on children's production of the syntax of complementation when compared to type-B items. The analysis did not reveal any significant difference ($t(69)= .760$, $p> .05$) indicating that children did not display different performance in responding to and producing complement clauses in the two tasks with different question formats. The mean score for type-A items is 3.07 and for type-B items is 2.99.

3.5. The relations between false belief and language tasks:

Hypothesis 3 predicted that the children who pass false belief tasks would also pass complement sentence tasks. In order to test this hypothesis a cross-tabulation of children's scores on the false belief tasks (children who gave correct answers to both of the false belief tasks received a score of 1), syntax of complementation (children who gave correct answers to more than five out of eight sentences received a score of 1) and memory for false belief statements (children who gave correct answers to three or more sentences out of four sentences) were obtained. The association between the ability to produce syntactically correct complement clauses and to pass false belief questions was found to be significant (χ^2 $(1, N=70) = 13.653$, $p< .001$). It was observed that there were seven children (14.3 %) who passed the false belief items but failed on syntax of complementation items over all age groups. Another chi-square analysis was conducted for the relationship between memory for false belief statements and false belief questions. The analysis

revealed significant results (χ^2 (1, N=70) = 21.333, p< .001). It was observed that there were six children (12.2%) who passed the false belief items but failed on memory for false belief statements over all age groups. Therefore, we can accept hypothesis 3 which states that majority of the children who pass false belief tasks would also pass complement sentence tasks.

The relationship between these sets of variables (syntax of complementation, memory for false belief statements and false belief tasks) was analyzed for each age group combined to represent full 12 months. Results are displayed in Table 8. The chi-square analysis revealed a significant relation for the 3;0-3;11 age group between false belief performance and memory for false belief statements (χ^2 (1, N=20) = 8.802, p< .005). There was only one child (16.7%) who passed the false belief items but failed the memory for false belief statements. However, in other age groups the analysis did not indicate any significant difference (See the appendices for full tables presenting the cross-tabulation of children by performance on false belief tasks and performance on syntax of complementation and memory for false belief statements tasks).

Table 8: Distribution of children who passed the false belief questions by performance on the syntax of complementation and memory for false belief statements for each age

FB Pass

	Syntax of complementation		
Age	**Fail**	**Pass**	**Total**
3;0-3;11	2 (33 %)	4 (66.7 %)	6/20
4;0-4;11	4 (25 %)	12 (75 %)	16/20
5;0-5;11	1 (5.9 %)	16 (94.1 %)	17/20
6;0-6;6	0	10 (100 %)	10/10
	Memory for false belief statements		
3;0-3;11	1 (16.7 %)	5 (83.3 %)	6/20
4;0-4;11	4 (25 %)	12 (75 %)	16/20
5;0-5;11	0	17 (100 %)	17/20
6;0-6;6	1 (10 %)	9 (90 %)	10/10

In order to examine the relation between language and false belief understanding, a stepwise logistic regression analysis was conducted on false belief scores as the dependent variable (where correct performance on both FB tasks was criterial for getting the passing score of 1). The independent variables were memory for false beliefs (scores ranging between 0-4), syntax of complementation (total of type-A and B items the scores of which can range between 0-8), performance on the verb *sanmak* 'think with implication of false belief' and age. The aim was to determine how much of variance is accounted for by these linguistic skills for false belief understanding. In step 1, memory for false beliefs expressed in complement clauses entered the equation, Nagelkerke R^2= .38, $F(1, 66) = 15.97$, $p < .001$. In step 2, age was added in the equation and Nagelkerke R^2= .49, $F(1, 66) = 6.40$, $p < .05$. Table 9 presents the results. The relationship between false belief understanding and linguistic competence is found to be accounted for by memory for false beliefs expressed in complement clauses and age. Therefore, memory for false beliefs appears to be the component predictor for false belief understanding.

Table 9: Stepwise regression analysis of memory for false belief, control of syntax, age and the verb *sanmak* on false belief tasks

	Nagelkerke R^2	Wald	Significance
(Step 1) Memory for FB	.378	15.974	.000
(Step 2) Age in month	.488	6.398	.011

4. Discussion

The present study aimed to explore the relationship between several linguistic capacities and theory of mind development. We focused on linguistic capacities such as the production of complement sentences, memory for false belief statements and understanding of mental verbs and tried to find out which of these, if any, enhances false belief understanding. First, findings about false belief understanding are discussed. Then, results about mental verbs and complement sentences are examined. Finally, the general relation between linguistic factors and theory of mind is discussed.

The hypothesis about theory of mind development, that correct understanding of false beliefs will increase with age received support. A major improvement in children's understanding of false belief problems was observed around 4 years of age. It has been claimed in the literature that children younger than 4 do not understand that people think and act in accordance with the way they represent the world mentally (Flavell, 1999) and assume that the other shares their own view of reality. The present study, however, revealed that children start to establish some understanding about other minds starting around three years of age. When we compare the performance of 3;0-5;0 years old Turkish speaking children of the present study with 3;0-5;0 years old English speaking children reported by de Villiers and Pyers (2001), we observe that a higher percentage of Turkish children show a capacity for false belief understanding than English speaking children on the unexpected contents task. This might be due to the effects of the verb *sanmak* which expresses false belief in the past tense and an open condition which may or may not

be true in the present tense. The use by the experimenter of this verb that explicitly marks false belief might have oriented Turkish speaking children to the possibility of a deceptive situation and facilitated their attributions of false beliefs to other people at an earlier age than English speaking children.

