

**THEORY OF MIND IN CHILDREN WITH SPECIFIC LANGUAGE
IMPAIRMENT (SLI)**

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A Dissertation Submitted in Part Fulfillment for the Degree of Master of Science
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ALL INDIA INSTITUTE OF SPEECH AND HEARING

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May, 2017

Certificate

This is to certify that this dissertation entitled “Theory of Mind in children with Specific Language Impairment (SLI) ” is a bonafide work in part fulfillment for the Degree of Master of Science (Speech- Language Pathology) of the student (Registration No. 15SLP021). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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Declaration

This dissertation entitled “Theory of Mind in children with Specific Language Impairment” is the result of my own study under the guidance of Dr. Jayashree C. Shanbal, Reader in Language Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

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Dedicated to
Maa & Deuta

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“Gratitude can transform common days into thanks giving, turn routine jobs into joy and change ordinary opportunities into blessings”

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CHAPTER 1: Introduction

The basis of human relationship is communication. Humans are social beings and hence communication. These communications are imparted through different forms, verbal and non-verbal. Expressing one's feeling or thought to another and understanding the thought of another individual impart communication. This verbal communication is augmented with non-verbal communications.

Theory of Mind (ToM) is defined as the ability to attribute mental states to self and others in order to explain behaviors (Premack & Woodruff, 1978). It is the knowledge and awareness of mental state of others and oneself. Theory-of-mind gradually develop with age, from childhood to toddler and then to adulthood (Wellman & Liu, 2004). Literature states that developing a theory- of- mind includes understanding of many concepts acquired in an extended series of development activities. Young children's understanding of desires, emotions and knowledge always has a cognitive background. ToM continues to develop from infancy to later childhood and then to adolescence as evidence by an increasing perceptive of emotional and non-literate meanings of utterances and behaviors (Choudhury, Blakemore, & Charman, 2006; Peterson, Wellman, & Slaughter, 2012). Since last two decades, research in ToM has taken a faster pace.

Understanding ToM in normal individuals and its outcome in language development has been new area for researcher. ToM researchers claim to have relation with language development. Different aspects of belief help us in understanding ToM. Till date, different tasks and scales have been introduced by researchers to measure ToM

in children as well as adults. These tests initially were developed for understanding folk psychology, later on understanding ToM came into the research field. Some of the scales for children that were often used are Sally-Anne test (Baron-Cohen, 1985), Smarties test (Happe, 1995), Faux Pas Recognition Test (Baron-Cohen, O’Riordan, Jones, Stone, & Plaisted, 1999) and Happé’s Strange Stories (1994), Wellman’s ToM rating scale (Wellman & Liu, 2004). The Wellman’s ToM rating scale has different aspects like desire, belief, knowledge about true or false and emotions of other individual. It is important to know that only one aspect cannot be used to understand an individual’s ToM. A combination of all the aspects gives a better measure of ToM. These tests also look into the language ability of the child along with ToM.

In literature, it has been reported that language is considered as one of the most important domains in relation to ToM. Many researchers have proved that ToM has a direct relation with language development. Theory- of-mind being a cognitive function has been researched for having a direct correlation with language. Various researches indicated that language may facilitate children’s ToM development (Baron-Cohen, 1985; Happe, 1994; Flavell & Miller, 1998; Wellman & Liu, 2004; Milligan, Astington & Dack, 2007; Nilsson & De Lopez, 2016). With development of language, there is a development in ToM whereas vice versa is not true (Astington et al., 2016). Further, children with language impairment could have impairment in ToM. Children with autism reported to have an impaired ToM (Baron-Cohen, Leslie & Frith, 1985; Leekam & Perner, 1991; Perner, Frith, Leslie & Leekam, 1989; Reed & Peterson, 1990; Swettenham, Baron-Cohen, Gomez & Walsh, 1996). Reports suggest that ToM was found to be affected in children with learning disability (Thulasi, 2013). Meta analysis

done on 17 studies found that children with Specific Language Impairment (SLI) performed lower than age matched typically developing (TD) children (Nilsson & De Lopez, 2016).

Like other language disorders, Specific language impairment (SLI) is a developmental language disorder. SLI is more prevailing in kindergarten or preschoolers, the effect of which may continue till adolescence and beyond. Children diagnosed with SLI exhibit marked language impairments on standardized tests, despite normal nonverbal intelligence and no apparent neurological or sensory dysfunction (Leonard, 1998). There are three types of SLI, namely expressive SLI, receptive SLI and mixed SLI (Leonard, 1998). Children with SLI show impairment in all the components of language (Syntax, semantics & pragmatics). Pragmatics is reported to be majorly effected in children with SLI (Spanoudis, 2016).

SLI has been found to be prevailing approximately 7% of children in kindergarten (Tomblin et al., 1997). Very few studies suggest that children with SLI perform significantly below the level of age-matched TD children on ToM tests (Nilsson & De Lopez, 2016). These findings thus form an association between language and ToM from the view of atypical development. In addition, it also questions the boundaries of SLI as a language disorder and calls for more research into the developmental interface between language and ToM as well as the potentially extensive consequences of language impairments.

CHAPTER 2: Review of literature

The concept of Theory of mind (ToM) came into existence by 1987, term coined by Premack and Woodruff. ToM is conceptualized as capacity to perceive other's belief, desire, emotion and intentions. The ability to attribute mental states to others is known as "mind-reading" or having a ToM (Povinelli & Giambrone, 2001). According to Cummin (2005), ToM can be defined as understanding a speaker's communication intent. ToM emerges from many individual abilities allows us to communicate competently with other people and hence act as social beings (de Villiers, 2007). At times ToM is discussed under single paradigm that is to understand only cognition.

Two theories for ToM/ mind reading has been discussed by Harris (1992), first theory known as Theory Theory (TT) and second theory is known as Simulation theory (ST). TT explains that average people achieve mind-reading by acquiring and applying a commonsense, something similar to a scientific theory. The ToM consists of a set of causal/explanatory laws possessed by average people that can relate external stimuli from the environment to certain inner states (e.g., desires, perceptions and beliefs) to other inner states (e.g. decisions), and these inner states like decisions to behavior.

