COMMUNICATION VIS- A- VIS THEORY OF MIND- A STUDY IN TYPICALLY DEVELOPING PRESCHOOLERS

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CERTIFICATE

This is to certify that this dissertation entitled "**Communication vis- a- vis Theory of Mind- A Study in Typically Developing Preschoolers**" is a bonafide work submitted in part fulfillment for the Degree of Master of Science (Speech Language Pathology) of the student (Registration No.: 12SLP005). The study has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any of the University for the award of any Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled "**Communication vis- a- vis Theory of Mind- A Study in Typically Developing Preschoolers**" is the result of my own study under the guidance of Dr. Prema, K.S.,Professorof Language Pathology, Department of Speech Language Sciences, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in other University for the award of Diploma or Degree.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO

CHAPTER I

INTRODUCTION

Communication serves as an important tool for the development of relationships among people. Human beings primarily communicate verbally by utilizing the complex linguistic rules and instill the rules of general social conduct to fulfill the goal of communication. In addition to verbalizing our thoughts and intentions, we tend to augmentour verbal codes by using certain non- verbal means of expression such as body language, facial expressions, gestures and so forth. From the early years, infants begin to communicate with their caregivers to fulfill their basic needs. Nevertheless, the mode of communicating is generally through undifferentiated vocalizations such as crying or grunts. The caregivers infer the meaning of these vocalizations with respect to the context and respond to the same through a series of simple, well- intoned meaningful verbal inputs in the form of a sing-song, most commonly known as "motherese" assuming that infants and toddlers would be more responsive to it. At about 1 year of age, children begin to speak their first words accompanied by jargon speech or verbalizations to communicate their needs. As the child grows older, they tend to rely more on verbal language to express their intentions which is accompanied by elaborate gestures, body language and facial expressions.

The development of linguistic competence in children is often intricately interwoven with the development of cognition. Cognition refers to the ability to "think and reason". Piaget had described six stages of cognitive development which gives a precise description about the development of various thought processes in children from infancy through adolescence and adulthood. As stated by Piaget, children are egocentric in nature during their childhood and relate the thoughts and intentions of others to their own. Alternatively stated, they assume that others'

emotional state would be similar to that of oneself. As they grow older, they begin to differentiate the perspectives of others' from their own perspectives.

1.1 Theory of Mind

The ability of being able to infer others desires, beliefs and perceptions is commonly referred to as "Theory of Mind" or ToM. Originally, the term "Theory of Mind" was coined to refer to the ability to impute mental states to the self and to others(Premack& Woodruff, 1978). The ToM is a significantfeature under the umbrella term "social cognition" and is considered to be a major factor for social interaction during daily living. It comprises the ability to follow directions and understand socially based instructions. It is also used by people to manipulate or deceive others.

1.1 Theory of Mind Perspectives

Several researchers in the field of developmental psychology and philosophy have presented with various perspectives related to theory of mind. The term ToM encompasses a wide range of mental states such as perception, intention, cognition and emotion. (Flavell, 1999; Hughes, 2001; Tager- Flushberg, 2001). Under such a broad framework, ToM can be viewed as having two contrasting explanations. (Tager- Flushberg, 2001). The emphasis can either be on *formal propositional skills* (a set of interconnected principles which states the way the mental world works) or *socio- perceptual skills* (social "know- hows" on how to negotiate mental aspects with respect to the outside world).

The *formal propositional skills* provide a wider arena to experiment their abilities to utilize, expand and manipulate their mental states besides giving a foundation to the individual

about how to formulate thought processes. The *socio- perceptual skills* on the other hand, gives an insight about relating the mental states of oneself to the social world, a feature that is critical to human communication- simply known as "social interaction". Thus, the relationship between these two factors must be kept in mind while assessing the emergence of social competence in childhood.

1.2 Development of Language versus Theory of Mind

Over several decades, researchers in the field of philosophy, psychology, cognitive sciences as well as linguists have provided an assortment of views about the connections between the science of thought processes and language formulation. Several investigators have often found mixed results with regard to whether theory of mind preceded language development or vice versa (Ashington, Wilde, Jenkins & Jennifer, 1999). Nonetheless, the debate still continues and an attempt was made to cumulate the most striking developments seen across all age groups with respect to theory of mind and language.

1.2.1   Infants

Newborns are often urged to interact with others while they also impel others to interact with them. In spite of limited verbal output, infants are considered to be quite active during social interplay. However, their awareness of the inner mental states is not so well- developed. Earlier, researchers often test for false- belief comprehension and consider it to be a "standard" test that would reflect the ToM abilities of a child (Baron- Cohen, Leslie& Firth, 1985; Wimmer&Perner, 1983). However, recent researchers have shifted their focus from beliefs to intentions, which in turn have led to a focus on the actions than on representations (Hughes,

2001b). Based on this premise, recent research shows that infants as young as 6 months of age can understand the difference between a mechanical and biological movement (Woodward, 1998). These competencies enhance the infants' abilities to selectively attend to others behavior and view events from an agent's perspectives. At about 10 months of age, infants tend to analyze actions with respect to the individuals' underlying intentions(Baldwin, Baird, Saylor & Clark, 2001). This skill is known as 'social referencing'; in which infants' make use of others' emotional reactions to guide their own actions in novel situations (Baldwin & Moses, 1994; Moses, Baldwin, Rosicky&Tidball, 2001). Though the infants learn to parse actions based on intentions, they are not capable of knowing the content of an intention. Nevertheless, the act of identifying the intentions itself serves as a basis for the development of social and communicative skills in children in the later years. One such skill which illustrates the above activity is the 'joint visual attention' which emerges between 9 to 12 months of age (Tomasello, 1999). This skill is crucial for the development of language abilities (Baldwin& Moses, 1994; Mundy &Sigman, 1989; Tomasello&Barton, 1994). It is also noted that eye gaze behavior also implies that the child is aware of other's mental state (Tomasello, 1999).

1.2.2   Toddlerhood

Meltzoff, Gopnick&Repacholi(1999) refers to toddlerhood as the "*dark ages between infancy and preschool years"*. One of the interesting skill that is developed during this period is the "shared imaginative play" which is an exciting activity shared by toddlers with their peers and this acts as an indirect tool to initiate and sustain social contact in young children. Also, in the same context, the pretend play behavior also develops during this period and hence facilitates cooperative interactions between siblings or peers (Brown, Donelan-McCall & Dunn,

1996;Dunn, Brown, Slomkowski, Tesla &Youngblade, 1991). Such interactive patterns have a powerful influence on the socio- emotional adjustment of children (Dunn, 2000; Garcia, Shaw, Winslow&Yaggi, 2000; Patterson, 1986). One of the most striking developments during this period is the language development. By this age, children acquire the skill of developing an internal state language (Bartsch& Wellman, 1995; Bretherton&Beeghly, 1982; Shatz, Wellman & Silber, 1983), and they would be able to non- egocentrically reason the feelings and desires of others; i.e. from a holistic point of view desires (Repacholi&Gopnik, 1997). This would enable the toddlers to display their awareness of the bias with respect to feelings, preferences,desires, and perceptions. This transforms toddlers' social interactions by opening up new horizons in communication, and by enabling notonly empathic exchanges as seen during comforting a younger sibling with a hug or a kiss (Zahn-Waxler, Radke-Yarrow, Wagner& Chapman, 1992) and joint goal-directedactivity but also during teasing and provocation (Dunn, 1988).

1.2.3 Pre- school years

Preschool age is the period of time when the children attend play school or pre-kindergarten; i.e. 3 to 6 years of age prior to the commencement of formal schooling. During this period, most children exhibit a well- versed understanding of mental states, especially emotions. For instance, older preschoolers are capable of identifying an array of mental states such as: people can camaflouge their emotions in various social contexts; can have varied emotional reactions influenced by their mood or earlier experiences associated with similar events; and can experience two or more conflicting emotions simultaneously (Flavell& Miller, 1998). Such developments in emotional understanding helps the children to become skilled 'mindreaders', and thus transform their social interactions, which in turn is significantly associated with

empathy (Zahn-Waxler, Radke- Yarrow, Wagner & Chapman,1992), positive peer relations (Dunn & Cutting, 1999) and the use of "socially accepted rules" for controlling emotional outlets (Harris,1989, 1994).

When children reach 3 years of age, they also learn to appreciate some of the basic facts related to thinking and understand that the word "know" refers to more than just "thinking" or "guessing" (Flavell& Miller, 1998; Montgomery, 1992; Perner, 1991; Taylor, 1996). They understand that every individual has his/her own stable, unique characteristics such as personality while can also display a variety of transient mental states (Flavell, 1999). This ultimately results in the development of 'self- concepts' or self- image in children which would facilitate better social relations with their peers(Eder, 2000).

By 4 years of age,children are able to attribute mistaken beliefs to themselves and to others, and begin to exhibit more advanced forms of social interaction, including tricks, jokes and deception. Such rapid improvements in understanding knowledge and belief make 4-year-olds more sophisticated social partners; and false-belief performance is correlated with connectedness of conversation (Slomkowski& Dunn, 1996) and elaborate joint pretend play (Hughes & Dunn, 1997; Taylor & Carlson, 1997; Youngblade& Dunn, 1995). By this age, children more often prefer to engage in interesting conversations with peers or siblings who have similar interests rather than with adult caregivers (Dunn, 1994). Thus, it would be reasonable to conclude that developments in theory of mind not only show associations regarding *how* the children interact, but also with *whom* they engage in social interactions.