When two of the false belief tasks were analyzed separately, it was observed that children's performance was higher for the unexpected contents task administered with the verb *sanmak* 'think with implication of false belief in past tense' than for the changed location task administered with the verb *bakmak* 'look', particularly between the ages 3;7-4;6. It would be expected that children perform better when asked a question with the action verb *bakmak* 'look' as compared to with the mental state verb *sanmak* 'think with implication of false belief in past tense'. However, whatever the meaning they attach to this verb may be, the use of the false belief verb *sanmak* appears to have facilitated Turkish 3-4 year olds' consideration of events from another person's perspective and to speculate about his/her mental states and behaviors.

The fact that use of an explicit false belief term presents an advantage for speakers of marked languages in false belief tasks over speakers of languages without such markings has also been noted by Shatz, Diesendruck, Martinez-Beck and Akar (2003). In their cross linguistic study, they found that speakers of languages with explicit false belief markers such as Turkish and Puerto Rican Spanish did better than speakers of languages without explicit markers such as Portuguese and English on false belief tasks, but only when the explicit false belief verb was used in questioning of the child. Research in Chinese which has several verbs for talking about true and false beliefs has also shown that when the verb has the implication that the belief referred to may be false, children between 4 and 5

year-olds' performance is better than when the verb used is neutral (Lee, Olson and Torrance, 1999). In short, existence of a marked term in the language can be said to enhance children's ability to consider that the belief in question may be false.

By the age of three children begin to use mental terms in their natural speech in order to initiate an interaction (Shatz, Wellman and Silber, 1983). However, a full understanding of the semantics of these verbs appears to be a later development. In this study we tried to explore when children begin to understand the semantics of mental verbs and which mental verbs they comprehend earlier. However, failure to counterbalance the order of correct choices in the forced choice task prevented us from attaining precise results. An order effect was found showing that children tend to repeat the verb that is mentioned last in the forced choice question. This resulted in an inflated level of higher performance for the verbs in order 2 (*kandırmak* 'deceive', *unutmak* 'forget', *tahmin etmek* 'guess', *düşünmek/bilmek* 'think/know') as compared to the verbs in order 1 (*sanmak* 'think with implication of false belief in past tense', *hatırlamak* 'remember', *bilmek* 'know', *düşünmek/sanmak* 'think/think with implication of false belief in past tense', *anlamak* 'understand'). We will therefore restrict our discussion to the verbs tested under order 1 even though this may be a conservative representation of children's level of competence.

Research suggests that by the age of 4-5 children understand the semantic and pragmatic functions of different mental verbs (Moore and Davidge, 1989). The present data also shows that correct responses for the mental verbs *sanmak* 'think with implication of false belief in past tense', *hatırlamak* 'remember', *bilmek* 'know', *düşünmek* 'think', *and anlamak* 'understand' increase with age. Moore and Davidge (1989) claimed that children differentiate mental terms on the basis of the degree of certainty they express. Therefore, we would expect children to distinguish

the verbs more easily when verbs expressing contrasting degrees of certainty are paired in the forced choice question. In order 1 it was the verb *sanmak* 'think with implication of false belief in past tense' expressing low certainty for which children produced the highest mean correct response, possibly because it was paired with the verb *bilmek* 'know' expressing high certainty, which might have facilitated the distinction between their meanings. When *düşünmek* 'think' was paired with *sanmak* 'think with implication of false belief in past tense' both expressing low certainty, however, the percentage of correct responses to *düşünmek* 'think' was very low, perhaps reflecting the difficulty of differentiating two verbs of comparable degrees of certainty.

The specialized false belief verb *sanmak* 'think with implication of false belief in past tense' appears to have an important status in children's vocabulary. Three year-old children identified *sanmak* 'think with implication of false belief in past tense' more easily than *anlamak* 'understand', *bilmek* 'know', *hatırlamak* 'remember' and *düşünmek* 'think'. They show a performance indicating a better understanding of the other mental verbs after the age three-and-a half. Children's correct responses to the verb *anlamak* 'understand' increased significantly between 4;0-4;11 years of age, suggesting they start to differentiate *anlamak* 'understand' and *açıklamak* 'explain' around the four years of age. There was a significant increase in children's correct responses to the verb *hatırlamak* 'remember' paired with *sanmak* 'think with implication of false belief in past tense' at the age of 6;0-6;6. Correct responses to the verb *düşünmek* 'think' paired with *sanmak* 'think with implication of false belief in past tense' increase between 4;0-4;11 years of age but then a decrease appeared at the age of 5;0-5;11. Astington and Pelletier (2001) stated that children use mental terms in the preschool years but it does not mean that they

comprehend the full meaning of the terms in contrastive use. Turkish children start to comprehend the verb *sanmak* 'think with implication of false belief in past tense' earlier than the other mental verbs but for a full differentiation of mental verb meanings a gradual development is necessary.

The second aspect of language that was investigated in relation to theory of mind was complement sentences. These constructions provide a tool to represent aspects of reality with different truth status. They are a means to discuss lies, mistakes, and other social cognitions involving false beliefs. De Villiers (2000) claims that children younger than 4-years do not represent complement structures. In our study there were two types of questions measuring complement sentence knowledge. In type-A items, a false belief statement was presented to the child and he was expected to represent it in memory and repeat the statement in response to a question. Thus, both memory for false belief statements and syntax of complementation were assessed. The results revealed that children's competence both for memory for false belief statements and for syntax of complementation improved with age. Four and half year olds acquired the fundamental syntax of complements, and by the age of five children displayed good memory for false belief statements. De Villiers (2000) reports that children acquire the syntax of embedding before making accommodation of meaning within that structure. Then, they notice that the statements can be compared to reality. This view is consistent with the findings of the present study: Turkish children display the capacity to control the complex syntax of complement constructions expressing propositions that conform to reality conditions earlier than they display memory for a false belief statement expressed in a complement structure.