Simulation Theory suggests that to calculate and predict the mental processes of others an individual use his/her own mental mechanisms. This theory says each subject put themselves in other's 'shoes' and imagined how the individual would have felt in their place. Even similar way they can predict another person's next response or move. Theory Theory utilizes psychological law for understanding theory of mind, where as Simulation Theory do not know or utilize psychological law. Hence, Simulation Theory

can explain importance of mirror neurons in ToM where it has been found that the same Mirror neurons are externally activated—by observing a target agent executing a similar action.

2.1 ToM and social communication

Social cognition is considered as a broader term. Social cognition such as emotion perception, self-cognition and social problem solving etc. contribute to such skills and abilities (Cohen et. al., 1998). Martin and Santos (2016) have commented on cognitive representations of ToM in primates and non primates. Primates or humans, being socially more active has a theory of mind which do not support for non-primates. Studies done on non-human primates and humans revealed that humans have representations for ToM , i.e. humans act on the unobservable metal states like belief, desires and intentions and this attributes for being a better socially active animal. Whereas the authors argued that primates also has a basic ToM as they are known for being sensitive to information of other animals i.e., when competing for food, they are aware of their potential competitor.

Since last 15 years, theory mind has been intensely studying in order to understand the human mind. According to Flavell (2004), a central Piagetian, claims that development of children begins by being cognitively egocentric. With development in language, the child experience and communicate with another person in a broader form and development of social norms happen. It helps a child understand people's mental state through conversation and stories, language provide vehicle for thinking other's mental state. Hence, social behavior increases with and understanding of other person's desire or mental state become more evidential. Flavell (2004) also talks about the child's

development in social cognition and simultaneous development in theory of mind. Further in a study by Watson, Nixon, Wilson and Capage (1999) Children rated by teachers as having better social skill were reported to have more advanced understanding of false beliefs and better social skills than their less advanced peers.

Repacholi and Gopnik (1997) in a developmental study in development of ToM stated that infant starts understanding and recognizing voice of the caregiver and respond differently to people and in different manner to object. The infant's reaction towards any object by late of their first year is different like intend to get it, fear it, wants it etc. and this reflect beginning of awareness and intentionality. By age of 18 months it is reported that infants understand what they should give an individual, a food that he/she reacts to with pleasure rather than giving one to which he/she do not show a pleasurable reactions, even though they might themselves prefer the other food; this action suggests that some limited ability to reason non-egocentrically about an individual's desires. Infants also understand that it is the adult's intentional focus rather than their intention that gives them the idea or clue as to what the adult is intending to refer when the adult labels an object (Woodward & Markman, 1998) in other words, infants recognize that the word which refers to the object the adult is currently looking at, not the one they themselves happened to be looking at when the word was spoken. In this way, scaffolding for early language development happens by early ToM.

Bartsch and Wellman (1995) in another study commented that in later development, visual perception plays an important role in later theory of mind development. In visual perception the basic understanding is that if an object is seen it is due to that an individual aims at the object if there is no vision blocking or any obstacle,

with this the child understand simple non-egocentric task like the child can infer that another individual can see something that they do not see and this in later development helps the child to percept that same thing may be percept in different way by two different individual. Similarly, with subsequent increase in age the child starts understanding that attention is selective and limited in different individuals. By age of three the child starts understanding desire of another individual that other individual feel good if they get what they want and they do not feel good, if they get something what they do not want. In later years children seem to learn more advanced emotional expression—i.e., people do not always really feel what they appear to feel or show and that people's earlier emotional experiences influences their emotional reactions with similar events or by their current mood (Flavell & Miller, 1998). After the preschool period Children's knowledge about mental representations continues to improve and increase. To be exact, it is observed that not until middle childhood and later that children appear to gain any significant understanding of the mind as an active, interpretive, productive processor (Carpendale & Chandler, 1996). Understanding of knowledge as claimed by older preschoolers that the information they have learned is always through experimental sessions in their environment, also they starts understanding that only a little bit information cannot allow an individual to understand the identity of an object.

Another study conducted by Plaut and Smith (1993) commented that language is central to ToM. Language plays a role in scaffolding of symbolic representation which helps in understanding ToM. They also stated that to use and maintain symbolic representation requires less cognitive sophistication. Explanation given by the authors why a 4 year old can pass a standard false belief task as because their symbolic

representation is developed to compete with earlier experiences which are supported by external verbal experiences, but they cannot pass the complex ToM tasks which are purely visual as because they cannot spontaneously generate the visual input are the necessary symbolic representation on their own. Further Wellman and Liu (2004) supported the development of ToM with development of age by describing that children in pre-school develops initially one individual's desire and after that they starts understanding that another person may have different belief about a same object consequent to it, their knowledge access ability develops. After knowledge access, they start understanding false belief and later stage real apparent emotion. These stages do not substitute each other; rather act as a mediator from one stage to another. A child having a concept of real apparent emotion will surely have a concept of false belief or knowledge access but the vice versa may not hold true as it develops from one stage to another. These were concluded by their study where they tested children of age range 3-7 years on each specific domain. Result showed that with increase in age the children could pass on all domains where as in initial age the children could perform only diverse desire.

Jenkins and Astington (1996) tested sixty-eight children of age range 3-5 years with false belief tasks, where they considered family size and linguistic ability. The significant predictor for false belief understanding was found to be verbal memory and linguistic ability. It was also found that family structure of the child contribute to better ToM, the children with larger family structure found to have perform better on false belief tasks. Family size was more strongly associated with false belief understanding in children who were less competent linguistically, suggesting that the presence of siblings

can compensate for slower language development in developing false belief understanding.

In one of the Indian studies, Archana (2014) assessed relation between linguistic measure such as Type-token ratio (TTR) and mean length of Utterance (MLU) of TDC with respect to ToM. Thirty participants were assessed using narration, referential communication, planning tasks, social cognition and peer tutoring. Result of the study concluded that with increase in length of utterance there is an increase in ToM rating scores. Also it was reported that children with better ToM has lower score of TTR i.e. which indicates richer vocabulary.

2.2 Specific Language Impairment and social cognition

Locke (1997), states that children's socio-cognitive ability is a precursor for development of language, and hence social cognition determines language acquisition. According to other authors (e.g., Bishop, 1997; Leslie, 1987), both language and social cognition are connected to each other by certain cognitive abilities such as working memory, encoding and discriminating information, and processing capacity.