1.3 Need for the study

Over the past four decades, developmental psychologists and other researchers have thrown light on a major aspect of social cognition- Theory of Mind (ToM). Earlier, the focus of research was on understanding the mental percepts of other people, particularly their emotions, desires and intents, in relation to self. Later, this aspect of mental perception was extended to include the influences of social relations in the ToM development and hence researchers began to provide a link between the cognitive- linguistic development and the ToM from childhood upto adulthood (Hughes&Leekam, 2004). Since ToM is viewed from such a wide range of perspectives, there are several opinions concerning the development of ToM in children. According to nativists' view, theory of mind development is not wholly determined by the nature of social interaction among children (Baron- Cohen, 1995; Leslie, 1994) andthat there are some universal age- related changes in the pattern of development of ToM (Avis & Harris, 1991). However, more recent accounts highlight the influence of family and cultural differences on the rate and extent of ToM development (Vinden, 1999; Wellman et al., 2001).

Besides the above, the syntactic ability, pragmatic understanding of task questions and discourse abilities such as the understanding of assumptions underlying conversational exchanges and the presence of mutual beliefs are reported to be important for expressing as well as reflecting upon others' mental states (Peterson, Peterson & Webb, 2000; Woolfe, Want &Siegal, 2002).

Continued exploration of ToM in typical as well as atypical children such as autism, Asperger's and children with perceptual disabilities has paved way for the development of a range of test materials to delineate the differences between the two groups with regard to ToM development and explore the extent of its deviancy in the atypical population.Several authors

have made available a number of tests to study the Theory of Mind in young children and adolescents with Autism Spectrum Disorders (Premack and Woodruff, 1978; 8), Happe, 1994; , Kaland, 2002; Baron- Cohen, 2006; Schereen, 2012). These tests make use of false- belief tasks using pictures or cartoons (the famous Sally- Anne Test), social stories and ambiguous tasks to study the ToM development in children with ASD as well as their typically developing counterparts.

It was a conventional trend that false- belief comprehension was the ultimate predictor of ToM (Baron- Cohen et al., 1985). Recently, this trend was critically evaluated and argued that false- belief understanding was not solely determined by the competence of ToM and likewise, ToM entails more depth than just the ability to reason out false- beliefs (Bloom & German, 2000). It is under this premise that demanded a need for understanding ToM beyond the dimensions of the typical "Sally- Anne" test of false- belief (Baron- Cohen et al., 1985).

Thus, the present study attempted to develop a test that would include linguistic elements of syntactic and discourse skills which would be utilized to infer the theory- of- mind development in typically developing preschool children. Since the preschool period is often considered crucial for the development of ToM abilities, the study would thus provide us an insight into the influence of language on ToM and/ or vice versa.

1.4 Aim of the Study

The aim of the study was to investigate the communication skills in typically developing preschool children in relation to Theory of Mind.

1.5 Objectives of the Study

1. To study the Theory of Mind (ToM) in typically developing preschoolers by adapting a test suitable to Indian population.

2. To evaluate the relationship between language abilities and the Theory of Mind development in this population.

3. To trace the course of developmental patterns of language abilities particularly social interaction and social cognitive skills in typically developing preschoolers.

CHAPTER II

REVIEW OF LITERATURE

Verbal language serves the most important purpose of humans' life- communication. The conventional definition of language defines it as: *"a set of arbitrary symbols"*, which implies that language is nothing but a set of abstract codes that is learnt by the individuals to fulfill their basic wants and send and receive information. Thus, language is used as a tool to encode as well as decode the inner mental states as well as reflect others' mental states respectively.

Right from birth, human beings have an innate capacity to comprehend as well as express their thought processes through verbal codes starting from reflexive cries, primitive vocalizations and verbalizations such as cooing, babbling etc which is further refined to spoken language in the later years. It is well known that language and thought processes go hand- in- hand; i.e. language is used to express thoughts and novel thoughts arise through the use of language. An often debated issue by researchers is about the emergence of cognition and language. It is frequently stated as the *"chicken and egg analogy"* implying that one cannot be sure to tell whether language emerged from cognitive processes or vice versa. Nonetheless, there is an enormous influence of both the factors on each other and it is often noted that with advancements in linguistic competence, the nature of thought processes also become complex. In other words, children become increasingly skillful in channeling their thoughts and express only certain facets of it while communicating with others. This process becomes refined and does not attain completion even in adulthood.

In order to serve as a successful communication partner in a discourse, one must be well-versed in knowing that others' have mental states (perceptions, intentions, beliefs) that are

different from one's own and thus are entitled to their opinion while discussing a topic. The ability to distinguish between self and other's inner state of language requires cognitive ability viz the "Theory of Mind".

The term "Theory of Mind", otherwise referred to as ToM, is a generic term that is used to indicate a person's ability to understand the thoughts, beliefs, desires and emotions of other individuals. The term "theory of mind" emerges due to the fact that the outcomes of its prediction are not directly observable. Rather, they need to be measured by means of various standard tasks that would help infer whether a person has ToM understanding or not. The development of theory of mind is a cognitive skill, which begins to emerge right from infancy through childhood and almost reaches fruition by adulthood. Though the theory of mind understanding is an innate potential ability of an individual, its concept is further strengthened and refined through social experiences in the real world situation and hence does not attain completion even by adulthood. Empathy, which refers to the ability to understand others perception without relating it to one's own is also found to be a culminating feature of the theory of mind development.

2.1 Foundations of ToM

Over the years, extensive work has been carried out in various fields of philosophy, neuropsychology, language as well as neuro- ethology (animal studies) to study the nature of development of ToM. For instance, it was suggested by psychologists that introspective consciousness has specific functions which enables the social animals to predict each other's behavior (Nicholas Humphrey, 1978). Also, neuro- ethological studies of animal behavior suggests that even rodents exhibit ethical or empathic behavior (Franz, 2007). Jean Piaget

suggested in his "theory of cognitive development" that before the age of 3 or 4, egocentrism prevents the children from understanding that other's thoughts and beliefs differ from their own. While on the other hand, non- Piagetian theories of cognitive development maintain that theory of mind is a byproduct of a larger hypercognitive ability of the human mind to register, monitor and represent its own functioning. ToM also has its roots in philosophy, wherein René Descartes laid down the groundwork for a science of the mind.

2.2 Origins of the Theory of Mind

Research on the theory of mind in humans and animals has had an enormous growth since the last 35 years since Premack and Woodruff (1978) published their paper: "Does chimpanzees have a theory of mind?" It was these pioneering researchers who had coined the term "theory of mind" which is now widely used in the field of developmental psychology.They argued that chimpanzees and perhaps other nonhuman primates could understand the intentions of others and therefore possessed ToM. Although the issue seems to be controversial, Premack and Woodruff's work served as an inspiration for psychologists studying normal and abnormal child development.

In 1983, Josef Perner and Heinz Wimmer applied Premack and Woodruff's false-belief test to children using an "unexpected location" task. There were two versions of this test. (Maxi and Sally- Anne). Until about 4 years of age, children attribute their own beliefs to those of others. However, older children understand that other people's beliefs differ from their own. There has been a long standing notion that false- belief tasks are one of the most reliable predictors of the ToM development.

2.3 Neuroscience of the ToM

Brain imaging studies while performing tasks related to ToM has suggested that there is a specific involvement of a patch of neurons above the eyes known as the anterior paracingulate cortex. Most researchers believe this region to be primarily responsible to distinguish between ones own mind from that of others and is presumed to a predominantly activated region central to ToM tasks. Also, the frontal cortex was found to be important for both ToM and cognitive abilities and this region continues to develop during adolescence. Morigu-chi and colleagues (2007) studied 9- to 16-year-olds and found that the activation of the medial prefrontal cortex, the bilateral superior temporal sulcus (STS), and the temporal pole adjacent to the amygdala were associated with ToM similar to that of adults and that during late childhood and adolescence, ToM activation of the medial prefrontal cortex switched from the ventral side to the dorsal. In addition, it was noted that the left medial prefrontal cortex is strongly activated when normal subjects read a story that requires understanding the mental states of characters, whereas this region is not activated when autistic subjects read the same story. The STS senses biological motion. It is activated by a moving hand but not a moving car and is particularly sensitive to eye and lip movements. The temporal pole is crucial for recalling memories. The amygdala, which is important for emotion, may also be involved in ToM.

Autism researchers have focused on the hypothesis that autistic children do not undergo normal ToM development. Autistic children who do manage to pass ToM tests usually have far more verbal knowledge than other 3- to 5-year-olds. They also laboriously explain their reasoning, whereas normal young children cannot explain their reasoning, suggesting that the autistic children use a different method to succeed on the test. Baron Cohen (1999) studied

children with Asperger syndrome or high-functioning autism and found that children who passed false-belief tests were nonetheless unable to recognize faux pas or recognized them but continued to make them. Autistic children also have difficulty understanding and carrying out deception. Studies on autistic individuals have helped distinguish between ToM and cognition since autistics can have exceptional cognitive abilities while lacking ToM skills.