As noted, the present study aimed to examine the relation between particular linguistic capacities and theory of mind development. What role, if any, might language play in false belief understanding? We initially focused on the semantics of mental verbs for the reason that false belief understanding requires language for talking about the mind. We assumed that understanding of certain mental verbs will precede false belief understanding. Therefore, it was stated in hypothesis 2 that majority of the children who pass false belief tasks will also pass mental verb items *sanmak* 'think with implication of false belief in past tense', *bilmek* 'know' and *düşünmek* 'think'. The results indicated that most of the children were not able to judge the implications of different mental verbs when these were presented contrastively before they acquire false belief understanding. Hypothesis 2 was, therefore, not supported. This finding suggests that a full understanding of the meaning of these verbs is not necessary for false belief understanding. However, the percentage of children who showed correct performance in matching the verb *sanmak* 'think with implication of false belief in past tense' to its context of use was higher than the percentage of children who could do so for the other two mental verbs *bilmek* 'know' and *düşünmek* 'think'. Although the hypothesis is not confirmed, findings support our viewpoint that *sanmak* 'think with implication of false belief in past tense' is an important mental verb in children's vocabulary. Children experience all mental verbs in different settings but they seem to distinguish *sanmak* 'think with implication of false belief in past tense' and understand its semantics earlier. All mental verbs are similar in that they refer to beliefs and knowledge states that are not directly observable but need to be inferred from behavior and language. The present findings suggest that the contexts of use of the false belief verb *sanmak* 'think with implication of false belief in past tense' contain

more distinctive or easily abstractable cues for the child, such as a deception situation, on the person who expresses presuming with the verb *sanmak* 'think with implication of false belief in past tense' typically being 'wrong', than the contexts of use of the other two mental verbs. This view is also supported by the observation that the verb which the majority of the children passed in order 2 was kandırmak 'deceive', another mental verb which has similarly concrete implications. It appears that children discover the meanings of these mental verbs first thru their pragmatic implications. If you 'deceive' (*kandırmak*) somebody, you put him in the "wrong", if somebody 'falsely believes something' (*sanmak*) he puts himself in the wrong. It is well known that children are sensitive to situations which involve deceptions (Hala, Chandler and Fritz, 1991). It may thus signal focus of attention on false representations and facilitate the development of the understanding of false beliefs.

The second linguistic capacity we focused on was the syntactic and semantic structure of complement clauses. It has been claimed that the acquisition of the syntactic and semantic structure of complement clauses with verbs of communication and cognition facilitates the representation of false beliefs (de Villiers and Pyers, 2001; de Villiers and de Villiers, 2000). Children who have mastered complement constructions acquire a new representational capacity to understand their own and other's beliefs. Therefore, in hypothesis 3 it was proposed that children who pass false belief tasks would also pass complement sentence tasks. It was observed that of the children who passed false belief tasks in the whole sample only 14.3 % failed on the syntax of complementation and 12.2 % failed on memory for false belief expressed in complement clauses. However, these percentages are more than 20 % for the younger children 3 and 4 years of age. Therefore, we can confirm the

hypothesis that complement structures contributes to competence for false belief understanding only for 5 year olds and older children.

Our concern to find out which linguistic competencies account most for false belief understanding indicated that memory for false beliefs expressed in complement clauses and age were the explanatory factors. Use of syntactic structures has been shown to be related to understanding the mind (Astington and Jenkins, 1999; de Villiers, 2000) and complement clauses predicted later development on standard false belief tasks. The present study revealed that comprehending complement constructions is closely related to false belief understanding. Understanding false beliefs expressed in a complement construction may be facilitative of the development of the conceptual representation underlying false belief reasoning or understanding other minds. However, the complement clauses in the present study had as their main verb, the mental verb *sanmak* 'think with implication of false belief in past tense'. This special verb which has an implication of false belief might have enhanced children's comprehension of mental events expressed in complement clauses. Therefore, we suggest a combined effect of *sanmak* 'think with implication of false belief in past tense' and complement construction on theory of mind development. Children's understanding of complement sentences with *sanmak* 'think with implication of false belief in past tense' and their correct interpretation of the event appears related to their false belief understanding. But the separate effects of the two variables need to be investigated in a future study.

In summary, the present study aimed to investigate the relations between specific linguistic capacities of three to six years old children and their false belief understanding. The first aim was to find out at what age Turkish speaking children

achieve false belief understanding. The results revealed that there was a great improvement in children's performance by age. They displayed correct performance from three years onwards and their performance was better in the unexpected contents task when compared with English speaking children's performance reported in the literature. The second aim was to investigate the relation between understanding of certain mental verbs and false belief understanding. The findings showed that understanding mental verbs did not precede false belief understanding. However, children understood the semantic and pragmatic function of *sanmak* 'think with implication of false belief in past tense' at an earlier age than other mental verbs and this might have facilitated their attendance to false representations since it denotes the falseness of the belief referred to when used in past tense. The third aim was to investigate if children acquired complement sentence constructions before false belief understanding. The findings indicated that comprehending complement constructions with the verb *sanmak* 'think with implication of false belief in past tense' was related with false belief understanding. Finally, our aim was to investigate which linguistic competences account most for false belief understanding. The results revealed that memory for false belief expressed in complement clauses with the verb *sanmak* 'think with implication of false belief in past tense' and age predicted false belief understanding.