Children with SLI have a lower level of language compared to that of their peer and hence they have poorer social communication and lower self esteem. They cannot make a successful peer relationship (Marton, Abramoff & Rosenzweig, 2005). They exhibit difficulties in initiating social interactions, participating successfully in continuing conversations, resolving any conflicts or negotiation with others (Craig, 1993; Jerome, Fujiki, Brinton, & James, 2002). Craig and Washington (1993), examined children with

SLI of age range 7-8 years the ability to access and participate in ongoing interactions and compared with chronologically age (CA) matched and language similar peers. All children in the chronological age and language similar groups successfully accessed the interaction, most could gain these tasks fairly rapidly and without effort, on the other hand only two out of the five children with SLI were successful using only nonverbal means in their attempts. Another study replicating the previous study was done in children with age 8-12 years and showed the similar results. Children with SLI being poorer in conversational skills are always rejected by peer partners and this posits more self-esteem issue (Fujiki, Brinton, Hart & Fitzgerald, 1999).

Marton et. al., (2005), conducted a study on children with SLI and TDC and were given twenty three hypothetical scenarios (e.g.: school, playground, shopping center etc), where negotiations and resolution of conflict skills were assessed to determine the coping strategies and their verbal reaction to each situation. The result of the study conclude that children with SLI performed significantly poorer than TDC group in hypothetical scenarios tasks and performed poorly in social pragmatic task than linguistic tasks. Study by other authors (Botting & Conti-Ramsden, 2008) where they carried out a cohort study on children with SLI and TDC of same age group. Tasks and questionnaires were used to assess language, social skills, social cognition and functional social measures, which includes levels of social activity and friendships. Slight associations were found between language, social cognition and social behaviors, whereas high association was found between language and social cognition. The results also concluded that functional social measures were more associated with social expressive skills and cognitive ability.

The findings also suggest that having poorer language ability may play an intricate role in social development for adolescents.

Another study by Farmer (2000), which was aimed to study the link between development of language and social cognition considered children with SLI attending special school and group of children with SLI attending integrated educational placements to that of age matched chronological and language normally developing peers where language, social competence and phonological short-term memory were measured. Children with SLI from special school scored significantly lower than the TDC and the Children with SLI from integrated placements did not differ significantly from other groups on these measures.

2.3 ToM in Specific Language Impairment (SLI)

As social communication and linguistic skills are effected in Children with Specific Language Impairment their ToM might be a question and which lead to many researchers to study in this field. A typically developing five-year is able to communicate in his/her environment as he/she has already acquired a large part of grammatical , phonological, semantic and pragmatic abilities in his/her local language.

Spanoudis (2016) conducted a study with the aim to examine the relationships of the language components (syntactic, semantic, and pragmatic skills) with that of ToM in school-age children. Twenty children diagnosed with SLI of aged 9–12 years and two control groups, where one for language ability (LA) and one matched for chronological age (CA) of age range 8–10 years were compared on a set of language tasks such as syntactic, semantic, pragmatic skills and using advanced test of ToM. The pragmatic task

was conducted by using pragmatic inference task, a metaphor and a simile task. Also ToM understanding task was carried to where the children were given short stories and based on it certain questions were asked. The findings suggested that children with SLI performed poorly in ToM understanding task. The children with SLI and their language age (LA) matched groups did not show differences in language abilities. Also the children with SLI performed lower compared to TDC on pragmatic tasks which had success rates from 30% to 45%. Gillot, Furniss, and Walter (2004) gave a similar conclusion. They explained though school-age children with SLI have a basic understanding of others' mental states, their understanding or expression of pragmatic context is basically hindered by poor language ability.

St. Clair Durkin, Conti-Ramsden, and Pickles (2010) measured behavioral, emotional and social problems using a Strengths and Difficulties Questionnaire in a sample of individuals, who had a history of SLI at four different point of time starting from childhood (7 years) to adolescence (16years). From childhood to adolescence, a decrease in behavioral and emotional problems was observed, although emotional problems were still evident in adolescence. On the other hand there found an increase in social problems. Reading skills and expressive language were related only to behavioral problems. Pragmatic abilities were related to emotional, behavioral and social difficulties.

Another study conducted by Nilsson and de Lopez (2016) where a meta analysis was carried out in 17 studies with 745 children of age range 4 to 12 years found that children with SLI has significantly lower ToM performance then age match TDC. The study also further explains that age and gender are not moderators for ToM development, but a strong association was reported between language and ToM. Further studies by

Farrant (2006), of twenty children with SLI and twenty TDC of age range 5-6 years were tested with ToM tasks, non-verbal ability and visual perspective taking. For ToM tasks they used Wellman's and Liu's (2004) rating scale tasks. Results of the study suggested that children with SLI performed poorer than TDC. Children with SLI were reported to have a delayed knowledge access, false belief and real apparent emotion. The study did not give a definite cause for the delay on ToM, rather it stated that ToM deficit may be due to delay in language, or impaired social cognition or may be due to impaired neuronal process.

2.4 ToM in other language disorders

There are many studies been conducted for ToM in different Language disorders. Predominantly language disorder used for studying ToM is autism. Many researchers have reported that children with autism have impaired ToM. A large number of studies have demonstrated that children with autism have problems in changing their outlook to judge what someone else might think, instead simply reporting what they themselves know (Baron-Cohen, Leslie & Frith, 1985; Leekam & Perner, 1991; Perner, Frith, Leslie & Leekam, 1989; Swettenham, 1996; Swettenham, Baron-Cohen, Gomez & Walsh, 1996). One of the review study by Baron-Cohen et. al. (2001) reports that deficit on ToM in children with autism is seen in the first year itself which is demonstrated by lack of joint attention. Authors reviewed the following tests -physical distinctions, appearance -reality distinction, first order false- belief tasks, "seeing leads to knowing tests", test of recognizing mental state words , test of production of spontaneous pretend play, Tests of inferring from gaze-direction when a person is thinking, or what a person might want, test of being able to monitor one's own intentions, test of deception, test of understanding

metaphor, jokes, sarcasm and irony, test of pragmatics, test of imagination and test of correlation with real life social-skills, concluded that there was a deficit in children with autism on all mentioned tests.