2.4 Theory of Mind Development

It is well known that understandings of others' intentions and imitative experience with other people are hallmarks of a theory of mind that may be observed early in the development of ToM. Simon Baron-Cohen identified that by 7 to 9 months of age, an infant's understanding of attention in others implies to be a "critical precursor" to the development of theory of mind. Understanding attention involves the appreciation that seeing can be attributed as selectively looking at something with interest which in turn can presume that seeing can induce beliefs. Attention can be directed and shared by the act of pointing, wherein a joint attention behavior requires taking into account another person's mental state, particularly when the person notices an object or has an interest towards it. Thus, it was speculated that the inclination to spontaneously reference an object in the world as of interest ("proto-declarative pointing") and to appreciate the directed attention of others may be the underlying motive behind all human communication.

In addition to the above, understanding of others' intentions is another critical precursor to understanding other minds since intentionality, or "aboutness", is a fundamental feature of mental states and events. The "intentional stance" has been defined by Daniel Dennett as "*anunderstanding that others' actions are goal-directed and arise from particular beliefs or*

desires." Both 2- and 3-year-old children could discriminate when an experimenter intentionally versus accidentally marked a box as baited with stickers. Even earlier, authors such as Andrew Meltzoff found that 18 month-old infants could perform target manipulations that adult experimenters attempted and failed, suggesting that the infants could represent the object-manipulating behavior of adults as involving goals and intentions.

Recent research in developmental psychology suggests that the infant's ability to imitate others constitutes mixed elements of both theory of mind along with certain aspects of social cognition such as perspective taking and empathy. According to Meltzoff, the infant's innate understanding that others are "like me" allows them to recognize the equivalence between the physical and mental states apparent in others and those felt by the self. For example, the infant uses his/her own experiences orienting his head/eyes toward an object of interest to understand the movements of others who would turn toward that object , that is attending to objects of interest or significance. On the contrary, certain researchers believe that the imitation skill is rather an unreliable measure to precisely point out to the underlying psychological state of an individual and that it cannot be used to draw conclusions regarding the mental states of human. These results were established based on an imitation test by Alexandra Horowitz who found that adult subjects imitated an experimenter demonstrating a novel task far less closely than the children did.

2.4.1 Theory of Mind- Infants versus Preschoolers

Though it is well established through various studies that the children acquirethe basis of the theory of mind as early as 18 months of age, it is however highly disagreed by various researchers who claim that it is unclear as to which behaviors indicate a developing ToM in

children younger than 3 and that it has been very difficult to assess ToM in preverbal children. Nonetheless, some researchers argue that mimicking by infants is indicative of a developing ToM. (Meltzoff, 2002). Hence, it was concluded that toddlers can understand that others have likes and dislikes that are different from their own. By 3 years of age, children develop a fairly good understanding of ToM. They are able to express attributes such as think, remember etc and can attribute to mental states such as dreams to be different from reality.

At about 4 years of age, the children are able to recognize the fact that other people have minds that are different from their own and can hold different information. They also identify the fact that appearances may be deceptive and can be misleading. Conventionally, the appearance-reality (A-R) task is used to assess a child's ability to distinguish between reality and representation. For instance, a child is given a sponge that is painted to look like a rock. When asked what the object looks like and what it really is, a 3-year-old will give the same answer to both questions—either a rock or a sponge. In contrast, a 4-year-old will correctly answer that it looks like a rock but is really a sponge. By the age of 5, children can understand that something that looks like a rock may actually be sponge.

Although it is clear that the abilities to pass false-belief and A-R tasks at about age 4 represent important milestones in ToM development, the nature of these cognitive shifts is unclear. Simulation theory argues that children learn to understand other's beliefs through imagination—by imagining themselves in another person's situation. While other scientists hold that this milestone occurs through a process of conceptual change or by means of maturation of brain structure that facilitate reasoning about the minds of others. It is thus a common belief

among several psychologists that failure on false-belief and other ToM tasks implies an immature executive functioning.

2.5 Factors influencing ToM development

Apart from the standard developmental milestones of the theory of mind development in childhood, there are several influential factors, both internal and external to an individual which can have a significant effect on the ToM development.

2.5.1 Family size and ToM

Although understanding ToM tasks is universal in normal children above 5 years of age, several factors decide the nature and age of acquisition of the skill. It is found that children with larger vocabularies and those from larger families pass ToM tests at an earlier age. Jenkins, Astington& Wilde (1996) attempted to study how cognition and family structure would influence the development of theory of mind in young children. They found significant correlations between the family size and the understanding of theory of mind tasks in that, the presence of siblings accelerated the rate of language development when compared to families having a single child. Similarly, Hughes and Leekam (2003) studied the link between theory of mind and social relations and found that the linkage between ToM and the development of social relations are not uniform or unidirectional; in both the typical and the atypical population and that the ToM skills are influenced/ transformed by the interpersonal and family relations and by different language communities.

2.5.2   Mother- child interaction and ToM

Over the years, there has been a keen interest in trying to understand the nature of mother- child interactions and its effect on the acquisition of language and theory of mind

understanding.Ross and Mellisa (1997) have studied the nature of theory of mind development in young preschoolers through active mother- child participation in conversation regarding past events. A total of 40 preschool aged children of the age range 3.5- 4.5 years were included in the study. Their task was to discuss three past events to their mothers and to complete a set of theory of mind tasks indexing their ability to understand the mental representations. Their test scores revealed that regardless of age and linguistic skills, the children's theory of mind scores were directly correlated to their narration of past (memory- based) events. Also, the frequency with which the mothers provided new information was related to children's theory of mind scores, although mothers' direct replies were not related to the same. This study has highlighted the relevance of theory of mind skills to real-world social interaction.

The relationship between the children's and mother's Mental State Language (Mental State Language refers to the language related to the desires and beliefs of an individual) and the Theory of Mind understanding is explored by Ruffman, Slade and Crowe (2003). This was a longitudinal study which examined the relation between mothers' utterances and the theory of mind understanding over a period of 1 year involving three time points. A total of 82 children were included in the study whose mothers were told to describe them a set of pictures at all the three time points over the year. Results showed a direct correlation between the mother's mental state language used in the earlier stages with their child's later understanding of the theory of mind. However, there was no reciprocal relationship. i.e. there was no relation between the early theory- of- mind understanding and the mothers' mental state language used at later stages. In addition, it was found that the child's descriptions of their desires preceded the talk about beliefs.

2.5.3 Language ability and ToM

ToM development in young children was also found to be strongly correlated with language ability. Bilingual preschoolers happen to have an increased understanding of both mental and non-mental representations. In addition, it is presumed that both language and ToM skills predict later metamemory— knowledge and beliefs about one's own memory—and metacognition—knowledge and beliefs about one's own cognitive processes. Farhadian, Abdullah, Mandsor, Redzuan, Gazanizadand and Vijay Kumar (2010) studied the differences in the theory of mind development in monolingual versus bilingual preschool children. A total of 163 preschool children with a mean age of 5.75 years consisting of Kurdish- Persian bilinguals and Persian monolinguals were tested for the ToM development using three instruments eliciting false- belief tasks. It was concluded from the study that the number of languages that a child is exposed to would influence the development of theory of mind in the early years.

A longitudinal study on the relationship between language and theory of mind development was done by Ashington et al., (1999). A total of 59 three- year old children were tested over a 7 month period in order to assess the contribution of theory of mind to language development and vice versa including independent contributions of syntax and semantics. The language competence of the participants was assessed using a standardized measure of reception and production of syntax and semantics (Test of Early Language Development) while the theory of mind skills was assessed using false- belief and appearance- reality (A-R) tasks. An interesting result was found wherein the earlier linguistic abilities predicted the later theory- of- mind development but the early theory- of- mind skills did not influence the later language

abilities, thereby indicating that language development may be an important milestone in the development of ToM.

2.5.4 Play Behavior and ToM

It was interesting to note that the ToM development appears to be advanced in children with older siblings and in children who participate in early pretend play and those whose families talk about mental states. Lilliard (1993) studied the relation between the development of pretend play skills and theory of mind. It assumes that pretend play might be a zone of proximal development, an activity in which children operate at a cognitive level higher than they operate at in non-pretense situations. In addition, the study has attempted to investigate whether pretend play is an area of advanced understanding with reference to three skills that are implicated in both pretend play and theory of mind: the ability to represent one object as two things at once, the ability to see one object as representing another and the ability to represent mental representations.

2.5.5 Social Interaction and ToM

Earlier, the theory of mind research viewed the child's development of concepts of mind (differing views about self and others) to be a gradual maturational process with the children's social environments playing a "triggering" role (Leslie, 1994). However, other researchers (Perner, Ruffman&Leekam, 1994) emphasized the striking effect of family size, number of siblings and social relations to ToM development. Watson, Nixon &Linkie (1999) studied the relation between social interaction skills and theory of mind in young children. Two studies were conducted wherein Study 1 consisted of global rating scale of social skills and peer interaction in

children by the teachers, a false belief task and an auditory comprehension task while Study 2 replicated Study 1 with a larger representative sample. A positive correlation was obtained between the children's scores on the ToM tasks and their social skills.