In conclusion, the present study showed that there is a strong relation between linguistic capacities and false belief understanding. The specialized mental verb *sanmak* 'expressing false belief in the past tense' and memory for false belief expressed in a complement sentence where the main verb is *sanmak* 'think with implication of false belief in past tense' enhance children's understanding of other minds.

5. Limitations of the study and directions for future research

The present study aimed to investigate the relation between the linguistic capacities of using mental verbs and complement sentences, and false belief understanding. There are several limitations of the study concerning the methodology.

The major problem was that the position of the verbs in the forced choice question was not counterbalanced. Statistical analyses revealed that there was an order effect that prevented a full comparison of the nine mental verbs to see when differentiated their full meanings. As a result separate statistical analyses were carried out on the two orders and precise information about understanding of the semantics of mental verbs could not be obtained. It is essential that future research counterbalance the position of mental verbs in the forced choice question. Such an arrangement would inform us better about the timing of the understanding of the semantics of mental verbs by the children. Further problem is that each mental verb was tried to be measured just with one scenario which may not have been sufficient.

Another limitation is due to the fact that the items of the complement sentence task used only the verb *sanmak* 'think with implication of false belief in past tense' as a main verb. This special verb enables children to produce embedded sentences without the use of complex syntactic operations associated with complementation. The relatively simpler syntactic properties of the verb might have facilitated its comprehension and production in discourse and lead to an understanding of its meaning at an earlier age. The earlier understanding of its semantic and pragmatic implications might; in turn, have facilitated children's understanding of the false belief statements. Future studies should use other mental verbs in addition to *sanmak* to observe whether children's comprehension of

complement sentence constructions differ according to mental verbs and the specific complementizers they take. Assessments of memory for false belief statements expressed in complement constructions should be made independently of the assessments of the understanding of the verb *sanmak*. This is considered to be important because a variable measuring two things confounds the results and our interpretation.

A further recommendation involves the investigation of false belief tasks including the different mental verbs *sanmak* and *düşünmek*. It is important to see whether there is a difference in children's correct responses to false belief tasks when the questions are asked with *sanmak* versus *düşünmek*. This will enable us to understand further the influence of *sanmak* on false belief understanding.

The study was carried out with a group of middle class children only. It is finally recommended to have studies with children from different environments as well.

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Appendix

Metacognitive Vocabulary Test

Bu iki kardesin hikayesi. Erkek kardesin adi Emre ve kiz kardesinin adı da Selin. Bu Emre ve bu da Selin. Hikayede ilerledikçe sana bazı sorular sorucam. Tamam mi? Soruyu şöyle sorucam "Bu kişi Emre mi yoksa Selin mi?" (Selini göstererek); "Emre kırmızı mı yoksa yeşil bir bluz mu giyiyor?" (Emreyi göstererek); (her defasında "evet, güzel" de, ya da düzeltici geri bildirim ver).

Örnek: 1

Bir gün Emre ve Selin, Selin'in odasında oyun oynuyorlar. Emre "Senin bilgisayar oyunlarına bakabilir miyim?" diyor. Selin de, "Tamam, oyunlar dolabımda duruyor," diyor ve dolabının kapısını açıyor.

Söyle bana: Selin oyunları dolabın içinden çıkartacak mı yoksa oyunları dolabın içine mı koyacak?

Olumlu geribildirim: Evet, bu doğru. Selin dolabından oyunları çıkartacak çünkü onları Emre' ye göstermek istiyor.

Ya da. düzeltici geribildirim: Hayır. Selin oyunları dolabın içine koymayacak. Selin oyunları dolabından çıkartacak çünkü onları Emre' ye göstermek istiyor. Hatırla, Emre "Senin bilgisayar oyunlarına bakabilir miyim?" dedi. Ve Selin de, "Tamam, oyunlar dolabımda duruyor," diyip dolabın kapısını açtı.Değil mi? O zaman tekrar söyle: Selin oyunları dolabından çıkartacak mı yoksa oyunları dolabın içine mi koyacak?

Örnek: 2

Emre Selin'in oyunlarına bakıyor ve diyor ki., "Gerçekten bu futbol oyununu çok beğendim." Selin de "Ben artık bu oyunu istemiyorum, sen alabilirsin." diyor. "Oo çok teşekkür ederim" diyor Emre de.

Söyle bana: Selin bilgisayar oyununu Emre'den geri mi alıyor yoksa Selin bilgisayar oyununu Emre'ye veriyor mu?

Olumlu geribildirim: Evet, doğru. Selin bilgisayar oyununu Emre'ye veriyor çünkü oyunun artık Emre'nin olmasını istiyor.

Ya da. düzeltici geribildirim: Hayır. Selin bilgisayar oyununu Emre'den geri almıyor. Selin bilgisayar oyununu Emre'ye veriyor çünkü oyunun artık Emre'nin olmasını istiyor. Hatırla, Emre sana diyor ki, "Gerçekten bu futbol oyununu çok beğendim." Selin de "Ben artık bu oyunu istemiyorum, sen alabilirsin." diyor. "Oo çok teşekkür ederim" diyor Emre. O zaman tekrar söyle: Selin bilgisayar oyununu Emre'den geri mi almıyor yoksa Selin bilgisayar oyununu Emre'ye veriyor mu?