ToM also been researched in children with Hearing Impairment. In a study by Jones, Gutierrez & Ludlow (2015) where they compared the ToM tasks performance of children with hearing impaired with that of TDC where the aim was to understand relationship of the language ability and false belief performance and was found that there was significantly positive relationship between the language ability (lip-reading ability) and false-belief tasks.

Researchers have investigated that amygdala in humans play an important role in social information processing. This social information processing is nothing but ToM. Stone et. al., (2003) have studied person with bilateral amygdala lesion, where the participants were given “recognition of faux pass test” (Baron-Cohen, O’Riordan, Jones, Stone, & Plaisted, 1999). The result revealed that the individuals with amygdala lesion performed poorly on the task given. The authors also discussed that these poor performance is not due to only cognitive difficulty but due to also impaired ToM in those individuals. Children with learning disability were assessed for ToM task (Thulasi, 2013). Twenty Children of age range 4-6 years with learning disability (LD) were assessed on modified Wellman’s rating scale and was found that children with LD performed poorer on ToM tasks. The author also reported that within the LD group, children having better language could perform well compared to other children in the group.

Different researchers quote that language may facilitate ToM. A meta-analysis done on 104 cross-sectional studies found out that there is a moderate correlation between false-belief tests and children's performance on language (Milligan, Astington, & Dack, 2007). Other longitudinal studies done in preschool children (Astington & Jenkins, 1999; de Villiers & Pyers, 2002; Slade & Ruffman, 2005) reveal that false-belief performances can be predicted by language abilities, whereas the reverse is not true.

With impairment in language there might be many other domains which may get affected through the developing years. More accurately, we can say when language is delayed there will be delay in the overall development in the child's cognition, though the child might have a score of average verbal intelligence. Recent studies in theory of mind elicited language as one of the domains which when affected in an individual, will affect theory of mind. Hence, language is one of the most researched developmental domains in theory of mind. Theory of mind is often studied in ASD and LD. ToM is found to be affected in children with ASD (Baron-Cohen, 1997) and Children with learning disability who perform poorly on false belief tasks when compared to typically developing children (Thulasi, 2013).

In typically developing children (Archana, 2014) ToM and language shows remarkable development in both language and theory of mind for children belonging to age 3yrs - 4yrs which almost reaches a plateau by 5-6 yrs. The current study can emphasize whether if the same pattern and/or a delay is expected in children with SLI as indicated in other developmental language disorders such as ASD and LD.

Aim of the study

The primary aim of the present study was to understand Theory of mind in children with Specific Language Impairment.

Objectives of the study

- To study the theory of mind ability in 4-6 year old typically developing children.
- To study the theory of mind ability in 4-6 year old children with Specific Language Impairment.
- To compare the performance of TDC and children with SLI on ToM.

Hypothesis

- There is no significant difference in the performance of typically developing children on theory of mind ability between 4-5 and 5-6 years of age.
- There is no significant difference in the performance of children with SLI on theory of mind ability between 4-5 and 5-6 years of age.
- There is no significant difference in the performance of TDC and SLI on ToM ability.

CHAPTER 3: Method

The primary aim of the study was to understand Theory of mind in children with Specific Language Impairment (SLI). The present study follows a standard two group comparison research design with two groups-clinical group (children with SLI) and control group (typically developing children as a comparative group).

3.1 Participants

The participants included two groups, one control and another clinical group.

Clinical group: The clinical group included ten Kannada speaking children, who were diagnosed as having SLI (expressive type diagnosed by certified Speech-Language Pathologist) in the age range of 4-6 years. This group was further subdivided into two groups, Clinical group I= $4.0 \leq A \leq 5.0$ years and Clinical group II = $5.0 \leq A \leq 6.0$ years.

Control group: The control group included twenty Kannada speaking typically developing children (TDC) matched for age and gender as the clinical group in the age range of 4-6 years. This group was subdivided into two groups as done in the clinical group i.e., Control group I= $4.0 \leq A \leq 5.0$ years and Control group II = $5.0 \leq A \leq 6.0$ years.

Participant Selection Criteria

The participants in the two groups were selected on the basis of the following criteria:

- The diagnosis of children with SLI was confirmed using the criteria given by Leonard et al., (1988). The Leonard's exclusionary criteria considered were on psychological evaluation (IQ > 80), normal auditory threshold, absence of behavioral and/or emotional issues, absence of classical neurological symptoms such as cerebral palsy, intellectual deficiency. Participants were included into SLI group; if their grand language total was at least 1.25 SD lower than the standard language score for that chronological age on Kannada Language Test (UNICEF Project,1990)
- The language skills of the participants in the control group were screened before the task using Kannada Language Test (UNICEF Project,1990)
- All the children were screened and ruled out for sensory-motor impairment using ICF CY checklist (WHO Work group version, 2003).
- All the children were selected from mid/high socio economic status using Socio Economic Status Scale (Venkatesan, 2011).

An informed consent was taken from all the caretakers of the participants before the actual testing. Each subject was tested separately. The TDC in the control group were matched for age, gender and socio-economic status of that of children with SLI.

3.2 Test material

The subjects were assessed using the modified Wellman's theory of mind ratings scale (Thulasi, 2013). False belief tasks were assessed with the following subtests;

- a) **Diverse desire (DD):** The child was provided with two pictures of chocolate and carrot (see appendix, plate 1) and was asked which one among the two he/she likes to have. If the child said chocolate, the child was told that his/her friend “X” likes carrot and he would prefer to have carrot for snacks (if child’s preference was carrot, X’s preference was chocolate). And then the child was asked what he would like to have for snacks. This would show his understanding of different desire, different individual has diverse desire.
- b) **Diverse belief (DB):** The child was provided with two pictures of a house and a bush (see appendix, plate 2) and the child was told that his/her friend “x” has lost his/her cat, so the child was asked “where does he think the cat would be?”. If the child said/pointed to the house, the child was told that friend “X” thinks the cat is inside the bush (if child says bush, “X” should be told as house) and hence “X” will search inside bush. Then the child was asked where he would search for the cat. This was used to test the child’s understanding that different people will have different beliefs.
- c) **Knowledge access (KA):** The child was asked to guess what is inside an unlabelled box. The child was then shown the box actually containing a small toy elephant. The child was told that the friend “x” has never seen the box and asked if “X” knows what is inside the box. The child was scored as correct if he said.
- d) **Diverse belief (DB):** The child was given a packet of chocolate and was asked to guess what is inside. The obvious answer was chocolate, then the clinician opened the box and showed that it do not contain chocolate instead it contained coins. Then the child was asked what would “X” say if he/she was given the chocolate box and asked

what is in. If the child answered “coin” he/she was scored 0 and if the child answered chocolate then he/she was scored ‘1’.