A comparative measure of the relation between social maturation and the development of theory of mind in typically developing children versus those with autism spectrum disorders has been given by Peterson, Slaughter &Paynter (2007). The ToM ability was tested separately across two groups of participants. In Study 1, 37 typically developing preschoolers were tested using a standard false belief tests of ToM test battery and were rated by their teachers on a newly developed age-referenced social maturity scale with 7 items. In Study 2, a further group of 43 children aged 4 to 12 years (13 with autism, 14 with Asperger's disorder and 16 with typical development) were included. Results from Study 1 revealed that ToM was capable of predicting typical preschoolers' social maturity independently of age and verbal maturity. While, in Study 2, it was observed that children with autism scored below age-matched and younger typical developers in both ToM and social maturity and those with Asperger's disorder did well on ToM but poorly on social maturity. Thus, the researchers established the fact that ToM was linked with social maturity independently of age and verbal ability, although the link was not independent of autism diagnosis.

In the context of social interaction, there are several facets influencing the development of social skills in children. A notable factor involves the degree of friendliness and acceptance of the children amongst their peer group- commonly referred to as peer acceptance. The link between peer acceptance and theory of mind in typically developing preschool childrenwas investigated by Slaughter, Dennis &Plitchard (2010). There were two studies undertaken in order

to test this hypothesis. In the first study, 78 children between 4 to 6 years of age were included in order to determine the social preference and social impact scores and classify the children in one of the five peer status groups. (Coie& Dodge, 1983). Also, these children were tested on five different ToM tasks. Study 2, on the other hand, was a replication and extension of the first study with a sample of 87 four- to- six year olds. In Study 2, measures of peer acceptance, theory of mind ability and verbal intelligence as well as teacher ratings of prosocial and aggressive behaviors were included. Results from Study 1 showed that the theory of mind scores was significantly related to the social preference scores obtained by the children who are above 5 years old. It was found that children who were classified as being popular performed better than those classified under rejected. The results of Study 2 showed that for the total group of children, prosocial behavior was the best predictor of social preference scores. When the Study 2 sample was split into older and younger children, theory of mind ability was found to be the best predictor of social preference scores for the older children (over age 5), while aggressive and prosocialbehaviours were the best predictors of peer acceptance in the younger children. Overall, the pattern of results suggests that the impact of theory of mind ability on peer acceptance is modest but increases with children's age.

2.5.6   Narrative Skills and ToM

One of the most outstanding concerns in the area of research related to theory of mind is to identify a reliable means to measure its outcomes. Since it is a concept far too complex to be observed directly, its consequences were identified through the performance of various tasks that would require cognitive competence which in turn would imply its nature and extent of development in an individual. One such task that is used to identify the presence of ToM ability

is that of narrative understanding. Shah (2003) attempted to relate the narrative understanding and theory of mind in preschoolers. Twenty- one 3 to 4 year old preschool children were included in the study whose verbal responses related to theory of mind concepts such as appearance- reality (A- R), deception and so forth were examined during multiple storybook reading sessions adapted from Guajardo and Watson (2002). There were three phases namely the pretest, training and posttest sessions. During both the pretest and the posttest sessions, the participants were tested for tasks related to A-R, deception and false belief. Results revealed that storybook reading sessions improved children's theory of mind skills compared to those who have not received any training sessions.

The relationship between the narrative input by mothers to the ToM development in typically developing versus those with autism spectrum disorder was investigated (Slaughter, Peterson& Mackintosh, 2007). There were two studies conducted wherein the mothers read wordless storybooks to their children of mean age 3.9 years and the narratives were analyzed for mental state language while the ToM understanding of the children were concurrently assessed. In Study 1, the children's ToM task performance was significantly correlated withmothers' explanatory, causal, and contrastive talk about cognition, but not with mothers' simple mentions of cognition. While in Study 2, the same pattern was found in an older sample of typically developing children with a mean age of 4.7 years, whereas for children on the autism spectrum of mean age 6.5 years, the ToM task performance was uniquely correlated with mothers' explanatory, causal, and contrastive talk about emotions.

2.6 Recent perspectives about ToM

It is a well established notion that theory of mind development cannot be measured directly and can only be derived from certain tasks requiring the understanding of thought processes (inner states). Thus, over several years, the 'false- belief' test has served to be a *litmus paper test* in inferring the extent of understanding of ToM in an individual. One of the major reasons is that false- belief test taps the most essential aspect of ToM- understanding differing perspectives and intentions about a same object or a situation by two people. Thus, it continued to serve as a strikingly important tool amongst researchers to study the social cognitive development in both typical and atypical children.

However, recently ToM research has gained a special importance in the field of language development and hence several investigators have given an account of the various language components that serve as an important tool for reflecting ToM by humans (Peterson et al., 2000; Woolfe et al., 2002). Thus, the 'false- belief comprehension' being a stand- alone tool for ToM inference has been highly questioned and researchers have proved that false- belief component does not solely suffice to explain the vastness underlying theory- of- mind (Bloom & German, 2000).

In brief, it can be said that under the domain of cognitive sciences, the Theory of Mind (ToM) has received a lot of attention under several perspectives including thoughts, percepts, intentions, emotions, desires as well as the language aspects associated with it. Though cognition is a multifaceted domain, examiners have often focused on ToM to be a major feature under social cognition and hence it is considered to be a rather essential factor in the development of social interaction, empathy and the concept of self and others. Moreover, it is also majorly

influenced by the language abilities of an individual during their early developmental years. In addition to the above, there are innumerable factors that help to augment the ToM abilities, both internal and external to the individual. Earlier, there was a conventional notion amongst researchers that false- belief tasks was the most accepted test to examine ToM abilities of an individual since it covers a major domain of theory of mind: understanding that the intentions of self and others are different. Though it is still proven to provide promising results about the ToM skills, researchers related to the field of language pathology hold a stance that there are wider domains to be considered while tapping the ToM abilities with respect to development of language. Therefore, keeping the above views in mind, the present study attempts to address the ToM aspects within wider domains by developing a test to understand the ToM development and the subsequent language development in typically developing preschool children.

CHAPTER III

METHOD

The aim of the present study is to study the communicative skills in typically developing preschoolers in relation to their Theory of Mind (ToM) development. In order to investigate this, the following methodology has been employed:

3.1 Participants

A total of 30 typically developing preschool children of ages 3 to 6 years served as the participants of this study. The participants belonging to the above mentioned age ranges were categorized under six age divisions such as 3.0<>3.5, 3.5<>4.0, 4.0<>4.5, 4.5<>5.0, 5.0<>5.5 and 5.5<>6.0 respectively, wherein five children were selected under each age group. The children undertaken for the study belonged to various cultural and socio- economic backgrounds and thus had different native languages such as Kannada, Tamil and Malayalam. The participants of the study were attending either play school or regular school, with the exception of two children who were not yet admitted to preschool. An informed ethical consent was received from all the parents/caregivers of the participants.

3.2 Participant Selection Criteria

In order to serve as the participants for the current study, the following criteria were set for inclusion:

1. Absence of any visual, auditory, intellectual, neurological or motoric disability, which was confirmed using the WHO- ten disability screening checklist (Singhi, Kumar, Malhi& Kumar, 2007).

2. Normal speech language abilities with respect to age; i.e. the receptive and expressive language skills must be appropriate to their age. This was validated using the Computerized Linguistic Protocol for Screening (CLiPS) (Anitha&Prema, 2002), which is a standardized test material intended to provide an estimate of the children's receptive and expressive language level with respect to age.

3.3 Stimuli

A Theory of Mind (ToM) test given by Flynn, Maley, Ding, Wood and Wood (1997) was adapted and modified by the investigator as a Theory of Mind (ToM) assessment rating scale. This rating scale was intended to assess the extent of theory of mind (ToM) development as well as evaluatethe overall communicative profile of participants. A total of five major domains were included in the ToM assessment rating scale which were: Narrative Ability, Referential Communication, Planning, Social Cognition (Problem Solving) and Peer Tutoring. These domains were arranged in the order of increasing complexity and include tasks ranging from simple picture description to more complex cognitive activities. A four- point rating scale was used to assess the performance of the participants under each subtest, where a maximum score of "3" and/ or a minimum score of "0" were rewarded based on the number of trails required to complete a given task(s).

"3" - correct response with no/ single trial

"2" – correct response after two trials.