Test maddeleri: (Geribildirim yok)

(1) Derken babaları odaya geliyor ve diyor ki, "Yatma zamanı. Eğer yarın hava güneşli olursa parka gideriz." Sabahleyin Emre yataktan kalkıp camdan dışarı bakıyor. Emre yağmur yağdığını görüyor. "Yoo hayır." diyor. "Bakarmısın! Bugün parka gidemeyeceğiz."

Söyle bana: Emre yağmurun yağdığını **biliyor** mu yoksa Emre yağmurun yağdığını **hatırlıyor** mu? (doğru cevap = biliyor)

(2) Sonra Emre dolabından meyveli şekerleri çıkartıyor. Torbanın içinde kırmızı, yeşil ve sarı şekerler var. Emre Selin'e diyor ki "Gözlerini kapat, sana bir tane şeker vereceğim." Selin gözlerini sıkıca kapatıyor. Emre "Sakın gizli gizli bakma" diyor. Selin de bakmıyor. Emre torbadan bir şeker çıkartıyor ve Selin göremesin diye elinde tutuyor. Emre "Ne renk?" diye soruyor. Selin de "ee..e.. kırmızı" diyor. Unutma Selin şekerleri göremiyordu.

Söyle bana: Selin şekerin kırmızı olduğunu gerçekten **biliyor** mu yoksa Selin **tahmin** mi ediyor? (doğru cevap = tahmin ediyor)

(3) Selin "Ben arkadaşımın evine oyun oynamaya gidiyorum." diyor. Yağmur yağıyor. Selin baştan aşağı ıslanıyor. Arkadaşının evine vardığında ıslak şapkasını kurutmak için kaloriferin üstüne koyuyor. Evine dönerken güneş açmış ve Selin şapkasını arkadaşının evinde bırakıyor. Selin eve vardığında annesi "Şapkan nerde?" diye soruyor. Selin "Ayy hayır.. Şapka arkadaşımın evinde kaloriferin üstünde." diyor.

Söyle bana: Selin şapkasının arkadaşının evinde olduğunu **hatırladı** mı yoksa Selin şapkasının arkadaşının evinde olduğunu **sanıyor mu**? (doğru cevap = hatırladı)

(4) Bir sonraki gün Emre okula gidiyor. Sınıfta yeni bir çocuk var. Emre "Merhaba, adın ne?" diyor. Yeni gelen çocuk adının Alper olduğunu söylüyor. Emre ve Alper beraber oynuyorlar. Emre eve geldiğinde babasına " Bugün sınıfta yeni bir çocuk vardı." diyor. Babası "Çocuğun adı neydi?" diye soruyor. Emre "ee..aa.." diyor. Emre babasına yeni çocuğun adını söyleyemiyor.

Söyle bana: Emre yeni çocuğun adını **hatırlayabildi** mi yoksa Emre yeni çocuğun adını **unuttu** mu? (doğru cevap = unuttu)

(5) Emre ve Selin okuldalar. Öğretmen derse başlıyor ve diyor ki "Önce bir yuvarlak çizmeniz lazım daha sonra da kesmeniz lazım". Çocuklar öğretmeni dinliyorlar. Sonra da yuvarlakları çiziyorlar ve kesiyorlar.

Söyle bana: Çocuklar öğretmeni **anlıyorlar** mı yoksa çocuklar öğretmene **açıklıyorlar** mı? (doğru cevap = anlar)

(6) Sınıf yarın hayvanat bahçesine gidecek. Selin "Yağmurluklarımızı getirmemize gerek var mı?" diye soruyor. Emre "Yağmur yağmayacak. Yarın bütün gün güneşli olacak." diyor.

Söyle bana: Emre yarın havanın güneşli olacağını **biliyor mu** yoksa havanın güneşli olacağını **düşünüyor mu**? (doğru cevap = düşünüyor)

(7) Emre okuldan gelmiş, palto ve çantasını kapının orada bırakıyor. Ve dışarı top oynamaya çıkıyor. Selin okuldan gelince Emre'nin eşyalarını görüyor ve "Aaa Emre gelmiş, gidip onu odasında bulayım" diyor.

Söyle bana: Selin Emre'nin evde olduğunu **sanıyor** mu yoksa Selin Emre'nin evde olduğunu **biliyor** mu? (doğru cevap = sanıyor)

(8) Yarın Selin'in doğumgünü. Annesi ona "Güzel bir pasta yapayım, içine de çikolata ve muz koyayım" diyor. Daha sonra "Çocuklar bu pastayı çok sevicek" diyor.

Söyle bana: Annesi güzel bir pasta yapacağını **düşünüyor** mu yoksa annesi güzel bir pasta yapacağını **sanıyor mu**? (doğru cevap = düşünüyor)

(9) Selin mutfakta Emre'nin yemek çantasına bakıyor. İçindeki yemekleri çıkartıp onun yerine kağıtlar koyuyor. Emre okula gitmek için hazır ve gelip çantasını aliyor.

Söyle bana: Selin Emre'ye kağıtları **gösteriyor** mu yoksa Selin Emre'yi kağıtlarla **kandırıyor** mu? (doğru cevap: kandırıyor)

Edi-Büdü Complement Sentences

(I) 1) Edi ile Büdü resim dersindeler. Edi, gizlice Büdü'nün boya kalemlerini çantasından alıp sıranın içine koyuyor.

2) Öğretmen "Hadi bakalım kalemlerinizi çıkartıp resimlerinizi boyayın" diyor.

Büdü boyalarının çantada olduğunu sanıyor ama aslında boyaları sıranın içinde!

Şimdi söyle bakalım, Büdü ne sanıyor?

Ç:.....