- e) **Real apparent emotion (RAE):** The child was asked “how will your friend “X” feel if somebody scolded him” and then the child was asked to point out one out of three faces (see appendix, plate 3) given which included a happy face, a neutral face and a sad face. A score of ‘1’ was given, if he/she could point out to the sad face and was score ‘0’, if the child pointed out neutral or happy face.

For the subtest DD, DB and RAE, the children were given pictures and based on the child’s belief the child were expected to point out to the picture. For the subtests KA and FB, models were used and were asked to point out. All the subtests included both targeted and controlled questions to make sure if the child has understood the task.

3.3 Scoring & Analysis

The performance of each child was scored on a rating from 0-5 (for the 5 subtests). The child was not scored for the control questions but to get a score of ‘1’ for the target question, the children had to answer the control questions correctly. To move on to the next level the child had to score ‘1’ in the previous level. If the child could not score ‘1’ in any of the level, further testing is not carried out. Score ‘1’ was given for correct answer and ‘0’ was given for incorrect or no response. The data was analyzed based on the total scores obtained for diverse desire, diverse belief, knowledge access, false belief and real apparent emotions. The data was compared between TDC and SLI. Data was further statistically analyzed using SPSS version- 20

CHAPTER 4: Results

The primary aim of the current study was to understand the Theory of Mind in children in Specific language Impairment. The objectives of study were,

- To study the theory of mind ability in 4-6 year old typically developing children.
- To study the theory of mind ability in 4-6 year old children with Specific Language Impairment.
- To compare the performance of TDC and children with SLI on ToM.

Twenty typically developing children of age range 4-6 years with Kannada as their first language participated as control group. Ten children of age range 4-6 years with specific language impairment with Kannada as their first language participated in clinical group. Task carried out was Wellman's theory of mind (ToM) rating scale which consisted of five tasks. Each task was scored 0 or 1 based on performance.

Descriptive statistics was carried out to compute mean, median, standard deviation (SD) for typically developing children (TDC) and children with specific language impairment (SLI). Non-parametric test, Mann-Whitney U test was carried out to see the significant difference between the two age groups i.e. 4-5 years and 5-6 years both in the control as well as clinical group. And Fishers exact test for association was carried out to see the significant association between the tasks and the groups.

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

- 4.1 Theory of mind ability in 4-6 year old typically developing children
- 4.2 Theory of mind ability in 4-6 years old children with Specific Language Impairment
- 4.3 Comparison of performance of TDC and children with SLI on ToM

4.1 Theory of mind ability in 4-6 year old typically developing children

Descriptive statistics was used to compute mean, median and standard deviation values (SD) for age group 4-5 years and 5-6 years in typically developing children (TDC).

Table 4.1.1

Mean, Median and SD scores of 4-5years and 5-6 years TDC

Age (in years)	Mean	Median	SD
4-5	1.80	1.50	1.22
5-6	2.50	2.00	1.30

The mean value observed from table 4.1 on ToM rating scale task indicated that TDC in the 5- 6years (Mean= 2.5, SD= 1.3) range performed better than 4-5years (Mean= 1.8, SD= 1.22) age range on all the 5 tasks. Mann-Whitney U test was used to compare the performance of both the age groups on ToM rating scale. Results revealed

that there was no significant difference between 5-6 years and 4-5 years in TDC, $|z|= 1.727, P > 0.005$.

Thus the results revealed that there was a developmental trend from 4-5 years to 5-6 years on ToM tasks, however there was no significant difference. The TDC in the 5-6 years of age performed better than 4-5 years on all the 5 task of ToM rating scale.

4.2 Theory of mind ability in 4-6 years old children with Specific language impairment

Descriptive statistics was used to compute mean, median and standard deviation values (SD) for age group 4-5 years and 5-6 years in children with Specific language Impairments (SLI).

Table 4.2.1

Mean, Median and SD score of 4-5 years and 5-6 years SLI

Age(years)	Mean	Median	SD
4-5	0.80	1.00	0.44
5-6	1.40	1.00	0.54

The mean value observed from table 4.2 on ToM rating scale task indicated that children with SLI in the 5- 6years (Mean= 1.4, SD= 0.548) age range performed better than 4-5 years (Mean= 0.80, SD= 0.445) age range on all 5 tasks. Mann-Whitney U test was used to compare the performance of both the age groups on ToM rating scale.

Results revealed that there was no significant difference on ToM task between both the age group, $|z| = 1.678, P > 0.05$.

Thus the results reveal that there was a developmental trend from 4-5 years to 5-6 years on ToM tasks, however there was no significant difference. The children with SLI in the 5-6 years of age performed better than 4-5 years on all the 5 task of ToM rating scale.

4.3 Comparison of performance of TDC and children with SLI on ToM

Descriptive statistics was used to compute mean, median and standard deviation values (SD) for typically developing children (TDC) and children with specific language impairment (SLI).

Table 4.3.1

Mean, Median and SD scores of TDC and SLI on five task of Wellman's ToM rating scale.

	TDC	SLI
Mean	2.15	1.10
Median	2.00	1.00
SD	1.30	0.66

The mean value observed from table 4.1 on ToM rating scale task showed that TDC (Mean= 2.15, SD= 1.309) performed better than SLI (Mean= 1.10, SD=0.668) on overall 5 tasks. . Mann-Whitney U test was used to compare the performance of TDC and

SLI on ToM rating scale. Results revealed that there was significant difference between TD groups. ($|z|= 2.693$, $P < 0.05$).

Thus the result indicated that there was a significant difference on ToM tasks in both TDC and SLI. Children with SLI showed poorer performance compared to TDC.