"1"- correct response after three trials

"0" - no response even after three trials

3.4 Description of the subtests

A brief description regarding the nature and details of the tasks to be performed under each domain is given in Table 1

Table 1:Description of the domains of the ToM assessment rating scale

DOMAIN	NATURE OF TASK	ACTIVITY
Narrative Ability	*Verbal*	Sequential picture cards of 3 stories such as "The Thirsty Crow", "The Hare and The Tortoise" and "The Capseller and the Monkeys" were used for this task. Here, the participants were asked to narrate any two stories of their choice. (See Appendix A)
Referential Communication (Adapted from George Yule, Derbyshire &Masidlover, 1977, 1982)	*Verbal*	A set of common objects namely: three balls of three different colors: red, green and yellow, a cup, plate and spoon and two blocks of different sizes; small and big were employed. In addition, a set of six picture cards consisting of illustrations of various arrangements of the above given objects were provided to the participants. Of the six picture cards, three cards (2, 4 & 6) were described by the tester and three cards (1, 3 & 5) were

		provided to the participants and they have to describe the same.
		The six instructions for the six picture cards were arranged in the order of increasing complexity. (See Appendix A)
Planning	*Verbal*	This task required the participants to verbally describe how they would plan out socially based events that requires active social participation such as birthday party, going to friends or relatives house during vacations or going to school. (See Appendix A)
Social Cognition (Problem Solving)	*Verbal*	This domain consisted of a total of five problem solving tasks; in which the participants had to provide a verbal description of how a particular situation would be handled by them. (See Appendix A)
Peer Tutoring (Adapted fromK-PALS- Peer-Assisted Learning Strategies for Kindergartners (K-PALS; Fuchs, Fuchs, Thompson, Al Otaiba, Yen, McMaster, et al., 2001).	*Verbal*	In this task, the investigator taught the participant(s) how to assemble a set of puzzles or blocks in a particular manner and the children had to retain the novel information and then instruct another peer of his/her age to construct it in the same manner. (see Appendix A)

3.5 Procedure

The participants of the study were tested individually, in order to avoid familiarity effects on the other participants. Each participant was seated comfortably and tested in a room with minimal noise or interference of any sort. The seating of the examiner was opposite to that of the participant(s) at a distance of about 1 meter. A video recording of the test administration was done using the Sony Digital Video Recorder. The recorder was placed at a suitable distance of about 50 cm from the participants and the tester. Also, the duration of video recording session for each child was approximately 25 to 30 minutes.

General instructions about the test were provided to each participant prior to the administration. In addition, specific instructions (See Table 1) were given before starting each subsection including details on the nature of tasks involved. An example or a brief description of was given under each domain to familiarize the participants to the nature of the task. In addition, they were given clear instructions on the number of trials or cues that the tester would be providing them prior to eliminating a task(s). Suitable tokens or reinforcements were awarded to the participants after the successful completion of the test.

The video recordings of each participant were primarily assessed using the four- point ToM rating scale in order to quantify their theory- of- mind abilities. In addition, a verbatim transcription of the participants' responses to the tasks under each domain was also performed. These verbal responses were subject to a linguistic corpus analysis using the SALT (Systematic Analysis of Language Transcripts) software. The SALT software is a computerized linguistic database which analyzes discourse samples based on linguistic units such as morphemes, utterances and syntax and hence generates a series of quantified values related to various

linguistic parameters under scrutiny. Hence, in the present study, the parameters such as TTR (Type Token Ratio) and MLUw (Mean Length of Utterances in words) of the verbal responses were quantified using the SALT software.The Type Token Ratio (TTR) is a measure of the lexical diversity or the richness of vocabulary. It gives an objective measure of the number and variety of root as well as bound morphemes that was used by the participants during the description of the tasks. The Mean Length of Utterance (in words) (MLUw) is calculated by determining the number of words used in a single utterance. Thus, the scores obtained from the ToM rating scale along with the values of the corpus analysis were cumulatively subjected to suitable statistical analysis to study the communicative skills in typically developing preschoolers in relation to their Theory of Mind (ToM) development.

CHAPTER IV

RESULTS AND DISCUSSION

The present study attempted to investigate the communication skills as envisaged using the linguistic analysis measures such as the TTR (Type Token Ratio) and the MLUw (Mean Length of Utterance in words) of typically developing preschool children with respect to Theory of Mind (using the ToM assessment rating scale). In order to track these developmental changes, a total of thirty participants of the age range of 3-6 years, who were further divided under six age groups such as 3.0<>3.5, 3.5<>4.0, 4.0<>4.5, 4.5<>5.0, 5.0<>5.5 and 5.5<>6.0respectively were undertaken as participants of the study. To assess the theory of mind understand of the children, a theory of mind (ToM) assessment rating scale was developed which consisted of a total of five subsections namely: Narration, Referential Communication, Planning, Social Cognition and Peer Tutoring. These subtests were rated using a three- point rating scale. Scoring was based on the performance of the tasks under each section and a defined set of parameters were specified for each subsection based on which the scores were to be rewarded. In addition to the above, the oral discourses of the participants during the test administration was video recorded for the purposes of transcribing their language samples and thereby subject it to SALT (Systematic Analysis of Language Transcripts) analysis in order to gauge the lexical diversity and the syntactic complexity in their descriptions. Once the ratings and the linguistic measures for the same were obtained for each participant, the data was subjected to suitable statistical analysis using the SPSS 16.0 software.

The results of the study are discussed under the following sections:

1. Comparison of the scores of ToM assessment rating scale and the TTR (Type Token Ratio) and MLUw (Mean Length Utterance in words) across age groups.

2. Pairwise comparison of the scores obtained from ToM assessment rating scale and the TTR and MLUw between the six age groups.

3. Estimate of the significance of scores obtained from rating scale and TTR and MLUw within each age group.

4. Comparison of scores between subtests of ToMwithin each age group.

5. Reliability testing of the rating scale.

6. Correlations between the rating scale scores versus the TTR and MLUw scores.

4.1 Comparison of the scores of ToM assessment rating scale and the TTR and MLUw across age groups.

The scores obtained from ToM assessment rating scale were compared with the TTR (Type- Token Ratio) scores as well as the MLUw (Mean Length of Utterance in words) scores by employing the Kruskal- Wallis Test. The mean and standard deviation of the rating assessment scores and the TTR and MLUw are shown in Table 2.
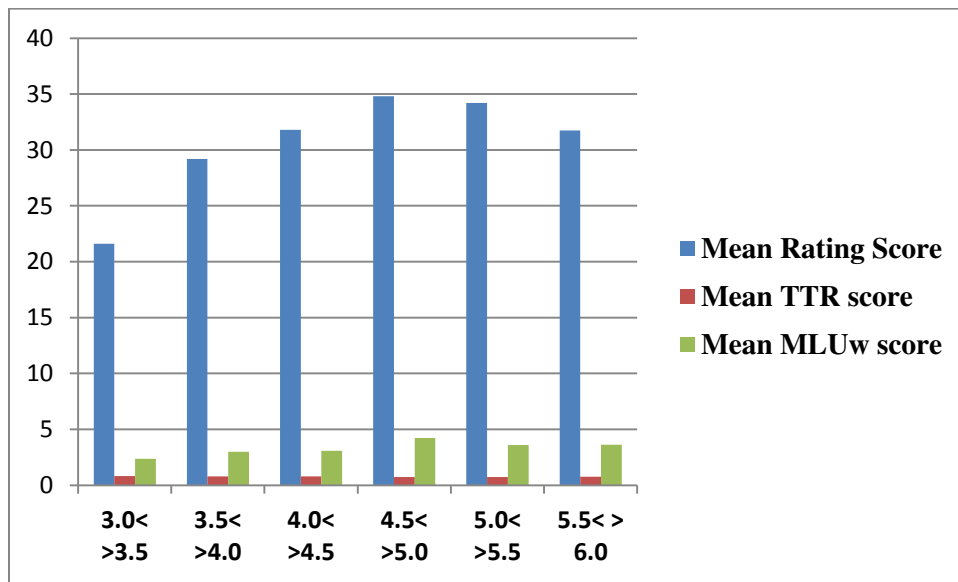
Table 2

Comparison of mean scores obtained from ToM rating scale, TTR and MLUw across the six age groups

Age Groups	Mean Rating Score	SD Rating Score	Mean TTR score	SD TTR score	Mean MLUw score	SD MLUw score
3.0- 3.5	21.6	6.107	0.83	0.06	2.37	1.09
3.5- 4.0	29.2	4.94	0.79	0.065	2.98	0.595
4.0-4.5	31.8	6.72	0.79	0.075	3.09	0.58
5.0-5.5	34.2	4.381	0.722	0.0558	3.598	0.899
5.5- 6.0	31.733	7.291	0.764	0.076	3.618	1.483

Figure 1

Mean scores of rating scale, TTR and MLUw across the six age groups.

The results as shown in Table 1 and Figure 1 show that, with the exception of subtest 1 (narration), there is a significant difference in the scores of all the four subtests as well as the TTR and MLUw scores across all age groups. In other words, the narrative ability of children across various age groups does not seem to exhibit a significant developmental trend. It can thus be implied that the scores of narrative skills domain are influenced by individual differences

among the preschool aged children and cannot be attributed to an increase in age. These outcomes are in harmony with the study done by Slaughter, Peterson & Mackintosh (2007) wherein it was implied that the mother's narrative input would influence the narrative abilities of preschool children of ages 3 to 4 years.

However, there was a notable difference observed in the mean scores of the other four domains across age all age groups. Such an outcome on the performance of tasks involving referential communication, planning, problem solving as well as peer tutoring abilities imply that such abilities follow a standard developmental trajectory which eventually attains maturity with increase in age.

4.2 Pairwise comparison of the scores obtained from ToM assessment rating scale and the TTR and MLUw between the six age groups

A pairwise comparison of the scores obtained from ToM assessment rating scale and the TTR and MLUw was done across between age groups using the Mann- Whitney Test (Z). The following results were obtained when the comparisons were carried out

4.2.1 Comparison of Group 1 (3.0≤>3.5use symbols) scores with the other age groups

A pairwise comparison of the scores obtained by the participants belonging to Group 1(age range 3.0≤>3.5) was made with the other age groups was subjected to Mann Whitney test and the following results were observed for the same.