(II) 1) Büdü'nün annesi kurabiye pişirmiş. Büdü de dayanamayıp kurabiyeleri yemeğe başlıyor.

2) Bir bakıyor ki geriye çok az kurabiye kalmış. Annesi kızacak diye korkuyor çünkü,

Kurabiyeleri misafirler için yaptığını sanıyor ama aslında annesi kurabiyeleri Büdü için yapmış!

Şimdi söyle bakalım, Büdü ne sanıyor?

Ç:.....

(III) 1) Edi Büdü'ye "Yarın Miki'nin doğumgünü. Hadi ona süpriz parti yapalım" diyor.

2) Büdü "Tamam. Ben pastayı alayım, sen herkese haber ver" diyor.

Edi, Büdü'nün pasta alacağını sanıyor, ama Büdü dondurma getiriyor!

Şimdi söyle bakalım, Edi ne sanıyor?

Ç:.....

(IV) 1) Bak Edi en sevdiği kitabın yırtıldığını görüyor.

2) Bak, burda Büdü ye kızııyor .

Edi, kitabını Büdü'nün yırttığına sanıyor ama aslında Miki yırtmış!

Şimdi söyle bakalım, Edi ne sanıyor?

Ç:.....

(V) 1) Bak Edi yatağına yatmış, Büdü de ona kitap okuyor.

2) Edi'nin gözleri kapanmış. Büdü de "Aa Edi uyudu" diyip okumayı bırakıyor.

Şimdi söyle bakalım, Büdü ne sanıyor?

Ç:.....

(VI) 1) Bak, bugün Edi'nin doğum günü. Heryeri süslemişler.

2) Aa bak, Büdü'nün elinde bir kutu var. Edi kutuyu görünce çok seviniyor, "Aa Büdü bana hediye almış" diyor!

Şimdi söyle bakalım, Edi ne sanıyor?

Ç:.....

(VII) 1) Edi resim boyarken ellerini kirletiyor.

2) Bak Büdü eve girdi. Edi'de banyoya doğru gidiyor. Büdü "Edi ellerini yıkamaya gidiyor" diyor!

Şimdi söyle bakalım, Büdü ne sanıyor?

Ç:.....

(VIII) 1) Büdü ile Miki Edi'yi arıyorlar.

2) Büdü dolaba bile bakıyor.

Büdü, "Aa Edi saklanmış" diyor!

Şimdi söyle bakalım, Büdü ne sanıyor?

Ç:.....

Distribution of children who passed the false belief questions by performance on the mental verb items for *sanmak* 'think with implication of false belief', *bilmek* 'know' and *düşünmek* 'think' for all ages combined

Crosstab

			sanmak			Total
			-1	0	1	
tomrecode (binary)	0	Count	6	1	14	21
		% within tomrecode (binary)	28.6%	4.8%	66.7%	100.0%
		% within sanmak	35.3%	25.0%	28.6%	30.0%
	1	Count	11	3	35	49
		% within tomrecode (binary)	22.4%	6.1%	71.4%	100.0%
		% within sanmak	64.7%	75.0%	71.4%	70.0%
Total		Count	17	4	49	70
		% within tomrecode (binary)	24.3%	5.7%	70.0%	100.0%
		% within sanmak	100.0%	100.0%	100.0%	100.0%

Crosstab

			bilmek			Total
			-1	0	1	
tomrecode (binary)	0	Count	10	1	10	21
		% within tomrecode (binary)	47.6%	4.8%	47.6%	100.0%
		% within bilmek	29.4%	25.0%	31.3%	30.0%
	1	Count	24	3	22	49
		% within tomrecode (binary)	49.0%	6.1%	44.9%	100.0%
		% within bilmek	70.6%	75.0%	68.8%	70.0%
Total		Count	34	4	32	70
		% within tomrecode (binary)	48.6%	5.7%	45.7%	100.0%
		% within bilmek	100.0%	100.0%	100.0%	100.0%

Crosstab

			dusunmek/sanmak		Total
			-1	1	
tomrecode (binary)	0	Count	16	5	21
		% within tomrecode (binary)	76.2%	23.8%	100.0%
		% within dusunmek/sanmak	37.2%	18.5%	30.0%
	1	Count	27	22	49
		% within tomrecode (binary)	55.1%	44.9%	100.0%
		% within dusunmek/sanmak	62.8%	81.5%	70.0%
Total		Count	43	27	70
		% within tomrecode (binary)	61.4%	38.6%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%

For the age group of 3;0-3;11

Crosstab

			sanmak			
			-1	0	1	Total
tomrecode (binary)	0	Count	4	1	9	14
		% within tomrecode (binary)	28.6%	7.1%	64.3%	100.0%
		% within sanmak	66.7%	50.0%	75.0%	70.0%
	1	Count	2	1	3	6
		% within tomrecode (binary)	33.3%	16.7%	50.0%	100.0%
		% within sanmak	33.3%	50.0%	25.0%	30.0%
Total		Count	6	2	12	20
		% within tomrecode (binary)	30.0%	10.0%	60.0%	100.0%
		% within sanmak	100.0%	100.0%	100.0%	100.0%

Crosstab

			bilmek			
			-1	0	1	Total
tomrecode (binary)	0	Count	7	1	6	14
		% within tomrecode (binary)	50.0%	7.1%	42.9%	100.0%
		% within bilmek	70.0%	50.0%	75.0%	70.0%
	1	Count	3	1	2	6
		% within tomrecode (binary)	50.0%	16.7%	33.3%	100.0%
		% within bilmek	30.0%	50.0%	25.0%	30.0%
Total		Count	10	2	8	20
		% within tomrecode (binary)	50.0%	10.0%	40.0%	100.0%
		% within bilmek	100.0%	100.0%	100.0%	100.0%