Table 4.3.2

Comparison of TDC and SLI performance across age groups

Age- group	TDC			SLI		
	Mean	median	SD	Mean	Median	SD
4-5 years	1.80	1.50	1.22	0.80	1.00	0.44
5-6 years	2.50	2.00	1.35	1.40	1.00	0.54

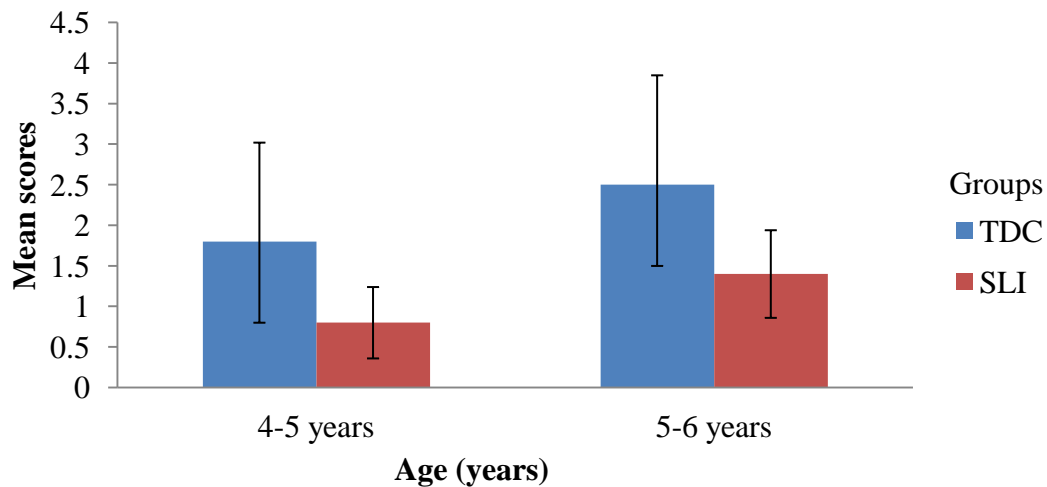


Figure: 4.1 Mean scores for TDC and SLI of age range 4-5 years and 5-6 years

The mean values as observed from the table 4.3.2 for age range indicated that age range 4-5 years, TDC (Mean=1.80; SD=1.229) showed better performance than SLI (Mean=0.80; SD=0.447). The analysis of result showed there was a significant difference between TDC and SLI for age range 4-5 years, $|z|= 2.097$, $p< 0.05$ For age range 5-6 years, TDC ((Mean=2.50; SD=1.354) showed better performance than SLI (Mean= 1.40; SD= 0.548). The result of the analysis showed that there was a significant difference for age rang 5-6 years for TDC and SLI. $|z|= 2.09$, $p<0.05$.

Thus the results indicated that the performance of TDC was better than children with SLI in both the age groups. Overall score of TDC showed that TDC has a better ToM than children with SLI.

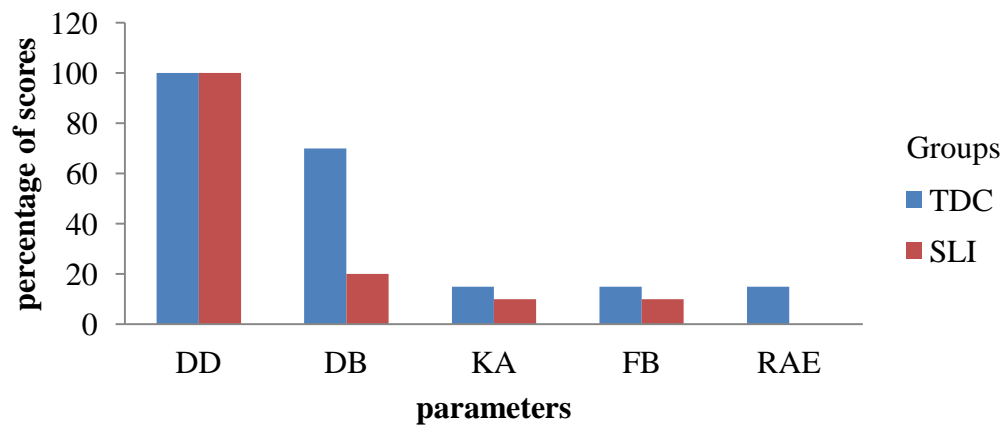


Figure 4.2: Percentage of scores by the participants of TDC and SLI on five tasks of ToM rating Scale

Note: DD= Diverse desire, DB= diverse belief, KA= knowledge access, FB= false belief, RAE= real apparent emotion.

Wellman's ToM rating scale has five tasks in hierarchy namely Diverse Desire (DD), Diverse Belief (DB), Knowledge Access (KA) and Real Apparent Emotion (RAE).

Fisher's exact test for association was carried out for the significant association between the tasks and the group. Analysis of results on Fisher's exact test revealed that on the first task i.e., Diverse Desire (DD), both the groups, TDC and SLI have performed in a similar manner and no significant association as DD is constant. In TDC and SLI, 100% of the participants scored a full score. Hence, there was no association between the groups and the tasks.

On the second task Diverse Belief (DB), 70% of TDC could score a score of '1' wherein only 20% of SLI could score a score of 1. Fisher's association test revealed a statistical significance for DB task, $|Z|= 2.587$, $p < 0.01$. Hence there was a significant association between the group and the DB task. The results showed that TDC performed better on the DB task.

On the third task, i.e. KA, 15% of TDC could score 1 wherein only 10% of SLI could score a score of 1. Fisher's association test revealed no statistical significance for the task, $|Z|= 0.3798$, $P > 0.05$. Hence there was statistically no significant association between group and the KA task although TDC performed better in the given task than SLI.

On the fourth task i.e. FB, 15% of TDC could score 1 and wherein only 10% of SLI could score 1. Fisher's association test revealed that $Z= 0.3798$, $P > 0.05$. There was statistically no significant association between group and the FB task although TDC performed better on the given task than SLI.

On the fifth task i.e. RAE, 15% of TDC could score 1 wherein 0% of SLI could score 1. Fisher's association test revealed, $|Z|= 0.532$ $P> 0.05$ statistically there is no significant association between the group and the task. However, TDC could perform better than the SLI.

CHAPTER 5: Discussion

The aim of the current study was to understand Theory of mind (ToM) in children with Specific language Impairment and typically developing children. The objectives of study were, to understand ToM in 4-6 years old TDC and children SLI and also to compare ToM ability in TDC and children with SLI.

The findings of the present study are discussed under the following sections.

- 5.1 Performance of 4-6 year old TDC on ToM rating scale.
- 5.2 Performance of 4-6 year old children with SLI on ToM rating scale.
- 5.3 Comparison of ToM in TDC and children with SLI

5.1 Performance of 4-6 year old TDC on ToM rating scale.

The findings of the current study indicated that, there was no significant difference in the performance of TDC between 4-5 years and 5-6 years. However, a developmental trend was shown by the participants of the two age groups. The older age group i.e. 5-6 years performed better on TOM tasks compared to the younger age group (i.e. 4-5 years). For the two tasks diverse desire (DD) and diverse belief (DB), both the age groups performed in a similar manner, however few participants of the older age group performed tasks beyond diverse belief i.e. knowledge access (KA), false belief (FB) and real apparent emotions (RAE) (see Figure 4.2). With increase in age, children's ability to use symbolic representations could explain their improvement of ToM. Also with increasing age symbolic representation becomes more elaborate which is indirectly achieved through language acquisition, in turn scaffolding ToM (Plaut & Smith, 1993).

Improvement in ToM with age can also be attributed to the “processing capacity” which helps children to understand ToM as a skill (Chandler et al., 1989). Children’s ability to perform false belief tasks could be developing with development of ability to make inferences on embedded rule which is dependent on increasing processing resources. Hence, the findings indicate that increase in processing capacity of children with age could contribute to better ToM in older children i.e., 5-6 years when compared to younger children, i.e., 4-5 years.

In the current study, it was found that children in the age range of 4-6 years who are in the preschool period showed similar performance in both DB and DD. On similar lines, there have been studies who have reported that pre-school children understand belief and desire equally Harris (1992). Children in their pre-school age period seem to develop the ToM ability, where the developments occur from understanding another person’s desire and then the children also understand that different individuals can have different beliefs about the same object. (Wellman & Liu, 2004). Consequent to this, it is reported that, then the child can judge that another person can have a false belief about a situation i.e. to understand which belief is true and which belief is false. Finally understanding the real and apparent emotion is considered as a late development in the preschool children (Wellman & Liu, 2004). Each stage do not substitute the another stage rather work as a mediator for the next stage (Wellman & Liu, 2004) Few late preschoolers could perform the tasks of real apparent emotions which suggest that ToM is still at a developing stage for preschoolers. 4 years children tend to pass more false belief tasks than children of 3 years (Flavell, 2000) which support the study of the current findings. The findings on developmental trend in the current study are in support of other

studies (Wellman & Liu, 2004; Harris, 1992), where in it was found that the early preschoolers performed well on diverse belief and diverse desire tasks.

This is the preoperational period as given by Piaget, where in it is suggested that children develop cognitive skills which starts from symbolic thinking, use of proper syntax and grammar to express full concepts. According to Lohmann and Tomasello, (2003), syntactic development is related to ToM. They found that 3 year old children, who were trained on sentential complement syntax, were found to improve their FB. .

Yet another explanation can be given in terms of development of social communication. Social communication development is considered to play an important role for development of ToM (Flavell, 2004). As children move from one grade to another in their pre-school, communication with the environment increases which can be a possible reason for better performance on ToM tasks by older preschoolers. This can also be explained through the Vygotsky's sociocultural theory (Jaramillo, 1996) that children generally internalize thought processes that first occur through interaction with others in the social environment. The acquisition and use of language plays a primary role in children's developing intellectual abilities. Simulation theory (ST) (Harris 1992, 1996) might hold good to explain theory of mind in older preschooler. This theory says each subject put themselves in other's 'shoes' and imagined how he would have felt in their place. Even similar way they can predict another person's next response or move. Hence, with increasing age and experience an individual is able to recognize the experience of another person and hence theory of mind develops.

5.2 Performance of 4-6 year old children with SLI on ToM rating scale

Children with SLI of age range 4-5 years performed lower than children with SLI of age range 5-6 years. But no significant difference was found, with development of age a better ToM ability is seen in children with SLI which follows almost a similar pattern as TDC. In SLI even behavioral problem, emotional problems show different developmental trajectories. Behavioral difficulties are more prevalent in childhood but decreases by adolescence (Clair, Pickles & Durkin, 2011). Other studies have findings similar to the current study. Children with SLI performed poorly in ToM understanding tasks both in preschool and school age children (Spanoudis, 2016). Language difficulties in children with SLI contribute to a poorer ToM understanding (Spanoudis, 2016).

Lower performance of children with SLI on ToM tasks can be due to their poor social communication which affects their social cognition in turn. Children with SLI showed a significantly poorer social cognitive knowledge than their age matched peer (Abramoff & Rosenzweig, 2005). Social cognition plays an important role in development of ToM (Kaminski & Emery, 2010).

Children with SLI taken for the current study were expressive type. They showed a much lower expressive language age than the TDC. Within the SLI group, children having a better language performed better on ToM tasks compared to other children of the group. With improvement in language ToM found to be better. There are few studies which addressed the relations of ToM with language in preschool- and primary school-age children with language impairments (Miller, 2001; Farrant et al., 2006; Farrar et al., 2009; Rakhlin et al., 2011), and another few studies which involving school-

age children (Farmer, 2000; Gillot, Furniss, & Walter, 2004; Norbury, 2005;). On the other hand some authors Farrar et al.'s study (2009) examined the relationships of general and special levels of language with performance on ToM tasks and Miller's (2001, 2004) studies investigated the effects of language demands on solving change-of-location tasks, for which preschool-age children with SLI were administered a variety of language measures and ToM measurement tasks. These studies came to the conclusion that general language measures (e.g., semantic or knowledge of grammar etc.) and not domain-specific (e.g. measures of performance in sentential complements) were important for the development of ToM in children with SLI. On the other hand, Farrant et al. (2006) investigated the understanding of children with SLI in different aspects of ToM by using measures of understanding desires, beliefs and emotions, on a scale from very easy to very difficult. The general notion of children with SLI is that they lag behind on ToM development. The same conclusion was found by studying the relationship of ToM with syntax development in native Russian children with SLI (Rakhlin et al. 2011).