Table 3

Pairwise Comparison of scores of rating scale, TTR and MLUw of Group 1(3.0- 3.5 years) across other age groups

Pairwise Comparison of Age Groups	Total Rating Scores		Total TTR		Total MLUw	
	Z	Significance	Z	Significance	Z	Significance
Group 1 and Group 2	1.886	0.059*	0.943	0.346	1.567	0.117
Group 1 and Group 3	2.102	0.036*	1.051	0.293	1.358	0.175
Group 1 and Group 4	2.402	0.016*	2.102	0.036*	2.402	0.016*
Group 1 and Group 5	2.432	0.015*	2.417	0.016*	1.776	0.076*
Group 1 and Group 6	2.619	0.009**	1.997	0.046*	2.193	0.026*

Note: *- Significant   **- Highly significant

As seen in Table 3, there is a significant difference between the scores of Group 1 across all age groups. Such an outcome is quite expected, owing to the fact that with increase in age, the ToM abilities acquire more maturity when compared to the early preschool years (i.e. 3.0<>3.5). The results obtained in the current study are similar to those obtained in a study done by Slaughter, Dennis & Pritchard (2010) who investigated the extent of theory of mind development in preschoolers in relation to peer acceptance. It was found that peer acceptance among the preschool children was correlated to their social preference and that their ToM development gradually inclines with increase in age.

Thus, it can be inferred from the Table 3 that a significant difference in the scores of rating scale, TTR and MLUw of Group 1 across all age groups would imply that there is a positive developmental pattern of all the above given skills from 3 years upto 6 years of age.

4.2.2 Comparison of Group 2 (3.5<>4.0) scores with the other age groups

A pairwise comparison of the scores obtained by the participants of the age range 3.5<>4.0 years was made with the other age groups was subjected to Mann Whitney test and the following results were obtained.

Table 4

Pairwise comparison of scores of rating scale, TTR and MLUw of Group 2 (3.5<>4.0) across other age groups

Pairwise Comparison of Age Groups	Total Rating Scores		Total TTR		Total MLUw	
	Z	Significance	Z	Significance	Z	Significance
Group 2 and Group 3	1.152	0.249	0.00	1.00	0.522	0.602
Group 2 and Group 4	1.676	0.094*	1.366	0.172	2.095	0.036*
Group 2 and Group 5	1.375	0.169	1.991	0.047*	1.358	0.175
Group 2 and Group 6	2.410	0.016*	1.781	0.075*	2.193	0.028*

Note: *- Significant

It can be inferred from Table 4 that there is a significant difference in the developmental trends between 3.5 to 6 years. This implies a much predictable pattern of development in the children with an increase in age. Also, it can be observed from the above result that the development of language and ToM skills are almost in a similar developmental pace within 3 to 3.5 years.

An interesting study was done by Sabbagh and Baldwin (2003) wherein the link between the preschool children's semantic ability and the theory of mind development was studied. A total of 48 three- to- four year olds were investigated using a novel word learning task in a knowledgeable versus an ignorant context. Results revealed that children of the ages 3 were unable to learn new words or understand the references in both the conditions while 4 year olds were able to better learn words in the knowledgeable conditions. The results of the present study can be attributed to a much similar reason suggesting that mental maturity cannot be wholly

influenced by external factors but are majorly dependent on the innate maturation processes as well.

4.2.3 Comparison of Group 3 (4.0<>4.5) scores with the other age groups

A pairwise comparison of the scores obtained by the participants of the age range 4.0<>4.5was made with the other age groups was subjected to Mann Whitney test and the following results were observed for the same.

Table 5

Pairwise Comparison of scores of rating scale, TTR and MLUw of Group 3 (4.0<>4.5) across other age groups

Pairwise Comparison of Age Groups	Total Rating Scores		Total TTR		Total MLUw	
	Z	Significance	Z	Significance	Z	Significance
Group 3 and Group 4	0.740	0.459	1.048	0.295	1.776	0.076*
Group 3 and Group 5	0.422	0.673	1.586	0.113	0.419	0.675
Group 3 and Group 6	1.786	0.074*	1.471	0.141	1.776	0.076*

*Note: *- Significant*

As can be seen in Table 5, it is important to note that the degree of significant differences in the developmental trajectory between 4 to 6 years is not very remarkable and that there are marginal differences in the scores of the participants due to individual differences between them.

4.2.4 Comparison of Group 4 (5.0<>5.5) and Group 5 (5.5<>6.0) scores with the other age groups

A pairwise comparison of the scores obtained by the participants between the age ranges 5.0<>6.0 was made with the other age groups was subjected to Mann Whitney test and the following results were observed for the same.

Table 6

Pairwise Comparison of scores of rating scale, TTR and MLUw of Group 4 (4.5- 5.0 years) and 5(5.0- 5.5 years) across other age groups

Pairwise Comparison of Age Groups	Total Rating Scores		Total TTR		Total MLUw	
	Z	Significance	Z	Significance	Z	Significance
Group 4 and Group 5	0.210	0.834	0.841	0.401	0.940	0.347
Group 4 and Group 6	1.383	0.167	0.943	0.346	0.940	0.347
Group 5 and Group 6	1.591	0.112	0.00	1.00	1.567	0.117

The results from Table 6 suggests that children between ages 3 to 4 indicate an incline in the development of ToM while those children who are 5 years and beyond follow almost similar developmental curve, thereby reaching a plateau during this period. Hence, there are no observable differences in the scores of the children belonging to the age range of 5 to 6 years.

4.3 Estimate of the significance of scores obtained from rating scale and TTR and MLUw within each age group.

In order to determine if there are any notable discrepancies in the results within each age group, the scores of the assessment rating scale as well as the TTR and MLUw were subjected to Friedman test. Table 7 and Figure 7shows an estimate of the significance in scores obtained within each group.
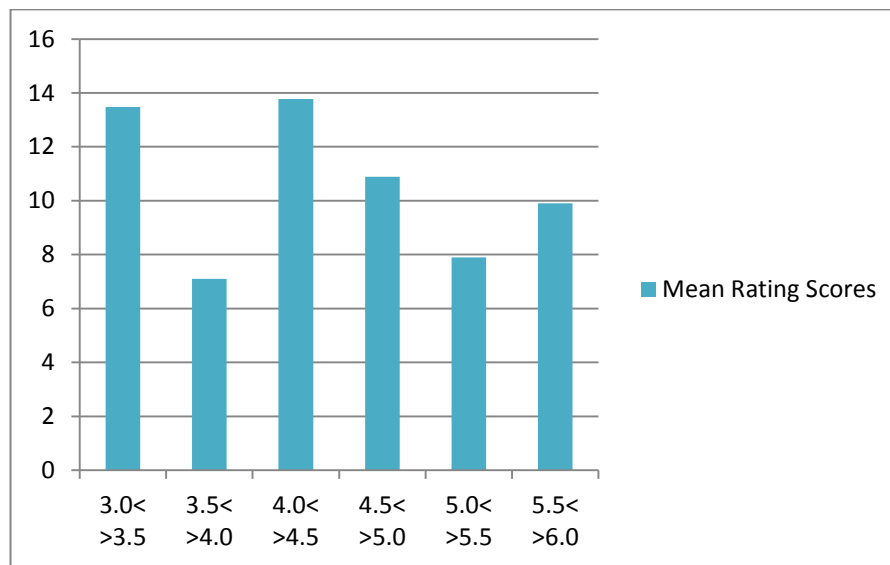
Table 7

Comparison of significance of scores across all age groups

Age Groups	Chi- Square Values	Significance
Group 1	13.483	0.009**
Group 2	7.106	0.130
Group3	13.78	0.008**
Group 4	10.889	0.028*
Group 5	7.897	0.095
Group 6	9.907	0.042*

Figure 2

Differences in the mean scores of ToM rating scale obtained across each age group

From Figure 2, it is evident that there seems to be a significant difference in the rating scores, TTR and MLUw scores within every age group, except group 2 and group 5. Such an outcome may imply that the participants falling under the age groups 3.5 to 4 years and 5.5 to 6 years do not have a notable difference in their ToM abilities, lexical diversity and their syntactic complexity. On the other hand, participants belonging to the other age groups seem to show

diverse trajectory patterns which may be attributed to an array of internal as well as external factors. It is also interesting to note that there is a highly significant difference in the scores of participants belonging to Group 1 and Group 2. Such a trend can entail that children undergo major developmental changes during the early preschool years between 3 to 4 years of age. Similarly, children belonging to age group 5.5 to 6 years also indicate an inclination of ToM as well as linguistic abilities just before children commence formal schooling.

4.4 Comparison of scores between subtests within each age group

It was evident from the earlier results that there is a notable variance in the scores of the participants within age groups. Hence, it would be reasonable to identify the domains in which the task performance was different amongst the children belonging to a particular age group(s). Hence, the within- subtests comparison within each age group was derived using the Wilcoxon Signed Rank Test. Upon comparison, it was found that:

a) The scores obtained in the narration versus referential communication task (Z= 2.032)narration versus planning task(Z= 0.066), narration versus peer tutoring task (Z= 0.041), referential communication versus planning task (Z= 0.046), referential communication versus social cognition (problem solving) task(Z= 0.059) and planning and problem solving task (Z= 0.059) revealed a significant difference in Group 1.

b) In the case of Group 3, significant variations in scores were found between narration versus referential communication(Z= 0.063), referential communication versus problem solving(Z= 0.034), referential communication versus peer tutoring(Z= 0.083), planning versus problem solving (Z= 0.042) and planning versus peer tutoring(Z= 0.038) respectively.

c) While in Group 4, there were fewer intra domain differences amongst the participants namely between narration and referential communication(Z= 0.041), narration and planning (Z== 0.041) and planning and problem solving(Z= 0.059) respectively.

d) The within- subtest scores which were significantly different were quite meager; i.e. between domains narration and peer tutoring (Z= 0.059), planning and problem solving (Z= 0.059) and problem solving and peer tutoring (Z= 0.038).