Crosstab

			dusunmek/sanmak		
			-1	1	Total
tomrecode (binary)	0	Count	11	3	14
		% within tomrecode (binary)	78.6%	21.4%	100.0%
		% within dusunmek/sanmak	73.3%	60.0%	70.0%
	1	Count	4	2	6
		% within tomrecode (binary)	66.7%	33.3%	100.0%
		% within dusunmek/sanmak	26.7%	40.0%	30.0%
Total		Count	15	5	20
		% within tomrecode (binary)	75.0%	25.0%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%

For the age group of 4;0-4;11

Crosstab

			sanmak			Total
			-1	0	1	
tomrecode (binary)	0	Count	2		2	4
		% within tomrecode (binary)	50.0%		50.0%	100.0%
		% within sanmak	25.0%		18.2%	20.0%
	1	Count	6	1	9	16
		% within tomrecode (binary)	37.5%	6.3%	56.3%	100.0%
		% within sanmak	75.0%	100.0%	81.8%	80.0%
Total		Count	8	1	11	20
		% within tomrecode (binary)	40.0%	5.0%	55.0%	100.0%
		% within sanmak	100.0%	100.0%	100.0%	100.0%

Crosstab

			bilmek		Total
			-1	1	
tomrecode (binary)	0	Count	1	3	4
		% within tomrecode (binary)	25.0%	75.0%	100.0%
		% within bilmek	7.1%	50.0%	20.0%
	1	Count	13	3	16
		% within tomrecode (binary)	81.3%	18.8%	100.0%
		% within bilmek	92.9%	50.0%	80.0%
Total		Count	14	6	20
		% within tomrecode (binary)	70.0%	30.0%	100.0%
		% within bilmek	100.0%	100.0%	100.0%

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Crosstab

			dusunmek/sanmak		Total
			-1	1	
tomrecode (binary)	0	Count	3	1	4
		% within tomrecode (binary)	75.0%	25.0%	100.0%
		% within dusunmek/sanmak	30.0%	10.0%	20.0%
	1	Count	7	9	16
		% within tomrecode (binary)	43.8%	56.3%	100.0%
		% within dusunmek/sanmak	70.0%	90.0%	80.0%
Total		Count	10	10	20
		% within tomrecode (binary)	50.0%	50.0%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%

For the age group of 5;0-5;11

Crosstab

			sanmak			Total
			-1	0	1	
tomrecode (binary)	0	Count			3	3
		% within tomrecode (binary)			100.0%	100.0%
		% within sanmak			18.8%	15.0%
	1	Count	3	1	13	17
		% within tomrecode (binary)	17.6%	5.9%	76.5%	100.0%
		% within sanmak	100.0%	100.0%	81.3%	85.0%
Total		Count	3	1	16	20
		% within tomrecode (binary)	15.0%	5.0%	80.0%	100.0%
		% within sanmak	100.0%	100.0%	100.0%	100.0%

Crosstab

			bilmek			Total
			-1	0	1	
tomrecode (binary)	0	Count	2		1	3
		% within tomrecode (binary)	66.7%		33.3%	100.0%
		% within bilmek	28.6%		9.1%	15.0%
	1	Count	5	2	10	17
		% within tomrecode (binary)	29.4%	11.8%	58.8%	100.0%
		% within bilmek	71.4%	100.0%	90.9%	85.0%
Total		Count	7	2	11	20
		% within tomrecode (binary)	35.0%	10.0%	55.0%	100.0%
		% within bilmek	100.0%	100.0%	100.0%	100.0%

Crosstab

			dusunmek/sanmak		Total
			-1	1	
tomrecode (binary)	0	Count	2	1	3
		% within tomrecode (binary)	66.7%	33.3%	100.0%
		% within dusunmek/sanmak	15.4%	14.3%	15.0%
	1	Count	11	6	17
		% within tomrecode (binary)	64.7%	35.3%	100.0%
		% within dusunmek/sanmak	84.6%	85.7%	85.0%
Total		Count	13	7	20
		% within tomrecode (binary)	65.0%	35.0%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%

For the age group of 6;0-6;6

Crosstab

			sanmak	
			1	Total
tomrecode (binary)	1	Count	10	10
		% within tomrecode (binary)	100.0%	100.0%
		% within sanmak	100.0%	100.0%
Total		Count	10	10
		% within tomrecode (binary)	100.0%	100.0%
		% within sanmak	100.0%	100.0%

Crosstab

			bilmek		
			-1	1	Total
tomrecode (binary)	1	Count	3	7	10
		% within tomrecode (binary)	30.0%	70.0%	100.0%
		% within bilmek	100.0%	100.0%	100.0%
Total		Count	3	7	10
		% within tomrecode (binary)	30.0%	70.0%	100.0%
		% within bilmek	100.0%	100.0%	100.0%

Crosstab

			dusunmek/sanmak		
			-1	1	Total
tomrecode (binary)	1	Count	5	5	10
		% within tomrecode (binary)	50.0%	50.0%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%
Total		Count	5	5	10
		% within tomrecode (binary)	50.0%	50.0%	100.0%
		% within dusunmek/sanmak	100.0%	100.0%	100.0%

Distribution of children who passed the false belief questions by performance on the syntax of complementation and memory for false belief statements for all ages combined