5.3 Comparison of ToM in TDC and children with SLI

TDC performed significantly better on ToM tasks when compared to children with SLI. The Wellman's ToM rating scale which has tasks in increasing order of complexity from diverse desire to real apparent emotions, which all the participants of TDC perform first two tasks of diverse belief and diverse desire in both the age group. Whereas children with SLI performed well task DD only, but did not perform well on diverse belief task. Few TDC perform all the tasks of the modified Wellman's rating scale whereas the same result was not shown by children with SLI. From the findings of

the current study SLI were found to be lagging on tasks of false belief, knowledge access and real apparent emotion. This delay on ToM tasks concludes that TDC has better ToM than children with SLI. 12-18 month delay was found in children with SLI (Tucker 2004). Knowledge access is delayed in children with SLI compared to TDC (Farrant, 2006). Different studies have a similar result, where preschooler and school age children with SLI performed significantly poorer than their age matched TDC (Spanoudis, 2016). There is a direct relation of language development and ToM development (Astington et. al., 1999)

Children with SLI also exhibited poorer social communication as compared to TDC. Due to delay in their expressive language, pragmatic skills were affected in the participants of the study. Lag of ToM in children with SLI is not only due to linguistic delay but because of some other factor like neurological impairment or problem with socialization.(Farrant et al., 2006) among the language component which has a more stronger relation with ToM development is said to be pragmatics (Astington et al., 1999). Pragmatic deficit is one of the important factors in children with SLI. In children with SLI relationship of self esteem and social pragmatics was found to be poorer (Marton et al., 2004) SLI complained of their social relations, about not having enough friends and often being lonely. These factors of social communication might hinder the development of ToM. The children with SLI lacked social knowledge and were unaware of their own social limitations. This deficit might result from a combination of factors, including denial, poor judgment, and lack of self-awareness Social knowledge include socially coping strategies like social negotiation, conflict resolution and also the ability to access on ongoing conversation or interaction, which has been reported that children with

SLI are significantly poorer than age matched TDC on the mentioned social knowledge. (Marton et al., 2004).

Social communication thus plays an important role in development of ToM. Also age related factors are seen both in SLI and TDC where 5-6 years age children performed better than their 4-5 years old counterparts. The older group of children had a better communication skill as they were more familiar with their environment and also had a better learning experience. With increasing age, cognition improved. Social pragmatics being another component of social knowledge, some studies have found that among all the components of language, pragmatics is highly effected in children with SLI (Nilsson & de Lopez, 2016). Extended series of conceptual insight takes place in preschool years as children acquire a ToM (Wellman and Liu, 2004). Using of this rating scale gave a better idea to understand the ToM, when compared to using a singletask or scale, which may not appropriately determine the ToM ability in an individual.

Summary and Conclusion

The current study was done in order to understand Theory of mind in children with SLI. The objective of the study was to understand theory of mind development in typically developing children from age range 4-5 years and 5-6 years, to understand ToM development in children with SLI of age range 4-5 years and 5-6 years and to compare ToM in TDC and children with SLI. Several researchers have conducted many studies to understand ToM in children with SLI and tried to understand the factors underlying for deficit ToM in children with SLI. With a similar aim the current study was carried out.

The participants of the present study include twenty TDC and ten children with SLI (expressive type), who were native Kannada speaker, of age range 4-6 years. The children were given modified Wellman's ToM rating scale (Thulasi, 2013) which was a five point rating scale and they were assessed for five different tasks namely, diverse desire, diverse belief, knowledge access, false belief and real apparent emotion. They were scored 1 if they can successfully perform the task and were scored 0, if they cannot perform successfully.

The findings of the study indicated that for TDC there was no significant difference on ToM performance in 4-5 years and 5-6 years age range but the older age group performed better on all the tasks. On a similar line, the children with SLI had no significant difference on ToM task performance between age range 4-5 and 5-6 years, although the older age group observed to perform better compared to the younger age group. The result also indicated that a developmental trend was found on improvement of ToM tasks, as with increase in age their processing capacity and symbolic representation

improves (Chandler et. al., 1989). In preschool age TDC could perform the tasks diverse desire and diverse belief in a similar manner. Only few late preschoolers could perform the task real-apparent emotion which indicated that ToM is still developing in preschoolers. With development of age, their social communication increases which in turn helps in improvement of socio-cognitive skill. Social cognition plays an important role in development of ToM (Kaminski & Emiry, 2016). There was a significant difference on ToM tasks performance between TDC and children with SLI. All the participants of TDC performed diverse desire and diverse belief wherein all the participants with SLI could perform only diverse desire task. Children with SLI performed significantly poorer on ToM tasks. Among the five tasks significant association was found for the diverse belief task between group and tasks. Except diverse desire, children with SLI showed delay on all the other four tasks i.e. diverse belief, knowledge access, false belief and real-apparent emotion. From this view, it could be inferred that with language development which trigger social development, there is a development on ToM which is lacking in children with SLI.

Implications of the study

This study gives an insight on the importance of social cognition to develop languages which are lagging in children with language impairment, as also reported in literature. ToM tasks can be assessed in children to understand their level of understanding about the social world. Also, it can be checked that what level of ToM the child with language impairment possess, and which level to work on. Children of age range found to perform well on first diverse desire and diverse belief where there was a more than 90 percent association between the task and the TDC group. So, these two

tasks can be taken as norms for the given age range to measure ToM. Assessment of ToM would suggest whether to improve social communication of the child and to what extent.

As a future direction more studies can be carried out where ToM can be assessed in other language disorders. Also studies can be carried out to see the underlying cause if any other than language or social cognition which contributes to poorer ToM are observed in some children. Further it can be studied whether development of ToM abilities can influence development of language abilities especially in children with language impairment.

Limitations of the study

The number of children taken for clinical group was lesser compared to control group. The study could not find a proper developmental pattern on ToM due to limited age group. The study could have given a better view on social cognition and ToM relation if social cognition tasks would have been carried out simultaneously along with ToM tasks.

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Diverse desire



PLATE 1

Diverse Belief



PLATE 2

Real Apparent Emotion



PLATE 3