The highly significant differences observed in the scores of children who fall under Group 1 and Group 3 (a and b) throws light on the previously implied aspect that the early preschool years can be considered as a rather important milestone in the development of linguistic abilities as well as higher cognitive percepts, such as the Theory of Mind (ToM). It would be interesting to note that the children seem to show a serial correlation with respect to the scores obtained in the domains 1, 3 and 5 which are Narrative ability, Planning and Peer tutoring skills respectively. This means to say that the performances of the task within these domains are interdependent. In simple terms, the ability to understand inferences and generate ideas based on novel information is interrelated to the language abilities of the child, especially in terms of richness of vocabulary and grammatical complexity. In addition to the above, there is a strong correlation between the domains thereby affecting the performances of each other in a significant manner.

On the contrary, age groups 4 and 6 (c and d) do not reveal such a drastic outcome in terms of inter- domain comparisons of performances. The only apparent scores obtained in Group 4 were between domains of narration and referential communication tasks and planning and social cognition tasks. While in the case of Group 6, it could be observed that the narrative

ability of a child belonging to age groups between 5.5 to 6 years would determine the level of complexity in their descriptions while tutoring their peers.

4.5 Reliability testing of the rating scale

The ToM assessment rating scale is a four- point rating scale which was developed to assess the task performance of five domains in order to infer the theory of mind abilities of typically developing preschool children. Since it is a newly developed rating scale, it was subjected to suitable reliability testing to ensure whether this test would generate similar patterns of results and give the same inference even when tested on a larger sample of individuals who fall under the age range of 3 to 6 years.

4.5.1 Interrater Reliability

The ToM assessment rating scale was employed by the tester to assess the video samples of the task performances of the participants. In order to ensure the reliability of rating scores, three experienced judges (SLPs) were instructed to rate 10% of the sample data using the same checklist. The scores obtained for all participants as rated by the tester as well as the three judges were subjected to interrater reliability testing using the Cronbach's Alpha Coefficient which generated a factor of 0.98, thereby indicating a high interrater reliability.

4.5.2 Test- Retest Reliability

In order to determine whether the rating scale is suitable for use across the population, test- retest reliability was done by reassessing 10% of the sample data using the same rating scale. The test- retest reliability was also subjected to statistical analysis to infer the significance

using the Cronbach's Alpha test. A significant factor of 0.9 was obtained for test- retest reliability scores.

4.6 Correlations between the rating scale scores versus the TTR and MLUw scores

This section deals with one of the important objectives of this study, which is to compare the developmental trend between language and theory of mind skills of the typically developing preschoolers. Pearson Correlation was employed to determine the correlation of scores obtained from the following parameters:

- ToM rating scale versus the TTR scores

- ToM rating scale versus the MLUw scores and

- TTR scores versus the MLUw scores

Table 8: Correlation of scores of ToM rating scale, TTR and MLUw

Correlations		Total Rating Scores	Total TTR Scores	Total MLUw Scores
Total Rating Scores	Pearson Correlation	1	-0.626[**]	0.746[**]
	Significance		.000	.000
Total TTR Score	Pearson Correlation	-0.626[**]	1	-0.741[**]
	Significance	.000		.000
Total MLUw Score	Pearson Correlation	0.746[**]	-0.741[**]	1
	Significance	.000	.000	

Note: ** Correlation is significant at the 0.01 level (2-tailed).

With respect to the correlation between the total rating scores versus the total MLU scores, there is a highly significant positive correlation, which indicates that as the length of utterances increases, there is an increase in the ToM rating scores as well. Thus, there is a direct correlation between the development of theory- of- mind abilities with the increase in the variety of utterances used to describe the tasks given under each domain. While, on the other hand, there is a negative correlation between the total rating scores and the TTR (Type Token Ratio). This shows that the participants who obtain higher scores in the ToM rating scale happen to score low on the TTR. TTR is a measure of the lexical diversity or the number of different root morphemes used while describing the activities under each subsection. Thus, it is an index of vocabulary richness. From these outcomes, it could be inferred that children using longer utterances while describing a task tend to redundantly employ similar root and bound morphemes thereby resulting in an overall reduction in the richness of vocabulary (TTR)while the rating scores were simply based on the quantity of utterances used by a child(s) during the description of tasks in the ToM test. Hence, the assumption that children employing longer utterances would be having lexical diversity beyond their age should be treated with caution.

A similar pattern of correlation was derived between the MLUw and the TTR; i.e. a strong negative correlation. Hence, it could be concluded likewise that the linguistic diversity and syntactic complexity do not develop in a parallel manner in children. With increase in age, the lexical diversity eventually increases along with the syntactic complexity. In other words, it emphasizes the fact that the quality of linguistic richness of a child(s) cannot be gauged with respect to the Mean Length of Utterances, but rather estimated through the diversified lexical units (a rich assortment of vocabulary) that is utilized by them during oral or written discourse tasks.

There are several supporting studies that support the above premise that language development and ToM development go hand- in- hand. Hale &Tager- Flushberg (2003) investigated the influence of language on ToM development and vice versa on a group of 60 preschoolers, in which one group were trained on sentential complements related to semantic diversity and syntactic complexity while the other group was trained only on false- belief tasks. It was quite interesting to note that children who were trained on the linguistic aspects showed an improvement in the theory of mind task performances while those who were only trained for false- belief task failed the ToM tasks. Thus, it can be strongly implied that language competence has a high influence on the developmental pattern of the ToM abilities.

Recently, there are numerous studies that attempt to study how false- belief task affects language understanding in children. An ongoing research program (Unpublished Dissertation, 2014) has attempted to study the relation between false- belief understanding and the language abilities in typically developing preschoolers. The results did not reveal a significant difference between the first- order belief and the language abilities however there was a difference between the second- order beliefs and language functions. Thus, such studies provide empirical support to validate the present study to show that there are wider domains of language involved in the Theory of Mind understanding and that false- belief task is involved with only a section of the wider array of social cognition.

The emphasis on the precedence of language over theory of mind abilities was also explained by Ashington et al., (1999), wherein fifty- nine 3- year old preschoolers were tested for both false- belief understanding as well as the language competence with respect to semantics and syntax. The results of this study was also in harmony with the findings of the present study

that the earlier language development predicted the later theory of mind understanding but the reverse was not true.

In summary, the above results suggests that the ratings of theory of mind skills in typically developing preschoolers would give an incomplete profile about the children if suitable corpus analysis of their linguistic units were not taken into consideration to quantify the results. Such a result supports the objectives of the study that it is possible to trace the communicative skills of typically developing preschool children with respect to their semantic diversity and syntactic complexity in relation to Theory of Mind (ToM) and this study supports the hypothesis that language competence of an individual are early predictors of their later developments in their theory of mind skills.

CHAPTER V

SUMMARY AND CONCLUSIONS

Theory of mind (ToM) is a generic term that is used to indicate a person's ability to understand the thoughts, beliefs, desires and emotions of other individuals.(Premack& Woodruff, 1978). Since theory of mind is an aspect under the wider domain of cognition and is equally influenced by linguistic competence, the present study attempted to trace the development of language and communication abilities in typically developing preschool children in relation to Theory of Mind. A total of 30 children belonging to age ranges between 3- 6 years were undertaken as the participants for the study. A ToM assessment rating scale was developed for the same purpose which consisted of a total of five domains namely: Narrative Ability, Referential Communication, Planning, Social Cognition and Peer Tutoring. A video recording of the task performances was performed in order to transcribe their descriptions related to each domain and hence was subjected to linguistic analysis using the SALT (Systematic Analysis of Language Transcripts) software to determine the lexical diversity and Mean Length of Utterances and thereby correlate it with the ratings obtained for the Theory of Mind inferences for the same.

The data was subjected to suitable statistical analysis which was done using the SPSS 16.0 software to determine the correlation between the scores obtained from the ToM assessment rating scale with the data obtained from corpus analysis namely the TTR (Type Token Ratio) and the MLUw (Mean Length of utterance in words). The results revealed that the children belonging to ages 3 to 4 exhibited a remarkably significant development in both the language and theory of mind development which almost reached a uniform plateau by 5 to 6 years, implying the early

preschool years to be the most crucial period for the ToM as well as language development. Another major finding of the study was that there was an inverse relationship between the TTR (Type- Token Ratio) scores and the MLUw (Mean Length of Utterance in words). In other words, it would be reasonable to conclude that children using more elaborative utterances during oral discourse should not be assumed as having a rich diversity in their vocabulary. Based on the results of the present study, it could be concluded that language is an important tool to tap the theory of mind abilities of an individual and it is highlights the necessity to analyze the components of communication (discourse) with respect to linguistic units (corpus analysis) in order to determine the extent of theory of mind capabilities of typically developing children. This study contradicted the necessity to employ false belief tasks to determine the ToM skills in children and emphasized the fact that: *"There is more to theory of mind than just false belief."* This hypothesis was proved true and the present study succeeded in entailing the vastness of Theory of Mind under the domain of social cognition and clearly listed out the linguistic parameters (TTR, MLUw) required to infer the ToM skills of typically developing children through their communicative skills.