Crosstab

			syntax recode		
			0	1	Total
tomrecode (binary)	0	Count	12	9	21
		% within tomrecode (binary)	57.1%	42.9%	100.0%
		% within syntax recode	63.2%	17.6%	30.0%
	1	Count	7	42	49
		% within tomrecode (binary)	14.3%	85.7%	100.0%
		% within syntax recode	36.8%	82.4%	70.0%
Total		Count	19	51	70
		% within tomrecode (binary)	27.1%	72.9%	100.0%
		% within syntax recode	100.0%	100.0%	100.0%

tomrecode (binary) * memory for fb recode Crosstabulation

			memory for fb recode		
			.00	1.00	Total
tomrecode (binary)	0	Count	14	7	21
		% within tomrecode (binary)	66.7%	33.3%	100.0%
		% within memory for fb recode	70.0%	14.0%	30.0%
	1	Count	6	43	49
		% within tomrecode (binary)	12.2%	87.8%	100.0%
		% within memory for fb recode	30.0%	86.0%	70.0%
Total		Count	20	50	70
		% within tomrecode (binary)	28.6%	71.4%	100.0%
		% within memory for fb recode	100.0%	100.0%	100.0%

For 3;0-3;11 age group

Crosstab

			syntax recode		
			0	1	Total
tomrecode (binary)	0	Count	10	4	14
		% within tomrecode (binary)	71.4%	28.6%	100.0%
		% within syntax recode	83.3%	50.0%	70.0%
	1	Count	2	4	6
		% within tomrecode (binary)	33.3%	66.7%	100.0%
		% within syntax recode	16.7%	50.0%	30.0%
Total		Count	12	8	20
		% within tomrecode (binary)	60.0%	40.0%	100.0%
		% within syntax recode	100.0%	100.0%	100.0%

tomrecode (binary) * memory for fb recode Crosstabulation

			memory for fb recode		
			.00	1.00	Total
tomrecode (binary)	0	Count	12	2	14
		% within tomrecode (binary)	85.7%	14.3%	100.0%
		% within memory for fb recode	92.3%	28.6%	70.0%
	1	Count	1	5	6
		% within tomrecode (binary)	16.7%	83.3%	100.0%
		% within memory for fb recode	7.7%	71.4%	30.0%
Total		Count	13	7	20
		% within tomrecode (binary)	65.0%	35.0%	100.0%
		% within memory for fb recode	100.0%	100.0%	100.0%

For the age group of 4;0-4;11

Crosstab

			syntax recode		
			0	1	Total
tomrecode (binary)	0	Count	2	2	4
		% within tomrecode (binary)	50.0%	50.0%	100.0%
		% within syntax recode	33.3%	14.3%	20.0%
	1	Count	4	12	16
		% within tomrecode (binary)	25.0%	75.0%	100.0%
		% within syntax recode	66.7%	85.7%	80.0%
Total		Count	6	14	20
		% within tomrecode (binary)	30.0%	70.0%	100.0%
		% within syntax recode	100.0%	100.0%	100.0%

tomrecode (binary) * memory for fb recode Crosstabulation

			memory for fb recode		
			.00	1.00	Total
tomrecode (binary)	0	Count	2	2	4
		% within tomrecode (binary)	50.0%	50.0%	100.0%
		% within memory for fb recode	33.3%	14.3%	20.0%
	1	Count	4	12	16
		% within tomrecode (binary)	25.0%	75.0%	100.0%
		% within memory for fb recode	66.7%	85.7%	80.0%
Total		Count	6	14	20
		% within tomrecode (binary)	30.0%	70.0%	100.0%
		% within memory for fb recode	100.0%	100.0%	100.0%

For the age group of 5;0-5;11

Crosstab

			syntax recode		
			0	1	Total
tomrecode (binary)	0	Count		3	3
		% within tomrecode (binary)		100.0%	100.0%
		% within syntax recode		15.8%	15.0%
	1	Count	1	16	17
		% within tomrecode (binary)	5.9%	94.1%	100.0%
		% within syntax recode	100.0%	84.2%	85.0%
Total		Count	1	19	20
		% within tomrecode (binary)	5.0%	95.0%	100.0%
		% within syntax recode	100.0%	100.0%	100.0%

tomrecode (binary) * memory for fb recode Crosstabulation

			memory for fb recode	
			1.00	Total
tomrecode (binary)	0	Count	3	3
		% within tomrecode (binary)	100.0%	100.0%
		% within memory for fb recode	15.0%	15.0%
	1	Count	17	17
		% within tomrecode (binary)	100.0%	100.0%
		% within memory for fb recode	85.0%	85.0%
Total		Count	20	20
		% within tomrecode (binary)	100.0%	100.0%
		% within memory for fb recode	100.0%	100.0%

For the age group of 6;0-6;6

Crosstab

			syntax recode	
			1	Total
tomrecode (binary)	1	Count	10	10
		% within tomrecode (binary)	100.0%	100.0%
		% within syntax recode	100.0%	100.0%
Total		Count	10	10
		% within tomrecode (binary)	100.0%	100.0%
		% within syntax recode	100.0%	100.0%

tomrecode (binary) * memory for fb recode Crosstabulation

			memory for fb recode		
			.00	1.00	Total
tomrecode (binary)	1	Count	1	9	10
		% within tomrecode (binary)	10.0%	90.0%	100.0%
		% within memory for fb recode	100.0%	100.0%	100.0%
Total		Count	1	9	10
		% within tomrecode (binary)	10.0%	90.0%	100.0%
		% within memory for fb recode	100.0%	100.0%	100.0%