Moreover, the present study further highlights the much debated issue and supports the hypothesis that the verbal language competence of an individual is a precursor to their development of ToM abilities. Based on the above premise, it would be valid to say that *"language is a reflection of cognition"*.

5.1 Merits of the study

a) The ToM assessment rating scale developed in this study can be used as a tool to infer the theory of mind abilities in typically developing preschoolers.

b) The rating scale scores along with the scores obtained from corpus analysis can be used to estimate the richness of vocabulary and the syntactic complexity achieved by a child through descriptions of inferences in the ToM tasks.

5.2 Limitations of the study

a) Though the rating scale provides a quantitative score for the Theory of Mind tasks, the results of thisstudy should be treated with caution in that the subjects under each group are limited and hence such a result cannot be generalized to larger samples.

b) Even though this study contradicts the necessity of a false- belief task, a ToM test without false- belief test cannot be regarded as being an entirely valid tool to provide an assessment of one's theory of mind abilities.

5.3 Future Directions

a) To validate the rating assessment scale used in this study across a larger population sample.

b) To derive a standardized set of norms for the theory of mind scores across the age groups.

c) To incorporate false- belief tasks in the test domain in order to acquire more specific quantified scores to better infer the ToM abilities.

d) To incorporate more language parameters while investigating the linguistic competence of children in relation to Theory of Mind.

APPENDIX A

Theory of Mind (ToM) Assessment Rating Scale- Instruction Manual

*Brief Description of the test:*The ToM assessment rating scale is intended to trace the development of theory- of- mind in typically developing preschool children.

*Age Range***:** 3- 6 years.

*Subtests:*There are five main subtests or domains included in this assessment. They are as follows:

1. Narrative Ability

2. Referential Communication

3. Planning

4. Problem solving

5. Peer tutoring

Subtest 1- Narrative ability:

- Picture cards of standard moral- based stories such as "The Thirsty Crow", "The Hare and the Tortoise" and "The Capseller and the Monkey" are employed.

- The tester is required to show the picture cards of any two stories of the child's choice and ask them to narrate the same in a logical sequence.

- Any clarifications asked while narrating the story will be considered as asking for cues and thus the scoring will be made accordingly.

Scoring is based on the following:

a) Adequate description of content.

b) What the child understood from the story (inference).

c) Relevancy of information (whether the child is mostly describing the relevant or irrelevant aspects of the story)

Subtest 2- Referential Communication:

- A set of common objects such as: balls of three different colors: red, green and yellow, a cup, plate and spoon and two blocks of different sizes; small and big would be used and a set of six picture cards consisting of illustrations of various arrangements of the above given objects would be provided by the tester.

- Of the six picture cards, three cards (2, 4 & 6) would be described by the tester and three cards (1, 3 & 5) would be provided to the participants and they have to describe the same.

- The six instructions for the six picture cards are arranged in the order of increasing complexity.

- A trail would be demonstrated using the objects for the familiarization of thetask.

- Materials used include: ***cup, spoon, plate, 2 sizes of blocks and 3 different colored balls (6 nouns, 2 adjectives and 3 colors)***

Instructions:

1. Put the red ball near the plate

2. Put the small block inside the cup.

3. Keep the cup on the plate and a green ball near the cup

4. Place a big yellow block and put a green ball in front of it

5. Keep a block on the plate and put the spoon inside the cup

6. Take the yellow ball and keep it next to the yellow block and take the small green block and keep it near the green ball.

- Not all children of all the ages (3- 6) can complete all 6 cards.

Scoring is based on the following:

a) Success of the child's attempts to follow adult instructions

b) Accurate instructions given by the child

c) Use of clarifications- when the information is inadequate

Subtest 3- Planning:

In this subtest, the child will be given 3 events of which the child has to choose any 2 of the 3 events and adequately give a description of how they would plan the above mentioned events.

1. Birthday party

2. Going to friends' or relatives' house during vacations and

3. Going to school

Scoring is based on the following:

a) Description of the event.

b) How well the child describes the event in a sequential or logical manner.

c) Creative or novel information provided.

Subtest 4- Social Cognition (Problem Solving)

In this subtest, the tester would give a set of five problem solving situations for which the child has to give a logical solution.

Stimuli:

1. When your caregivers are either sleeping or bathing or busy with some errands, someone comes home and rings the bell. Would you open the door? If yes, will you be able to unlock the door? If no, why not?

2. You are in your school playing with your friends. You come back to your classroom and find that your bag seems to be missing. What would you do?

3. You are playing at home with a ball or running around when you hit on an object like a glass and it falls down and breaks. What would you do?

4. You are playing with your friends in a park. You accidently trip and fall and you get hurt. What would you do then?

5. You are at home and you are playing with a balloon or a ball and it suddenly gets stuck behind a shelf or a place too narrow for you to reach out. What do you do?

Scoring is based on the following:

a) Whether the child able to recognize the problem in the situation or ignores it

b) Whether the child able to foresee the outcomes of the problem

c) Whether the child able to initiate a solution on their own or by seeking for help

Subtest 5- Peer Tutoring:

- In this task, the tester would teach the participant(s)how to assemble a set of puzzles or blocks in a particular manner

- The child would have to learn it and then instruct another peer of his/her age to construct it in the same way as instructed to him.

Scoring is based on the following:

a) How well the child is able to retain the task taught to him.

b) Ability of the child to teach his peer.

c) Ability to provide clarifications, if asked.

NOTE: The tester must discontinue the subtest(s) if the child consecutively fails in two or more items.

Rating Scale: A four- point rating scale is used to assess the above skills.

"3" - correct response with no/ single trial.

"2" – correct response after two trials.

"1"- correct response after three trials

"0" - no responses even after three trials

ToM Assessment Rating Scale- Score Sheet

Name of the child:

Age/ Sex:

Name of the clinician:

DOMAINS	RATINGS			
NARRATIVE ABILITY	**0**	**1**	**2**	**3**
Description of content				
Inference				
Relevancy of Information				
REFERENTIAL COMMUNICATION				
Comprehension of adult instructions				
Instruction to adults				
Use of clarifications				
PLANNING				
Description of events				
Coherence of information				
Novelty of information				
SOCIAL COGNITION				
Recognition of the problem(s)				
Anticipate consequences				
Initiation to solve the problem(s)				
PEER TUTORING				
Retention of the novel information				
Tutoring ability of the child				
Providing clarifications to peers				
TOTAL SCORES				

Maximum Score: 45

Obtained Score:

ToM Stimulus Sample

Domain 1: Narrative ability
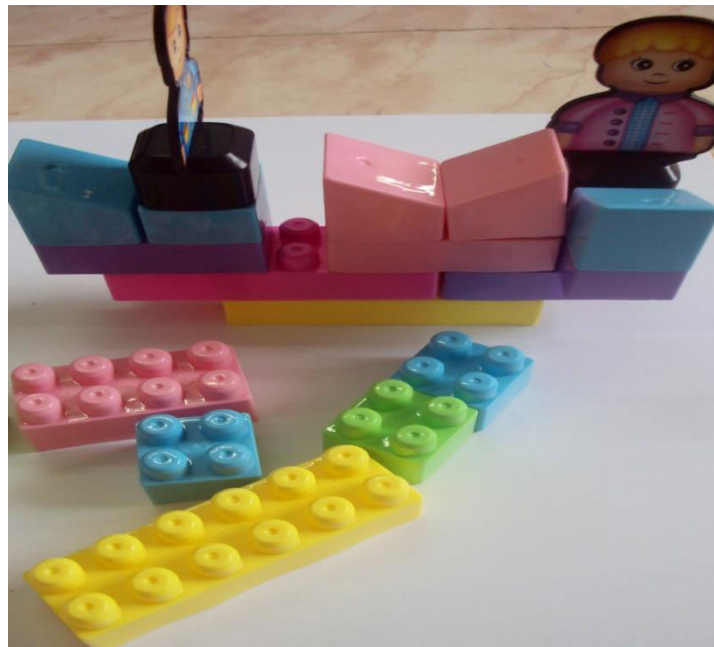
Stimulus: Picture Cards

Domain 2: Referential Communication Stimuli

Stimuli: Common objects and Pictorial Illustrations

Domain 5: Peer Tutoring

Stimuli: Building Blocks

Informed Consent Form

ALL INDIA INSTITUTE OF SPEECH & HEARING

Naimisham Campus

Manasagangothri, Mysore 570 006

TITLE OF STUDY: Communication vis-à-vis Theory of Mind- A study in typically developing preschoolers

CONSENT FORM

I have been informed about the aims, objectives and the procedure of the study. I understand that I have a right to refuse participation or withdraw my consent at any time. I have the freedom to write to head of the Institute in case of any violation of these provisions without the danger of my being denied any rights to secure the clinical services at this institute. I am interested in allowingmy child to participate for the study and hereby give my written consent for the same.

I, _____, the undersigned, give my consent to be participant of this investigation/study/program. I have no objection in participatingmy child in the program.

Signature of Participant   Name and Address:

Date: