LEXICAL FAST MAPPING ABILITIES IN CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT

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May, 2016

CERTIFICATE

This is to certify that this dissertation entitled **"Lexical Fast Mapping Abilities in Children with Specific Language Impairment"** is a bonafide work submitted in part fulfilment for degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 15SLP013. 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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CERTIFICATE

This is to certify that this dissertation entitled **"Lexical Fast Mapping Abilities in Children with Specific Language Impairment"** has been prepared under my supervision and guidance. It is also been certified that this dissertation has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled **"Lexical Fast Mapping Abilities in Children with Specific Language Impairment"** is the result of my own study under the guidance of Prof. Shyamala K.C, Professor in Language Pathology, Department of SLP, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysore, **Registration No. 15SLP013**

May, 2017

Dedicated to my

Amma

Appa

Friends

DON'T

QUIT

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TABLE CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Language is an essential constituent for every child to deliver their views, ideas in day to day communication. They acquire different innovative words every day in their life during the age of development. If the learning becomes imperfect, it affects their comprehension and interaction level to communicate with the society and such circumstances lead to developmental language communication disorders. One of the most common disorders noticed in children with such condition is specific language impairment and it is assumed that children exhibit issues in onset of speech and language suspension with no attributable cause being displayed. Specific language impairment is defined as a form of developmental language disorder, occurring in the absence of mental retardation, sensory deficits, frank neurological damage, serious emotional problems and environmental deprivation (Leonard, 1998). According to western studies, specific language impairment is one of the most common types of developmental language disorders, affecting 7% of kindergarten children, more likely to be seen in males than in the females. Children with SLI are more likely to have parents and siblings with a history of language learning problems than typically developing children. (Tomblin, Record, Buckwalter, Zhang, Smith and O'Brien, 1997).

Children with specific language impairments exhibit issues in many language areas, out of which one of the areas appears to be learning a novel word. This may affect other important areas including listening and reading comprehension skills (Bishop and Adams 2006; Cunningham and stanovich 1997, Scarborough, 2001; Storch and Whitehurst 2002). Since the earliest studies of children with SLI, it has been known that

the first word appears later in these children's speech and subsequent lexical development is protected (Nice, 1925; Bender, 1940; Werner, 1945; Morley, Court, Miller and Garside, 1955). They appear to use or comprehend particular lexical items and they do not always show a complete mastery of those words that they have learned. They majorly exhibit difficulties in comprehending and expressing a lexicon, morphosyntax, and phonological components.

Many of the lexical studies on SLI examines on fast mapping abilities. The fast mapping is defined as the earliest stage of word learning when the child is exposed to a new word the first few times (Carey and Bartlett 1978). They elucidated that fast mapping has two stages of word learning.

The first stage of fast mapping starts from the stage at which the child forms a new lexical representation of a novel word. Second stage of fast mapping is the "extended phase", where in the child cultivates some of the information about that particular novel word for which the child has already encountered. When a child encounters a new word, he gains more information about that referent of the novel word, phonetic characteristics and its syntactic form. The factors which affect the novel word learning are word length, complexity of a word, word frequency, taxonomic organization cultural factors and phonotactic probability (Stroke 2001; stroke and Rogers, 2000). In addition to these factors the practice effects plays a critical role in them. The Practice effects are very important in learning new words (Newll and Rosenbloom, 1981). Word learning processes involves acquisition process and repeated practice fine tunes the information about the particular novel word which the child was exposed (Rumelhart and Norman, 1978). Repeated practice strengthens the connections between them. The study

done on mapping skills in Kannada speaking toddlers revealed that the high practice words created a neighborhood activation, which facilitated the rapid learning of low practice words (Sushma, Amulya, Ranjini, and Swapna 2010).

For the novel word to be strongly represented in the child's memory, child should have a skill of matching a lexical representation of the previously acquired words to the newly learned words. Learning a new word requires the learning of the word form, its referent and strong lexical connection. Pinker (1982) stated that children may use the strategy of "Ostension", that is, the act of pointing out or to make a connection between the word and the entity. This connection can occur using the past events and the related words which is already been acquired through visual or auditory modality, provides linguistic cues such as morphemic, phonemic and semantic for mapping a lexicon. These linguistic cues are used as strategy by children to learn a new word. Many numbers of researchers found out that children use both linguistic as well as non-linguistic strategies to encounter a novel word for the first time. (Beaver, 1970; Chapman; Clark, 1973).Children with SLI exhibit impairment in combinations of any of these components. They also depict impairment in mapping nouns and verbs. Oetting (1999) found novel verb retention to be poor in children with SLI as compared to language- and age-matched peers. They possess slow mapping skills in terms of recognition and naming tasks. In a study the School age children with SLI showed slower than normal response times in naming pictures and poorer recall on memory tasks even when the words used in these tasks are those that they could readily identify on simple picture pointing tasks (Kail and Leonard, 1986). Leonard (1998), referred on memory function that children with SLI exhibit a general reduced capacity compared with their typical language peers. The slower reaction times

and poor recall insights the limited tasking capacity of cognitive processing skills. Abundant studies has been carried out on SLI with respect to the components of language and cognition in western as well as in Indian context. Fast mapping skills are one of the current research which are from western context, has thrived the Indian authors to look upon how novel word learning occurs in typically developing children, monolinguals, bilinguals and multi-linguals. The children with specific learning impairment demonstrates issues in recognition as well as production of novel word due to impairment in the components of language and cognition. The fast mapping abilities strokes on how the novel word is learned how these constituents helps in mapping the novel word. Apparently studies related to Fast mapping in children with SLI in Indian context are limited.

This research is valuable in finding out fast mapping ability in children with Specific language impairment and it will be beneficial to know how novel word learning occurs in children with SLI and will vision on their process of acquisition of a lexicon.

Need for the study:

In the past, the word learning has been analyzed in several different ways. But in all of these paradigms; there was no control over the input to the child i.e., amount of exposure, the information about modality (visual or auditory) or in which context children with SLI had exposure of a word is not known. Children with SLI are exposed to novel words like that of the young normal children in their day to day life, but they face difficulties in learning the novel words due impairment in morpho-syntax, receptive and expressive skills and illustrates limited load control on cognition with respect to

phonological memory, short term memory, long term memory, access and recall /retrieval.

Most of the survey related to fast mapping in is in the western context. There is a dearth of literature related to fast mapping in children with SLI. So this study will help us to know whether practice effect enhances the novel word learning process and how fast word learning can occur in children with SLI group. Further, the novel word learning can be delineated to other clinical population of impaired language children in their lexical acquisition process

Aim:

The present study aims to explore the fast mapping abilities in novel word learning in children with specific language impairment using naming and recognition task.

Objectives of the study:

- To study the novel word Acquisition in children with specific language impairment.
- To study the practice effect of children with SLI in novel word learning.
- To study and compare immediate and delayed recall abilities of novel word in children with SLI and normal children who are native speakers of Kannada.
- To compare the novel word learning in recognition and production task in children with SLI and normal native Kannada speaking children.

Hypothesis:

There is no significant difference in novel word learning across recognition and production task between children with SLI and normal native Kannada speaking children.

CHAPTER II

REVIEW OF LITERATURE

2.1 Language Acquisition

Language is exceptional to human beings, exclusively in the form of speech. It is the prime means through which people express ideas, learn new information, and establish and maintain social relationships in their respective society. Acquisition of language arises right from the period of infancy and continues till several years of developmental life. Along with the language development, speech of the child also changes and both are ideally meant to develop hand in hand in typical individuals. It is the child's expression in terms of speech which serves as one of the important avenues for language evaluation. According to Glietman and Wanner, (1982) developmental process of language was defined as "mysterious" and according to Bloom (1983) as "Magic". Overall, the development of language and speech is a dynamic, constructive process (Thelen, 2005).

For any individual to learn new words or develop language the main pre requisite that is required plays a major is the cognitive abilities. Cognition comprises of those mental activities that are involved in the comprehension of perceived information, including acquisition, organization and storage, memory and use of knowledge. Traditionally cognition has been believed to be the foundation upon which language develops. It represents the underpinnings of language (Bloom and Lahey, 1978; Muma, 1978). Hence there is an intricate relationship between cognition and language, especially the cognitive processes like attention, memory and organization which are important for

comprehending and producing language (American Speech Language Hearing Association, 1987).

Language development is sub served with other functions. Language is merely a specific event of semiotic or symbolic function (Piaget, 1969), which includes imaginary play activities, the gestural symbols, the written or drawn picture, etc. Several researchers suggest that cognition, symbolic play develop in parallel (Bates, Benigni, Camaioniand, Volterra, 1979; Mc Cune-Nicolich, 1981; Ogura, 1991; Lytenin and Laakso, 1997). Vygotsky believed that language development in children is important for communication as well as regulation of behavior by themselves (Berk and Winsler, 1995). In the course of language development along with communication there is a lot of enrichment in the cognitive processes and other psychological functions (Vygotsky, 1978).

ASHA in 1983 defined language into 3 components; form, content and use. According to ASHA (1983), language is a "complex and dynamic system of conventional symbols that is used in various modes for communication and expressing thoughts". ASHA proposed five parameters of language; phonology, morphology, syntax, semantics and pragmatics.

Language acquisition occurs across various stages and it is explained by several researchers using different approaches. This knowledge of acquisition helps in differentiating between typical individual and disorder, where it has implications in language assessment and planning therapy.

Skinner (1957) says, “Language is a learnt behavior and it can be modified according to the environmental stimulation”. Children acquire language with the help of modelling and reinforcement of the parents. Chomsky (1969) in contrast to Skinner’s belief explained the rule based device known as Language Acquisition Device for learning language. In language development vocabulary development is considered as one of the important yardstick to measure.

2.2 Vocabulary development

It is surveyed that more than 60,000 words’ comprehension is achieved by the time of graduation. According to Bloom (2000) to gain this size of vocabulary child must be involved in learning of new words on an everyday basis throughout his/her childhood. Development of vocabulary development in children is highly variable across individuals. It is dependent on so many factors like exposure to language, education, socioeconomic status, dialect and native language (Mallikarjun, 2002). Learning novel words in children also varies across age wherein younger children learn these words by focusing the particular stimulus that is in and around their environment. Gradually these styles of learning will be replaced with a more matured form of learning novel word where children start linking to the previous episodes of events and try to link with lexical –semantic map. Learning L2 (second language) also differs across age where older children may use different learning strategies than younger children. Potter et al, (1984) researched that vocabulary development in younger children is more lexically mediated than in older children.

Measuring the child’s vocabulary development is crucial in the period of language development to both clinician as well as researchers. Learning language is one of the

important components of cognition. Hence several researchers who studied language acquisition have emphasized on cognition, working memory and IQ because it's all interrelated to each other (Marchmanand Fernald, 2008).

The skill to learn novel words is particularly exponential and is one of the crucial aspects in speech and language development. Children in the age range of 2-3 years old are estimated to learn approximately 2 new words per day; on contrary 8- 12 year old children learn as many as 12 words per day (Bloom, 2000). When a child learns a new word, he/she assigns meaning to the particular word. Several studies have reported that children between the age of 2.5 -4 years select an unfamiliar object as a novel word referent and with repeated exposure they map that word. Few theories explain that novel word learning is happening by linguistic experience in the developmental period. The strategy of learning word through novel mapping is one such example. (Lederberg andPrezbindowski, 2000).

Word learning links the connection between conceptual and linguistic organizations in infants (Bloom, 2000; Gelman, Coley,Rosengren,Hartman, and Pappas, 1998). In conceptual domain the linkage between objects and events will be taking place and in linguistic domain phrases and words are learned through melody of human language. Several researchers have proved that during the infant's stage word learning takes place through a strong linkage of conceptual and linguistic domain. To become a successful word learner, infants must identify relevant linguistic units, conceptual units and make a strong mapping between linguistic and conceptual units. And each of these domains requires a certain amount of abstraction for example a given word or utterances

must be related to abstract phonological representation and should have abstract concept related to it.

2.3 Fast mapping

Fast mapping is defined as the phenomenon which forms a lexical representation of the newly learned words. This came into the field of child language acquisition around 3 decades ago (Carey and Bartlett, 1978). The word fast mapping is believed to be critical in the first stage of learning new words or novel words, which requires intact phonological and semantic processing skills (Ellis Weismer and Evans, 2002; Gray, 2005). Few researchers investigated novel word learning and opined that with a single exposure to a new phonological form and semantic value of the word, children create a 'map' (Form meaning), which is pre requisite or initial stage to the learning of novel word. During this stage there is phonological, syntactic or semantic information represented. In typically developing child novel word learning creates particular lexical semantic map and this is refined through various experiences across communicative contexts. (Alt, Plante, andCreusere, 2004; Capone andMcgregor, 2006; Dollaghan, 1987; Ellis Weismer and Evans, 2002; Ellis Weismer andHesketh, 1993, 1996, 1998; Gray, 2003, 2004, 2005, 2006; Hwa-Froelichand Matsuo, 2005).

According to Lederberg (2000), two types of word learning exist: rapid word-learning (fast mapping) and novel mapping (quick incidental learning). Child is given an explicit reference in rapid word- learning whereas in the second type, the child has to establish link among the novel word and unfamiliar object. In the present study fast mapping is employed.

In ideal situations, fast mapping tasks include two phases: exposure phase and probe phase. In exposure phase child listens to a novel word and looks into the corresponding referent which would be in the form of pictures or real objects. In probe phase child has to name a particular picture which he has learned in the exposure phase. Further probe phases are evaluated with two tasks namely, recognition and expression probes (Ellis Weismer and Evans, 2002). Ideally fast mapping task is carried out without specific feedback or teaching over very short duration. In the present study above stated phases have been assessed.

Several studies on monolingual preschool children showed that receptive probe is better than expression probe. Gray in 2003 exclaimed that children' fast mapping receptive scores might be a strong predictor of child's capability to express the learnt novel word. Hence, reception becomes eternal part for expressing the word.

Vocabulary also plays an important role in fast mapping especially in production skills.(Fenson et al., 1993), a parental report instrument of language development, and the expressive portion of the Preschool Language Scale- 3 (Zimmerman, Steiner and Pond, 1992). Similar correlation was found on fast mapping performance and score of Peabody Picture Vocabulary Test, in monolingual English speaking preschoolers (PPVT-III; Dunn, Dunnand Williams, 1997), Gray (2004). And performance of fast mapping is influenced by several variables.

2.4 Factors affecting fast mapping

Several studies have found that there are various and potentially influencing aspects of learning skills in typically developing young children. First, age becomes the

primary contributing factor in the process of novel word learning. Fast mapping and age have direct one to one relationship, with evidence of older children outperforming better than young children (Alt et al., 2004; Gray, 2005, 2006). Second influencing factor in the process of fast mapping is cohesion of child's underlying language system. Children diagnosed with specific language impairment perform poorer than their peers with intact language skills in fast mapping task (Alt et al., 2004; Alt andPlante, 2006; Dollaghan, 1987; Ellis Weismer andHesketh, 1993, 1996, 1998; Ellis Weismer and Evans, 2002; Gray, 2004, 2005, 2006).The third important learning factor influencing the child's learning skills is their persistent language knowledge (Gray, 2003, 2004).

Fourth important novel word learning factor is phonotactic probability. It refers to frequency of occurrence of individual sounds and sounds combination it is believed that behavioral effects of phonotactic probability provides insight about the role of phonological representation in language processing (Vitevitch and Luce,1999). Children learn words which have high phonotactic probability easily than low phonotactic probability words (Storkel, 2001; Storkeland Rogers, 2000). Specific language impairment is one the important variables which tend to influence fast mapping skills. In order to understand the effect of Specific language impairment on fast mapping, review of basic aspects of specific language impairment is essential.

2.5 Specific language Impairment

Language disorders are defined as impairment in reception and expression or other symbol system of components of language such as form (phonology, morphology and syntax), content (semantics) and use (pragmatics) in any combination.

As defined by Leonard (1998), it is a form of developmental language disorder, occurring in the absence of Mental Retardation, Sensory Deficits, evident neurological damage, serious emotional problems and environmental deprivation.

A term "Specific Language Impairment" is used to label the children with language disorder when it cannot be attributed to any of the cause. Most of the Speech-Language Pathologists reserves this label while diagnosing this condition, it may be because of various diagnostic labels have been used throughout the literature.

Many researchers have proposed different types of classification system for Specific Language Impairment. One among them is given by Bishop(2000) which includes 6 subtypes viz.Verbal auditory agnosia (word deafness) for those who have severe comprehension deficits; Verbal dyspraxia**:** deficit in language production even though comprehension is relatively intact; Phonological programming syndrome**:** deficit in producing speech sounds; Phonological–syntactic deficit**:** poor phonological and syntactic abilities; Lexical–syntactic deficit syndrome-word finding difficulties along with poor sentence structure; Semantic–pragmatic deficit syndrome: ability to comprehend and produce meaningful linguistic elements will be compromised. Another classification Rapin and Allen (1987) consider two main subtypes of Specific Language Impairment and those are expressive type where limited capacity to learn new words and poor in speech production and mixed receptive-expressive type where along with expression problems they exhibit poor reception abilities with respect to their age.

Children with SLI perform poorly on standardized language test batteries exhibiting below age expectations. These children with SLI portray a delay in acquiring

first word and further \two-word combinations which extend the delay in overall language development to school age years. In other words, it can be said that children with SLI will be manifested as late talkers in the early days, but few late talkers will lead to SLI and others will be resolved. The children with SLI who are manifested with the delay in language development in school age will exhibit poor abilities in reading and writing skills which is termed as Learning Disability.

Children with SLI exhibit deficit in semantic, morpho-syntactic and pragmatic components of the language when compared to typically developing children. Leonard (1998) reported that morpho-syntax will be prominently affected in children with SLI, where their performance on this language component is expected to be poorer than young typically developing children with respect to their chronological and language age.

Children with SLI exhibit language impairment, along with which they have impaired cognitive functioning, have been studied in the recent decades. With the increase in demands for processing, the performance of children with SLI in comprehension and expression of linguistic and non-linguistic tasks is noticed. Using tasks such as Non-word repetition task, sentence repetition task, sentence comprehension task etc, it has been found that children with SLI perform poorly when compared to typically developing children where the limited capacity is attributed to the poor working memory or phonological working memory in children with SLI.

2.6 Lexical acquisition Abilities in children with SLI

Children with SLI appear to be late in acquiring their first words. At the age of preschool they could comprehend more object words than action words and produce less ability to extend to newly learned objects unnamed (Leonard, Schwartz, Allen, Swanson, and Loeb, 1989; Leonard, Schwartz, chapman, Rowan, Prelock, Terrell, Weiss, Schwartz, Leonard, Messick, and Chapman, 1987). During the school years they exhibit chief symptoms of word finding problems, long pauses in speech, frequent circumlocution and frequent use of non-specific words. Rubinand Liberman,1983; wig, Semel and Nystrom,1982 found that there were great number of naming errors in comprehending target words meaning in a picture –pointing test. Along with the naming task in account to time limit the children with SLI were found to be slower when compared with the peers of the same age group (Kail and Leonard, 1986). Later in a study by R.Stark and Montgomery in 1995 revealed that children with SLI performed faster with respect to time when target words appeared in sentences as opposed to word list. In children with SLI the words are not represented in the memory in an all-or-none fashion. Some words have richer network of associations in memory than other words. In recall task, the known words are insufficiently elaborated in their memory than being retrieved improperly. This implicates that words are recalled frequently less than that of the age controls (Kirchner and Klatsky, 1985; Sommers, Kozarevich and Micheals, 1994). Similarly, the free recall task revealed that the children with SLI relied more on phonological cues and exhibited difficulty in semantic organization.

Often the Verbs, in particular start to show deficiencies that seem to go beyond the general lag in these children's lexical abilities. Verbs differ widely in the types of

meaning they convey (Kelly and Rice 1994). Other than verbs they also exhibit errors in morpho-syntax such as bound morphemes, possessive morphemes, regular and irregular tenses, various forms of auxiliaries and irregular plural forms. In later stages they start using grammatical tense markers and show slower acquisition, although the change in acquisition over time follows an upward path toward the adult grammar that is not different from normal (M.L.Rice, Wexler, and Hershberger).

2.7 Specific language impairment in bilinguals

The researchers in the current trend are also keen about studying the fast mapping skills on the bilinguals and SLI.

For children with SLI learning two languages is not appropriate developmental option because of their limited capacity to learn a language. It would be burden for children with SLI to acquire two languages. According to Miller (2001) slowing hypothesis, children with SLI have poor speed of processing which restricts them to learn, store and retrieve the linguistic and non-linguistic elements and this will hinder their language development. According to slowing hypothesis, if children with SLI learn two languages, they do not show delay in their language development not only when compared to age matched typically developing monolingual peer but also when compared to a children with SLI who are monolingual. Contradicting the above discussion, many of the researchers have argued that learning two languages does not impoverish the language development in children with SLI. Throughout the literature, the researchers have tried to find the benefit of bilingualism on children with Specific language Impairment. One of the evidence puts a note that bilingual SLI exhibit more grammatical difficulties when compared to their monolingual SLI children. The above evidence was

supported by two studies, Crutchley, Conti-Ramsden and Botting (1997) compared the morpho-syntactic abilities in mono-lingual and bilingual children with SLI. It was found that bilingual children with SLI were poor in morpho-syntactic abilities when compared to the mono-lingual counterparts. Paradis and Crago (1998) found that bilingual children with SLI were poor in use of tense markers when compared to the monolingual group.

A case study by Restrepo and Kruth (2000) described linguistic abilities of bilingual typically developing child and child with specific language impairment. They concluded that bilingual child with SLI showed significantly more errors in morpho-syntax and less variety of sentence types and grammatical forms when compared to bilingual typically developing child and mono-lingual child with SLI and these children also showed language loss in first language after the exposure to the second language. Contrary to the above studies, a study by Paradis, Crago, Genesee and Rice (2003) compared French-English bilingual children with SLI with French and English monolingual children with SLI for morpho-syntactic abilities. After analyzing spontaneous speech sample of the three groups, it was found that no difference in morpho-syntactic abilities among the three groups.

2.8 Fast mapping studies in other disordered populations

Few researchers were also keen on studying the pattern of how novel words get mapped in language disordered children with comparison to typical developing children it's of great interest to know how the mapping takes place across various disorders like hearing impairment etc and these studies give some insight about how the word learning takes place across these disorders and these results will be useful in planning rehabilitation program. In these lines few studies have employed the principle the fast

mapping Gilbertson and Kamhi (1995) studied perception and production of nonsense words in typical normal individuals (between 7-10 years) and with hearing impaired individual (between 5-9 years). Results showed that learning of nonsense words were poorer in hearing impaired than typical individuals.

Word learning can take place at 2 conditions; one is rapid word learning and novel mapping. In rapid word learning, child gets the reference for a particular word which he is taught. In novel mapping, child will make lexical connections between referent and new word. In this regard, Lederberg et.al (2000) studied two aspects of language acquisition in hearing impaired, namely; rapid word learning and novel mapping who were 3-6 year old and found that performance was better in rapid word learning than the novel mapping. And also they found that there was a significant correlation between receptive vocabulary and performance.

Stelmachowicz et al. (2004) studied rapid word learning in children with hearing impaired (Moderate hearing loss) in the age range of 6-10 years old and typical individuals. It was found that hearing impaired performed poorer even with adequate training and exposure.

Margieet al. (1995) examined rapid word learning on 60 typical hearing children and 37 hearing impaired children with moderate sensorineural hearing lossbetween 5-14years. The task was to watch the animated slideshow which contained nonsense words and it was presented for about 3 times. Child was asked to identify the particular trained word from the slide show. Results revealed that children with hearing impairment performed poorer than typical normal individuals on recognition task.

Studyby Vishnu, Ranjini, SapnaandShyamala (2011) investigated novel word learning in Malayalam – English bilinguals and Tulu- Kannada – English multilinguals in adolescents using referent identification task and picture naming task and found that bilinguals children learned novel words faster in L1 (Malayalam) that L2 (English). Whereas multilingual children learned words faster in L3 (English) followed by L1 (Tulu) and L2 (Kannada). And further they opined that language proficiency, degree of exposure and opportunities to use the language are contributing factors for novel word learning.

Study by Danielle and Pui (2016) investigated fast mapping skills in preschool children whose L1 was Spanish and L2 was English, across two different context; one is storybook reading and cartoon viewing. These children were exposed to 8 unfamiliar words for a period of 4 sessions in both the contexts which mentioned above. Results revealed that there was no significant difference in learning unfamiliar words in storybook reading or cartoon viewing and the researchers opined that both storybook and cartoon viewing help the children in learning unfamiliar words in both L1 and L2.

To conclude, the above studies cited provide few interesting findings that pertain to fast mapping in different disordered population and also in the context of monolingual and bilingual children both western and Indian population are studied with the latter includes are very few studies related to fast mapping. From all these studies the knowledge of fast mapping skills across different disordered population, normal monolinguals and normal bilinguals is clear though not exhaustive. Further, these studies reflect the significance of number of exposures, influences of L1 vs.L2 and difference in the recall abilities. Literature has elaborated on how the novel words are stored in long

term memory using fast mapping strategies and the factors influencing the recall abilities in them.

CHAPTER III

METHOD

The present study aimed to investigate fast mapping abilities in Children with Specific language impairment in the age range of 4- 7 years.

Objectives of the study:

The main objective of the present study was to investigate fast mapping abilities in children with specific language impairment across recognition and production tasks.

Further, the study also examined on

1. Comparison of practice effect between (5 vs 10 repetitions) trials in SLI children in novel word learning.
2. Comparison of immediate and delayed recall abilities of novel word in children with SLI and normal children who are native speakers of Kannada.
3. Comparison of the novel word learning in recognition and production task in children with SLI and normal native Kannada speaking children.

3.1 Participants:

3.1.1 Clinical group

10 children with SLI aged 4-7 years were recruited as per the classification specified by Rapin and Allen (1987).

Inclusion criteria: The participants for children with SLI were selected with reference to the criteria for SLI given by Leonard, L.B (1998) (see Table 1).

Table 1; *Inclusionary criteria for participants*

Language ability	**Language test scores of -1.25 standard deviations or lower; at risk for social devalue**
Nonverbal IQ	Performance IQ of 85 or higher
Hearing	The pass is screening at conventional levels
Otitis media with effusion	No recent episodes
Neurological dysfunction	No evidence of seizure disorders, cerebral palsy, brain lesions: not under medication for control of seizures
Oral structure	No structural abnormalities
Oral motor function	Pass screening using developmentally appropriate items
Physical and social interaction	No symptoms of impaired reciprocal social interaction or restriction of activities

Table 2; *Participant's (SLI) demographic details*

SL NO	Age/Gender	Education
1.	4.1Years/Male	LKG
2.	4.3Years/Female	LKG
3.	4.5Years/Male	LKG
4.	5.0years/Male	UKG
5.	5.4Years/Female	UKG
6.	5.7years/Male	UKG
7.	6.2Years/Female	1st Grade
8.	6.10Yeras/Male	1st Grade
9.	6.10years/Female	1st Grade
10.	6.11Years/Male	1st Grade

3.1.2 Control group:

The control group included a total of 10 age matched typically developing children, free from motor, hearing, neurological, cognitive and psychological illness, ensured using the 'WHO ten question screening checklist' (Singhi, Kumar, Malhiand Kumar, 2007).

An informed consent will be taken from all the participants or caretakers before the actual testing.

Table 3; *Participant's (NNKS) demographic details*

SL NO	AGE/ GENDER	EDUCATION
11.	4.0years/ Female	LKG
12.	4.2years/Female	LKG
13.	4.3years/Female	LKG
14.	4.6years/Male	LKG
15.	5.7years/Female	UKG
16.	5.8years/Female	UKG
17.	5.8Yeras/Female	UKG
18.	6.1Years/Female	1st Grade
19.	6.2Yeras/Male	1st Grade
20.	6.7years/Male	1st Grade

*NNKS = Normal native speakers of Kannada

3.1.3 Study design:

Standard Group Comparison

3.1.4 Stimuli preparation:

25 meaningful novel words were selected and it was validated by three speech language pathologists. The novel words will be checked for equal length and phonological complexity. In every word selected, the appropriate color picture as bmp file and its respective name were recorded as audio files.

Selection of novel words:

1. Selection of novel words were made with the help of Early Language Training Manual (Karanth, Manjula, Geetha and Prema, 1999) and the 4th, 5th standard language textbook of Kannnada.
2. For selection of novel words, set of words were listed and 10 children in the age range of 4-7yrs will be asked to rate on the familiarity of the words. The words which are unfamiliar were selected as novel words.

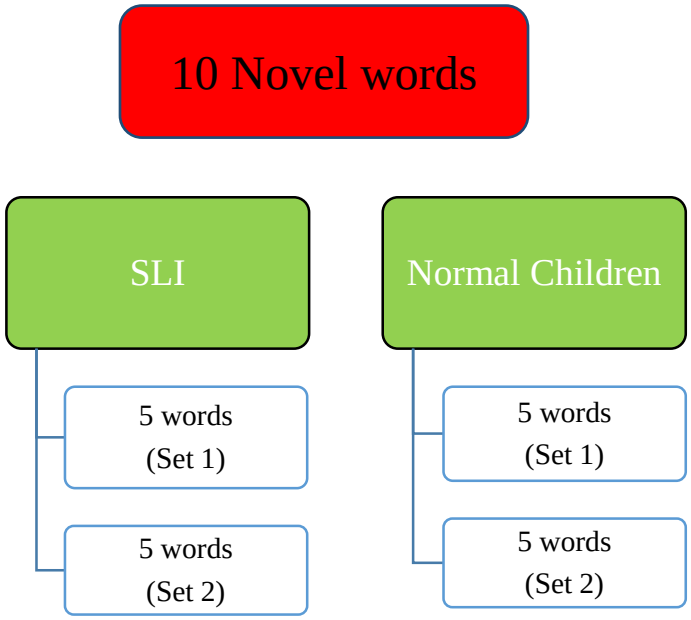


Figure 1 *Design of novel word selection*

After selection of these 10 novel words, the respective bmp picture and audio file was saved. Two different sets of power point presentation files were prepared. One set of power point presentation file with 5 times repeated trials and second power point file with 10 times repeated trials was used for both recognition and production task. In this manner, two sets of novel words in power point files were prepared for both children with SLI and NNKS. Slide show option was used to present the stimulus only in training

phase. The total duration of the stimulus presentation of each novel word was set to 7,000ms and inter stimulus interval was set to 6,000ms.

3.2 Procedure:

3.2.1 Training Phases:

In the present study, the testing was done in a distraction free and quiet environment. The study was carried out in 2 phases.

Phase I:

In this phase, each novel word from (set1) was introduced for 5 times in visual and auditory mode simultaneously in the laptop using Microsoft power point presentation software (Microsoft office 2013). To check the novelty of the words in the child, set of pictures used in the word sets was introduced to the child and asked to name the picture one by one. If the child does not name the particular novel word, then those words were assumed as novel words and testing was continued.

No Prompts or visual feedback were provided during the training period. After every set of novel word, immediate recall followed by delayed recall was measured by the time gap of 2 days.

Phase II:

The same procedure was used for the second phase. Here next 5 novel words (set 2) were presented for 10 times.

3.2.2 Response Phase:

In both the phases, immediate and delayed recall was checked. And responses were evaluated for both immediate and delayed recall through

1. Recognition task
2. Production Task

In recognition task, children were given three pictures consisting of trained target novel word and two other non-trained words. The child were asked to say 'Yes' or 'No' response when asked by the examiner for each novel word. For example: Examiner points for each of the pictures in the set and asks "Is this pen? (For trained target novel word-pen), then the child has to respond "yes" or "no". These trained novel pictures were presented via laptop along with pictures of word which is given as a choice. The child gets a score '1' for every correct response.

During the production task, children were presented with each novel word picture through laptop and they were asked to name it. Score '1' was given for each correct response. To rule out the effect of task (Recognition and production) on the responses, counter balancing of the tasks were be done. For example, if first 5 children performed recognition task then production tasks was performed first for next 5 children followed by recognition tasks.

3.2.3 Instructions to participants

The participants were instructed to listen carefully to the novel word which was played via the headphone. Simultaneously they were also instructed to carefully watch the picture related to particular novel word and memorize the word.

3.3 Scoring and Analysis

Scores of each participant were noted for recognition and production tasks across

1. SLI and NNKS
2. 5 repetitions and 10 repetitions trials condition
3. Immediate and delayed recall conditions

Score '1' was given for correct response and '0' for incorrect response. After scoring for each task, the scores were averaged for each child across the conditions mentioned above. Data of all twenty participants were entered into SPSS (Version 21) software and subjected to further statistical analysis.

CHAPTER IV

RESULTS AND DISCUSSION

The present study aimed to explore the fast mapping abilities in novel word learning in children with specific language impairment using recognition and production tasks. Statistical analysis was done to measure recognition and production responses in children with SLI between 4-7years in the following conditions.

1) Fast mapping abilities in children with SLI and NNKS.
2) Practice effect; 5 (S1) vs. 10 (S2) repetition trials after training phase in children with SLI and NNKS on fast mapping.
3) Immediate (I) vs. Delayed recall (D) abilities of novel word learning in children with SLI and NNKS.

- Following statistical measures were applied to the data collected for scores obtained by 10 SLI and 10 NNKS.
- Descriptive statistical analysis was done for recognition and production scores across the above mentioned three conditions.
- Non parametric Manwhitney -U test was carried out on the data to examine pair wise difference between children with specific language impairment and normal native speakers of Kannada.
- Non-parametric Wilcoxon Signed rank test was applied on the data to examine pair wise difference between the conditions for two sets such as (S1) and (S2).

- Similarly, for the immediate recall (I) and delayed recall (D) the pair wise difference between the conditions were examined using Wilcoxon Signed rank test.

Descriptive statistics was applied for measures of recognition and production scores across age groups 4-7 years. Mean, Median and Standard deviation were calculated.

Subsequently, the data obtained for analyzing recognition and production scores across all the three conditions mentioned above (SLI vs NNKS, S1 vs. S2 and I vs. D) were subjected to verify skewness using Shapiro- Wilk's test. The test results indicated that the data was skewed ($p<0.05$), which signified that the scores were not normally distributed. Since the data did not abide to the properties of normal distribution, Non-Parametric tests were applied in order to see if there was any significant difference in within the group and irrespective of the groups across conditions. To examine the statistical significance between the conditions on population (SLI vs. NNKS), Practice effect (5 vs.10 repetition) trials and immediate vs. Delayed recall abilities on recognition and production tasks, Wilcoxon Signed rank test was applied on the data.

There were eight variables studied.

Table 4; *Expansion of variables measured in the study*

Conditions	Expansion
NIS1	NIS1 Normal Immediate recall subtest one
NIS2	NIS2 Normal Immediate recall subtest two
NDS1	NDS1 Normal Delayed recall subtest one
NDS2	NDS2 Normal Delayed recall subtest two
SIS1	SIS1 SLI Immediate recall subtest one
SIS2	SIS2 SLI Immediate recall subtest two
SDS1	SDS1 SLI Delayed recall subtest one
SDS2	SDS2 SLI Delayed recall subtest two

Note:

N: NNKS and S: SLI

I: Immediate Recall and D: Delayed Recall

Subtest 1: Novel words presented to children with 5 repetitions

Subtest 2: Novel words presented for 10 repetitions.

The results of the study are discussed in specific to following objectives.

4.1 Objective 1: Fast mapping abilities in children with Specific language impairment and Normal native speakers of Kannada: Recognition and production

The mean, median and standard deviation measures were compiled for NIS1, NDS1, NIS2, NDS2, SIS1, SDS1, SIS2 and SDS2. To compare the performance of children with SLI and NNKS were tabulated. (See: Table 5)

Table 5; *Mean, Median and standard deviation measures for SLI vs. NNKS in production and recognition task across 4-7 years in children with Specific language impairment*

VARIABLES	**RECOGNITION**			**PRODUCTION**		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.00	2.00	2.00	1.333
SIS1	4.60	5.00	0.699	0.40	0.00	0.516
NIS2	5.00	5.00	0.000	1.60	1.50	0.966
SIS2	4.70	5.00	0.483	0.60	1.00	0.516
NDS1	4.60	5.00	0.516	1.20	1.00	1.033
SDS1	3.60	4.00	0.843	0.00	0.00	0.000
NDS2	4.90	5.00	0.316	0.80	1.00	0.632
SDS2	4.40	5.00	0.843	0.20	0.00	0.422

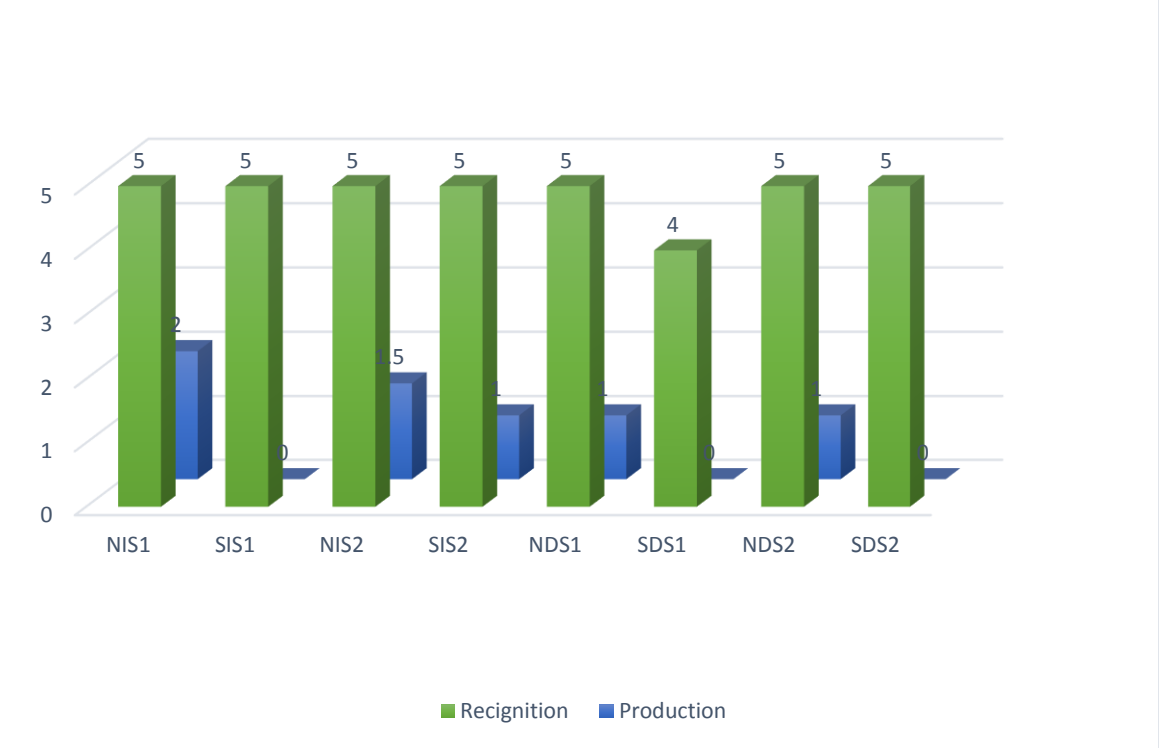


Figure2 *Median of recognition and production in Specific language impairment and normal native Kannada speaking children across 4-7 years*

From Table 5 and figure number 1 it was noted that there was difference in median values between SLI and NNKS across 4-7years. The median values were higher for both SLI and NNKS in recognition task. The performance was better in both SLI and NNKS for all variables with respect to recognition like NIS1-SIS1, NDS1-SDS1, NIS2-NIS2, NDS2-SDS2. Similarly in production, performance was noted to be slightly better in NNKS when compared to children with SLI like NIS1-SIS1, NDS1-SDS1, NIS2-NIS2, NDS2-SDS2. Broadly comparing recognition and production scores in this group, both the groups performed better in recognition than production tasks based on median measures. Further, Manwhitney –U test was applied on the data to examine pair wise

statistical significance between subject's such as SLI and NNKS for both recognition and production tasks across 4- 7 years of age which is tabulated in table 6.

Table 6; *Comparison of performance across SLI vs. NNKS in 4- 7 year old children in recognition and production task.*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	P Value	[z]	P Value
SIS1-NIS1	-1.826	0.068	-2.686	0.007
SIS2-NIS2	-1.831	0.067	-2.449	0.014
SDS1-NDS1	-2.683	0.007	-3.117	0.002
SDS2-NDS2	-1.595	0.111	-2.238	0.025

***p<0.05-significant difference**

From Table 6, in recognition task there was no significant difference found in SLI vs. NNKS across 4-7years children. Whereas there was a significant difference found between SLI vs. NNKS in the production task like SIS1-NIS1 (|Z|= 2.686, p=0.007), SIS2-NIS2 (|Z|= 2.449, p=0.014), SDS1-NDS1 Z|=3.117, p=0.002) and SDS2-NDS2 (|Z|=2.238, p=0.025) as observed from the data in Table 6. From median scores and Manwhitney-U test it was evident that NNKS scores was better than SLI, wherein statistical significance was seen only at production task. Further, in comparison with NNKS and SLI the performance was equally better in recognition than that of production task.

On comparing recognition skills and production skills across children with SLI and NNKS, the recognition task was correspondingly better in both the groups. There are

two possible explanations for this; one could be that the lexical representation of the novel word would have been mapped adequately and refinement of information (extended phase) including phonetic characteristics and syntactic frame for the presented novel words would have been encountered. Secondly healthier the exposure, richer is the semantic network. They require more exposure to learn lexical label (Gray, 2004; Rice et al., 1994).This also demonstrates that the children enhance the novel word better with more exposure. Overall the findings suggest that a healthy exposure leads to richer semantic network and in turn it leads to better fast mapping skills.

It was also observed that the NNKS performed slightly better in production than children with SLI. It can be presumed that children in this age group acquire expressive vocabulary in an identical pattern. This may be credited to emerging phonological skills in the population. In NNKS we can assume that phonological loops and lexical nodes are still strengthening. Whereas in Children with SLI, even if they acquire critical number of words, the grammatical morphemes continue to lag behind. (Gathercole, Service, Hitch, Adams and Martin,1999) found a strong association with phonological memory skills and vocabulary knowledge in elderly children which suggests that phonological memory constraints continue to be a factor in word learning at this period of development. The other factor which influences the performance of production task in NNKS is the nature of modality. Since production involves active retrieval, there is necessity for numerous exposure to the novel words in order to fast map these in the memory lexicon. It requires more episodes of exposures to the novel words in order to fast map these lexical memory.

Probably the performance in the case of children with SLI at production task can be due to poor phonological and semantic lexical processes affecting one another in word

learning (McGregor, et al., 2002). The Children with SLI demonstrate weaker semantic representations of words than their peers (Kail, Hale, Leonard, and Nippold, 1984; McGregor, Newman, Reilly, and Capone, 2002). Several studies that looked specifically at semantics have also shown that children with SLI have poor fast mapping skills for semantic features. The semantic information aids the lexical acquisition, but children with SLI are at disadvantage due to their poor semantic network and depict diminished depth of semantics (Kail et al., 1994; McGregor et al., 2002). A poor phonological loop and weak lexical node exhibits deprived phonological working memory (Grathocele and baddeley, 1990). In turn it affects the long term and short term memory which leads to poor aces in retrieval. It depicts impairment in cognitive networks. As production task involves tapping the lexicon from long term memory followed by accessing and retrieving the novel word for production, it displays an overall weakened output in cognitive level. Hence from the supporting studies that are stated above it reveals that children with SLI exhibit limited capacity in aspect of cognitive process and sequentially the production task in SLI could be impaired.

4.2 Objective 2: Effect of Training phase - S1 (5 Repetition) vs. S2 (10 Repetition): Recognition and Production in Specific language impairment and normal native speakers of Kannada on fast mapping.

The mean, median and standard deviation measures were compiled for NIS1, NIS2, NDS1, NDS2, SIS1, SIS2 SDS1and SDS2. To compare the performance of children with Specific language impairment and normal native speakers of Kannada are tabulated. (See table 6)

Table 7; *Mean, Median and standard deviation measures for S1 vs. S2 in production and recognition task across 4-7 years in children with Specific language impairment*

VARIABLES	**RECOGNITION**			**PRODUCTION**		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.000	2.00	2.00	1.333
NIS2	5.00	5.00	0.000	1.60	1.50	0.966
NDS1	4.60	5.00	0.516	1.20	1.00	1.033
NDS2	4.90	5.00	0.316	0.80	1.00	0.632
SIS1	4.60	5.00	0.699	0.40	0.00	0.516
SIS2	4.70	5.00	0.483	0.60	1.00	0.516
SDS1	3.60	4.00	0.843	0.00	0.00	0.000
SDS2	4.40	5.00	0.843	0.20	0.00	0.422

Figure3 *Median of recognition and production task in S1(5 Repetition) vs. S2(10 Repetition) trials*

From Table 7 and Figure 3 it was inferred that there was difference in median values of production and recognition between 5 repetitions vs. 10 repetitions across 4-7 age group, wherein the median values were equally better between 5(S1) vs. 10(S2) repetitions in both recognition and production task. Further the performance was overall better for recognition task for 5 and 10 repetitions compared to production task in this group. To compare effect of S1 vs. S2 (5 vs. 10 repetitions) Wilcoxon Signed rank test was applied on the data to examine pair wise statistical significance between subject's effect on S1 vs. S2for both recognition and production task in 4- 7 years in SLI and Normal native Kannada speaking children were tabulated in table 7.

Table 8; *Comparison of performance across S1 vs. S2 in 4 - 7 year old children in recognition and production task.*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	P Value	[z]	P Value
NIS2-NIS1	0.000	1.000	-1.155	0.248
NDS2-NDS1	-1.342	0.180	-1.633	0.102
SIS2-SIS1	-0.577	0.564	-0.816	0.414
SDS2-SDS1	-2.530	0.011	-1.414	0.157

***p<0.05-significant difference**

From Table 8, on analyzing practice effect of 5 vs. 10 repetition for recognition task the results revealed no significant differences in variables like NIS2-NIS1(|Z|=.0.000, p=1.000), NDS2-NDS1(|Z|=1.342, p=0.180) and SIS2-SIS1(|Z|=0.577, p=0.564) other than one variable i.e., SIS2-SIS1(|Z|=2.530,p=0.011. Similarly, on observing results of production task on 5 vs. 10 repetitions, there was no significant difference found across variables like NIS2-NIS1(|Z|=1.155, p=0.248), NDS2-NDS1(|Z|=1.633, p=0.102), SIS2-SIS1(|Z|=0.816,p=0.414 and SIS2-SIS1(|Z|=1.414, p=0.157). The median measures and Wilcoxon signed ranked test revealed performance for both 5 vs. 10 repetitions was equally better in both recognition and production tasks. Performance was better in both 5 repetitions and 10 repetitions in recognition task than production.

As the SLI received extended training of novel words their performance was correspondingly similar to the NNKS when compared with provided limited training for

both recognition and production task. The general assumption is that the learning of the novel word progresses proportionately when the number of training trial is increased. This could be due to the increase in repeated trials, strengthening the lexical activation network. The language processing system shifts to exponential improvements in word retrieval abilities with more exposure to the novel words (Gershkoff-Stowe and Hahn, 2007). According to McClelland, 1995, in Parallel Distributed Model, over the course of the training, the network successively readjusts the connection weights and results in representing information. In this manner, language knowledge is stored in the network connections and these connections are used for processing the information.

Since, greater experiences lead to stronger mappings among input and output. The children should possess better recognition and production abilities in terms of better exposure and increased trials. But in contrary, the findings of the present study depicted poor production skills when compared to that of recognition. In addition, there was no significant difference in practice effects identified between the (5 vs. 10) repetitions trials. There are three possible explanations for this: One could be the performance of five repetition trials would have been sufficient enough or effective as that of 10 repetition trials. Secondly repetition is a subset of production task. The production task involves precise access and retrieval from the storage. Recalling an item from the memory requires more information from storage than recognizing an item. (Postman, Jenkins, and Postman, 1948).The production task in mapping an auditory word or a picture stimulus requires as many associations to remember during retrieval to answer declarative statement. The declarative memory system can be fast, even after a single exposure to the information. Retrieval of information from declarative system is often

conscious through processes of recognition and recall (Squire and knowlton, 1995). Children with SLI illustrates reduced cognitive processing capacities. (Hoffman and Gillam, 2004; Montgomery, 2002). Ellis Weismer (1997) and Ellis Weismer and Hesketh (1998).The steps involved in cognitive processing includes attention ,encoding into short term memory followed by long term memory, access and finally retrieval/ recall. In SLI various investigators have implicated attentional difficulties to explain on working and declarative memory. In the current study the production task directly taps their intentional declarative memory. The younger Children learn to produce declarative memory by associating working and procedural memory (Fonteneau and van der Lely, 2008; Neville, Coffey, Holcomb, and Tallal, 1993; Ullman and Pierpont, 2005). Typically developing normal children are in critical stage of acquiring association between different types of memories at this stage. They are in the process of acquisition and strengthening their declarative memory skills, this could have attributed to deprived production scores. On other hand children with SLI exhibits difficulty in word rehearsal (Ullman, 2004) in turn affects the declarative memory. This study supports the findings that children with SLI have poor production skills when compared to that of typically developing normal children.

4.3 Objective 3: Immediate Recall vs. Delayed Recall: Naming and Recognition

The median and standard deviation measures were compiled for NIS1, NDS1, NIS2, NDS2, SIS1, SDS1, SIS2 and SDS2. To compare the performance of children with Specific language impairment and normal native speakers of Kannada are tabulated

Table 9; *Mean, Median and standard deviation measures for immediate recall vs. Delayed recall in production and recognition task across 4-7 years in children with Specific language impairment*

VARIABLES	RECOGNITION			PRODUCTION		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.000	2.00	2.00	1.333
NDS1	4.60	5.00	0.516	1.20	1.00	1.033
NIS2	5.00	5.00	0.000	1.60	1.50	0.956
NDS2	4.90	5.00	0.316	0.80	1.00	0.632
SIS1	4.60	5.00	6.999	0.40	0.00	0.516
SDS1	3.60	4.00	0.843	0.00	0.00	0.000
SIS2	4.70	5.00	0.483	0.60	0.00	0.516
SDS2	4.40	5.00	0.843	0.20	0.00	0.422

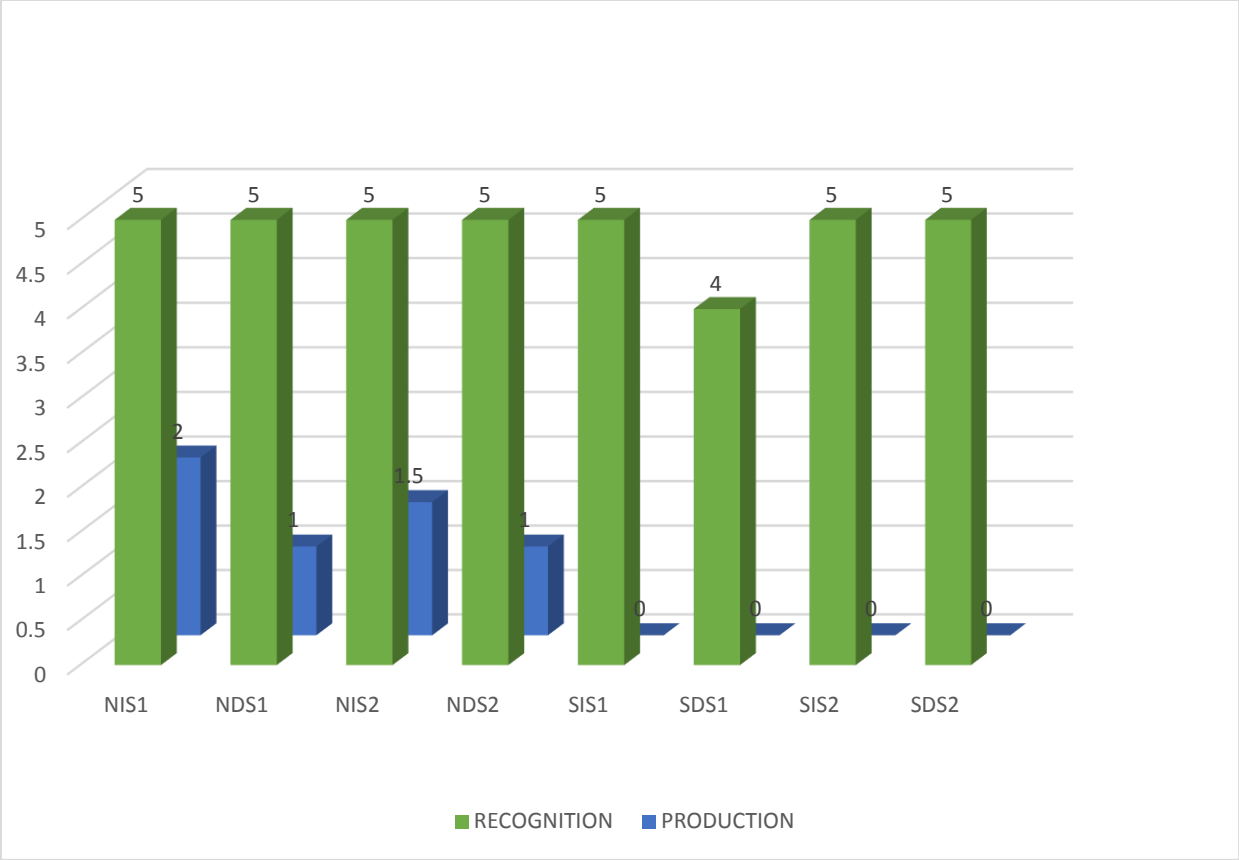


Figure 4: *Median of Immediate and delayed recall in Recognition and production task across 4- 7 years.*

From Table 9 and Figure 4 it was inferred that there was difference in median values of recognition and production between immediate vs. delayed recall task, wherein immediate recall scores are better than delayed recall for both recognition and production tasks. Overall, recognition scores are superior to production scores for both immediate and delayed recall task. Further, Wilcoxon Signed rank test was applied on the data to examine pair wise statistical significance between subject's effect on immediate and delayed recall for both recognition and production task in 4- 7 years in SLI and NNKS and results of pair wise comparison were tabulated. (See table 9)

Table 10; *Comparison of performance across Immediate (I) vs Delayed recall (D) in 4 - 7 year old children in recognition and production task.*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	P Value	[z]	P Value
NDS1-NIS1	-2.000	0.046	-2.271	0.023
NDS2-NIS2	-1.000	0.317	-2.060	0.039
SDS1-SIS1	-2.232	0.026	-2.000	0.046
SDS2-SIS2	-1.342	0.180	-2.000	0.046

***p<0.05-significant difference**

From Table 10, results revealed significant difference in production tasks for all the variables like NDS1-NIS1=(|Z|=2.271,p=0.023), NDS2-NIS2=(|Z|=2.060,p=0.039), SDS1-SIS1=(|Z|=2.000,p= 0.046) and SDS2-SIS2=(|Z|=2.000,p=0.046)across all the conditions. On observing the results of recognition task on immediate and delayed recall, the results revealed significant difference in two variables NDS1-NIS1=(|Z|=2.000,p=0.046) and SDS1-SIS1=(|Z|=2.232,p= 0.026). From the median scores and pair wise comparison of immediate and delayed recall variables it was evident that immediate recall was better than delayed recall and statistically it was significant in both recognition task and production task.

Recognition and production of novel words in children with SLI across 4 to 7 years revealed that immediate recall was better on comparison with delayed recall. Learning a new word and retaining it evolves three memory processes; encoding,

consolidation and retrieval. This determination can be accredited to the fact that the new memories have richer network than older memory which is more prone to conflicts or they may interfere with new memory storage to make older memory stronger requires a sufficient degree of exposure, number of rehearsals (Suzuki et al., 2004). Hence better exposures to novel words results in better retention of the memory over the older learned words. Immediate recall triggered by short term memory involves brief representation of novel lexical knowledge which is independent of any rehearsals, whereas in delayed recall that is actively functional by long term memory is directly dependent on frequent rehearsal. Hence this explains why immediate recall is superior to delayed recall. Secondly, the process of fast mapping may not be adequate for the development of lexicon. Hence, the children may not retain all the words learnt from the process of fast mapping, a subsequent extended slow mapping would also be necessary for word learning. Therefore, it could be inferred that development of lexicon is a process and fast mapping just triggers the process and need not be the complete word learning process. So after stage of fast mapping there should be a stage of slow mapping to make delayed recall abilities stronger, which in turn requires sufficient amount of exposures, rehearsals and result in strong lexical connections. May be this is one of the reasons why immediate recall is better than delayed recall and this finding is in consonance to the study by Trupthi (2009).

Considering the main objective of the present study as which is to compare recognition and production abilities across all the conditions, consistent finding was obtained where recognition was better than production. This asymmetry in understanding and production may be attributed to difference in demands imposed by the tasks. The two

tasks place different demands on retrieval process that is, the retrieval of a word for production may require activation strengths that are greater than those needed to access a word in comprehension (Capone and McGregor, 2005).This idea is based on a common model lexical access in which the retrieval of a word is not an all or none event but, rather, involves a process of graded activation (Stemberger, 1989).To comprehend the meaning of a word, the listener begins with an auditory cue that activates a phonological representation stored previously in memory. Activation then spreads from the phonological level to the semantic level where, given sufficient activation of the associated concept, the word is comprehended. In contrast, the retrieval of a word for production involves the reverse flow of information and derives its initial activation from a set of non-linguistic cues that originate in semantic memory and spreads to the phonological level. Given sufficient strength to activate the associated sound form of a word, the word is accessed for production.

CHAPTER V

SUMMARY AND CONCLUSION

The present study aimed to explore the fast mapping abilities in novel word learning in children with Specific language impairment using recognition and production tasks. In this study 20 children aged between 4-7 years were recruited on the random basis, out of which 10 were children with SLI and 10 included typically developing children (NNKS).

These children were trained for two sets of novel words in Kannada. Out of 10 words, five words were trained for 5 repetitions and another five words were trained for 10 repetitions. These words were trained with aid of pictures and audio recordings. After the training phase, children were tested for recognition and production skills in terms of immediate and delayed recall tasks. Hence results were unfolded and studied across comparison between the two populations and two phases (5 vs. 10 repetitions) different conditions; i) Comparison between children with specific language impairment SLI vs. Normal native Kannada speaking children ii) Effect of training) and iii) Immediate vs. delayed recall abilities in fast mapping. Each condition scores were separately calculated for each participant and overall data was statistically analyzed using SPSS software version IBM 21. The data was subjected to descriptive statistical analysis and based on the normality criteria, non-parametric tests were employed.

In the present study on comparing two populations i.e., SLI vs. NNKS across recognition and production tasks, results indicated novel word learning was better in both the groups for recognition task. This was attributed to magnitude of language exposure.

Poor production skills were expressed more in children with SLI when compared to that of NNKS due to impaired association of attaining phonological memory and retrieval or access for production. On examining the effect of (5 vs. 10) repetition trials, results revealed that there was no significant effect in practice trials between (5 vs. 10) repetitions. This may be assumed to the fact that the performance of 5 repetition trials would have been sufficient or could be as effective as 10 repetition trials. Secondly the children are in the process of learning the intentional declarative memory this could attribute to the reason that there was least difference witnessed between the two types of repetition tasks. Results for comparing immediate recall condition vs. delayed recall revealed better performance in immediate recall than delayed recall though children with SLI possess limited storage capacity and poor memory. This may be attributed to brief representations of novel lexical knowledge which is independent of any rehearsals in case of immediate recall, whereas in delayed recall, it is actively functional by long term memory and is directly dependent on frequent rehearsals. Hence this explained why immediate recall was superior to delayed recall. Henceforth, the ability to learn to recognize, accurately produce and use new word is essential in acquiring language and becoming skilled in that language.

Limitations of the study

- The present study recruited a smaller sample size, fast mapping abilities in children with SLI and typically developing children could be studied in larger size. Larger sample could be aiding in greater generalization of results.
- In the present study, both bi-syllabic and tri-syllabic words were selected for novel words, influence of word length could be eliminated if the word length were

to be maintained uniformly. On the corollary word length could be studied as an independent variable.

Implications of the study.

- This study also highlights the relationship between the mode of stimulation and elicitation of the response for both NNKS and children with SLI.
- The results of the study can be used to study the pattern of declarative memory in children with specific language impairment. This enables us to understand the Short term memory and Long term memory as tapped on immediate and delayed recall.
- The results of the study can be used to design intervention procedure in language disordered population.
- This study gives an insight about how novel word learning takes place in children with specific language impairment.

Future directions

- Fast mapping abilities can be studied in children with greater age range in a larger sample size and checked for how those words are acquired by children in each age group.
- Fast mapping abilities can be compared between Specific language impairment vs Learning disability.
- The repetition task can also be employed along with auditory and visual stimulus.
- The reaction time / response time taken for learning novel word may be incorporated in future studies.

- Fast mapping abilities can be studied across different grammatical categories like noun vs. verbs across different age groups.
- The bi-syllabic and tri-syllabic words can be employed in fast mapping skills along with maintenance of word length uniformly.

REFERENCE

Alt, M., & Plante, E. (2006). Factors that influence lexical and semantic fast mapping of young children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *49*(5), 941-954.

Alt, M., Plante, E., & Creusere, M. (2004). Semantic Features in Fast-Mapping Performance of Preschoolers with Specific Language Impairment Versus Preschoolers With Normal Language. *Journal of Speech, Language, and Hearing Research*, *47*(2), 407-420.

American speech hearing association. (1983).In Buckley, B. (2003).Children‘s Communication Skills: From birth to five years, 1st Ed., Pp.3.Routledge publication

Bates, E., Benigni, L., Camaioni, L., & Volterra, V. (1979). Relationships between cognition, communication, and quality of attachment. *The emergence of symbols: Cognition and communication in infancy*, 223-269.

Berk, L. E., & Winsler, A. (1995). *Scaffolding Children's Learning: Vygotsky and Early Childhood Education. NAEYC Research into Practice Series. Volume 7*. National Association for the Education of Young Children, 1509 16th Street, NW, Washington, DC 20036-1426 (NAEYC catalog# 146)..

Bever, T. G. (1970). The Cognitive Basis for Linguistic Structures', JR Hayes (ed.), Cognition and the Development of Language, 279-362.

Bishop, D. V. (2006). What causes specific language impairment in children?. *Current directions in psychological science*, *15*(5), 217-221.

Bloom, L. (1983). Of continuity and discontinuity, and the magic of language development. *The transition from prelinguistic to linguistic communication*, 79-93.

Bloom, L., & Lahey, M. (1978). Language development and language disorders.

Bloom, P. (2000). *How children learn the meanings of words* (Vol. 377). Cambridge, MA: MIT press.

Capone, N. C., & McGregor, K. K. (2005). The effect of semantic representation on toddlers' word retrieval. *Journal of Speech, Language, and Hearing Research*, *48*(6), 1468-1480.

Carey, S., & Bartlett, E. (1978). Acquiring a single new word.

Chomsky, C. (1969). Acquisition of syntax in Children from 5 – 10. Cambridge, MA: MIT Press.

Conti-Ramsden, G., Crutchley, A., & Botting, N. (1997). The extent to which psychometric tests differentiate subgroups of children with SLI. *Journal of Speech, Language, and Hearing Research*, *40*(4), 765-777.

Cunningham, A. E., & Stanovich, K. E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental psychology*, *33*(6), 934.

Dale, P. S., Fenson, L., & Thal, D. J. (1993). Development inventories to additional languages.

Deepak. (2015). Fast mapping abilities in young bilingual children. *An Unpublished Masters dissertation, University of Mysore.*

Dollaghan, C. A. (1987). Fast mapping in normal and language-impaired children. *Journal of speech and hearing disorders*, *52*(3), 218-222.

Dunn, L. M., & Dunn, L. M. (1997). *Examiner's manual for the PPVT-III Peabody picture vocabulary test: Form IIIA and Form IIIB*. AGS.

Fonteneau, E., & van der Lely, H. K. (2008). Electrical brain responses in language-impaired children reveal grammar-specific deficits. *PLoS One*, *3*(3), e1832.

Gathercole, S. E., Service, E., Hitch, G. J., Adams, A. M., & Martin, A. J. (1999). Phonological short-term memory and vocabulary development: further evidence on the nature of the relationship. *Applied cognitive psychology*, *13*(1), 65-77.

Gelman, S. A., Coley, J. D., Rosengren, K. S., Hartman, E., Pappas, A., & Keil, F. C. (1998). Beyond labeling: The role of maternal input in the acquisition of richly structured categories. *Monographs of the Society for Research in Child development*, i-157.

Gershkoff-Stowe, L., & Hahn, E. R. (2007). Fast mapping skills in the developing lexicon. *Journal of Speech, Language, and Hearing Research*, *50*(3), 682-697.

Gilbertson, M., & Kamhi, A. G. (1995). Novel word learning in children with hearing impairment. *Journal of Speech, Language, and Hearing Research*, *38*(3), 630-642.

Gleitman, L. R., & Wanner, E. (Eds.). (1982). *Language acquisition: The state of the art*. Cambridge University Press.

Gray, S. (2003). Word-Learning by Preschoolers With Specific Language ImpairmentWhat Predicts Success?. *Journal of Speech, Language, and Hearing Research*, *46*(1), 56-67.

Gray, S. (2004). Word Learning by Preschoolers With Specific Language ImpairmentPredictors and Poor Learners. *Journal of Speech, Language, and Hearing Research*, *47*(5), 1117-1132.

Gray, S. (2005). Word Learning by Preschoolers With Specific Language ImpairmentEffect of Phonological or Semantic Cues. *Journal of Speech, Language, and Hearing Research*, *48*(6), 1452-1467.

Gray, S. (2006). The relationship between phonological memory, receptive vocabulary, and fast mapping in young children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *49*(5), 955-969.

Hoffman, L. M., & Gillam, R. B. (2004). Verbal and spatial information processing constraints in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *47*(1), 114-125.

Hwa-Froelich, D. A., & Matsuo, H. (2005). Vietnamese children and language-based processing tasks. *Language, Speech, and Hearing Services in Schools*, *36*(3), 230-243.

Kail, R., & Leonard, L. B. (1986). Word-finding abilities in language-impaired children. *ASHA monographs*, (25), 1-39.

Kail, R., Hale, C. A., Leonard, L. B., & Nippold, M. A. (1984). Lexical storage and retrieval in language-impaired children. *Applied Psycholinguistics*, *5*(1), 37-49.

Karanth, P., Manjula, R., Geetha, Y. V., & Prema, K. S. (1999). With a Little Bit of Help—Early Language Training Manual. *Bangalore: Books for Change*.

Kelly, D. J., & Rice, M. L. (1994). Preferences for verb interpretation in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *37*(1), 182-192.

Kroll, J. F., & Curley, J. (1988). Lexical memory in novice bilinguals: The role of concepts in retrieving second language words. *Practical aspects of memory*, *2*(389-395), 8.

Kroll, J. F., & De Groot, A. (1997). Lexical and conceptual memory in the bilingual: Mapping form to meaning in two languages.

Lederberg, A. R., Prezbindowski, A. K., & Spencer, P. E. (2000). Word-Learning Skills of Deaf Preschoolers: The Development of Novel Mapping and Rapid Word-Learning Strategies. *Child development*, *71*(6), 1571-1585.

Leonard, L. B., Schwartz, R. G., Allen, G. D., Swanson, L. A., & Loeb, D. F. (1989). Unusual phonological behavior and the avoidance of homonymy in children. *Journal of Speech, Language, and Hearing Research*, *32*(3), 583-590.

Marchman, V. A., & Fernald, A. (2008). Speed of word recognition and vocabulary knowledge in infancy predict cognitive and language outcomes in later childhood. *Developmental science*, *11*(3), F9-F16.

McCardle, P., Scarborough, H. S., & Catts, H. W. (2001). Predicting, explaining, and preventing children's reading difficulties. *Learning Disabilities Research & Practice*, *16*(4), 230-239.

McClelland, J. (1995). A connectionist perspective on knowledge and development. In T.Simon & G. Halford (Eds.), Developing cognitive competence: New approaches

McClelland, J. L., McNaughton, B. L., & O'reilly, R. C. (1995). Why there are complementary learning systems in the hippocampus and neocortex: insights from the successes and failures of connectionist models of learning and memory. *Psychological review*, *102*(3), 419.

McCune-Nicolich, L. (1981). The cognitive bases of relational words in the single word period. *Journal of Child Language*, *8*(1), 15-34.

McGregor, K. K., Newman, R. M., Reilly, R. M., & Capone, N. C. (2002). Semantic representation and naming in children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *45*(5), 998-1014.

Montgomery, J. W. (2002). Examining the nature of lexical processing in children with specific language impairment: Temporal processing or processing capacity deficit?. *Applied Psycholinguistics*, *23*(03), 447-470.

Morley, M., Court, D., Miller, H., & Garside, R. F. (1955). Delayed speech and developmental aphasia. *British medical journal*, *2*(4937), 463.

Muma, J. R. (1978). Language handbook: Concepts, assessment, intervention.

Nair, V., Ranjini, R., & Shyamala, K. C. (2011). LEXICAL LEARNING OF NOVEL WORDS IN BI/MULTILINGUAL CHILDREN. *Journal of the All India Institute of Speech & Hearing*, *30*.

Neville, H. J., Coffey, S. A., Holcomb, P. J., & Tallal, P. (1993). The neurobiology of sensory and language processing in language-impaired children. *Journal of Cognitive Neuroscience*, *5*(2), 235-253.

Nice, M. M. (1925). Length of sentences as a criterion of a child's progress in speech. *Journal of Educational Psychology*, *16*, 370-379.

Oetting, J. B. (1999). Children with SLI use argument structure cues to learn verbs. *Journal of Speech, Language, and Hearing Research*, *42*(5), 1261-1274.

Paradis, J., Crago, M., Genesee, F., & Rice, M. (2003). French-English Bilingual Children With SLIHow Do They Compare With Their Monolingual Peers?. *Journal of Speech, Language, and Hearing Research*, *46*(1), 113-127.

Pinker, S. (1982). A theory of the acquisition of lexical interpretive grammars. The mental representation of grammatical relations, ed. by Joan Bresnan, 655-726.

Postman, L., Jenkins, W. O., & Postman, D. L. (1948). An experimental comparison of active recall and recognition. *The American Journal of Psychology*, *61*(4), 511-519.

Potter, M. C., So, K. F., Von Eckardt, B., & Feldman, L. B. (1984). Lexical and conceptual representation in beginning and proficient bilinguals. *Journal of verbal learning and verbal behavior*, *23*(1), 23-38.

Rapin, I., & Allen, D. A. (1987). Developmental dysphasia and autism in preschool children: Characteristics and subtypes. In *Proceedings of the first international symposium on specific speech and language disorders in children* (pp. 20-35). Brentford: Association for All Speech Impaired Children.

Restrepo, M. A., & Kruth, K. (2000). Grammatical characteristics of a Spanish-English bilingual child with specific language impairment. *Communication Disorders Quarterly*, *21*(2), 66-76.

Rubin, H., & Liberman, I. Y. (1983). Exploring the oral and written language errors made by language disabled children. *Annals of dyslexia*, *33*(1), 111-120.

Rumelhart, D. E., & Norman, D. A. (1983). *Representation in memory* (No. CHIP-116). CALIFORNIA UNIV SAN DIEGO LA JOLLA CENTER FOR HUMAN INFORMATION PROCESSING.

Singhi, P., Kumar, M., Malhi, P., & Kumar, R. (2007). Utility of the WHO Ten Questions screen for disability detection in a rural community—the north Indian experience. *Journal of tropical pediatrics*, *53*(6), 383-387.

Skinner, B. F. (1957). Verbal Behavior. Englewood, Cliffs, N. J: Prentice Hall.SLI: implications for a theory of special language impairment. In A. Stringfellow,

Sommers, R. K., Kozarevich, M., & Michaels, C. (1994). Word skills of children normal and impaired in communication skills and measures of language and speech development. *Journal of communication disorders*, *27*(3), 223-240.

Squire, L. R., & Knowlton, B. J. (1995). Learning about categories in the absence of memory. *Proceedings of the National Academy of Sciences*, *92*(26), 12470-12474.

Stark, R. E., & Montgomery, J. W. (1995). Sentence processing in language-impaired children under conditions of filtering and time compression. *Applied Psycholinguistics*, *16*(02), 137-154.

Stemberger, J. P. (1989). Speech errors in early child language production. *Journal of Memory and Language*, *28*(2), 164-188.

Storch, S. A., & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: evidence from a longitudinal structural model. *Developmental psychology*, *38*(6), 934.

Storkel, H. L. (2001). Learning New WordsPhonotactic Probability in Language Development. *Journal of Speech, Language, and Hearing Research*, *44*(6), 1321-1337.

Storkel, H. L., & Rogers, M. A. (2000). The effect of probabilistic phonotactics on lexical acquisition. C*linical Linguistics & Phonetics*, *14*(6), 407-425.

Thelen, Owens, R. (2005). Language development: an Introduction, 7th Ed., Merill Publication Co.157–204. Hillsdale, NJ: Erlbaum.

Tomblin, J. B., Records, N. L., Buckwalter, P., Zhang, X., Smith, E., & O'Brien, M. (1997). Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language, and Hearing Research, 40*(6), 1245-1260.

Trupthi (2009),Fast mapping in kannada speaking children of 2.5-4.5years,unpublished masters Disseration, university of mysore, Mysore

Ullman, M. T. (2004). Contributions of memory circuits to language: The declarative/procedural model. *Cognition, 92*(1), 231-270.

Ullman, M. T., & Pierpont, E. I. (2005). Specific language impairment is not specific to language: The procedural deficit hypothesis. *Cortex, 41*(3), 399-433.

Vitevitch, M. S., & Luce, P. A. (1999). Probabilistic phonotactics and neighborhood activation in spoken word recognition. *Journal of Memory and Language, 40*(3), 374-408.

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children, 23*(3), 34-41.

Weismer, S. E. (1997). The Role of Stress in Language Processing and Intervention. *Topics in Language Disorders*, *17*(4), 41-52.

Weismer, S. E., & Evans, J. L. (2002). The role of processing limitations in early identification of specific language impairment. *Topics in Language Disorders*, *22*(3), 15-29.

Weismer, S. E., & Hesketh, L. J. (1993). The influence of prosodic and gestural cues on novel word acquisition by children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 36*(5), 1013-1025.

Weismer, S. E., & Hesketh, L. J. (1996). Lexical learning by children with specific language impairment: Effects of linguistic input presented at varying speaking rates. *Journal of Speech, Language, and Hearing Research, 39*(1), 177-190.

Weismer, S. E., & Hesketh, L. J. (1998). The impact of emphatic stress on novel word learning by children with specific language impairment. *Journal of Speech, Language, and Hearing Research*, *41*(6), 1444-1458.

Werner, H. (1945). Perceptual behavior of brain-injured, mentally defective children: an experimental study by means of the Rorschach technique. *Genetic psychology monographs*.

Wiig, E. H., Semel, E. M., & Nystrom, L. A. (1982). Comparison of rapid naming abilities in language-learning-disabled and academically achieving eight-year-olds. *Language, Speech, and Hearing Services in Schools*, *13*(1), 11-23.

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (1992). *PLS-3: Preschool language scale-3*. Psychological Corporation.

Appendix (A)

Sl. No.	S1-A (5 repetitions)			
	CB 1	**CB 1**	**CB 2**	**CB 2**
1	ತಿರುಪು ಚಾಲಕ	t̪irupu ʧalaka	ಪರದೆ	paraḍe
2	ಕೊಳ	koḷa	ಕಿರೀಟ	kiri:ṭa
3	ಕೈಚೀಲ	kaiʧi:la	ಪಲ್ಲಕಿ	pallaki
4	ಭೋಗೋಳ	bʰo:go:ḷa	ಕೊಳ	koḷa
5	ವಿದ್ಯುತ್ ತಂತಿ	vidjut̪ t̪^nt̪I	ಭೋಗೋಳ	bʰo:go:ḷa

Sl. No.	S2-A (10 repetitions)			
	CB 1	**CB 1**	**CB 2**	**CB 2**
1	ಬಿರಂಗಿ	bi:rangi	ಖರೂಜುರ	kʰaru:ʤura
2	ಚರಕ	ʧaraka	ಕಟ್ಟಡ	kaʈʈada
3	ಕಬ್ಬರ್	kabbar	ಔಷಧ	auʃadʰa
4	ಕಂಕಣ	kankaṇa	ಚರಕ	ʧaraka
5	ಹಲಗೆ	halage	ಕಂಕಣ	kankaṇa

Note:

CB1: Counterbalance 1

CB2: Counterbalance 2

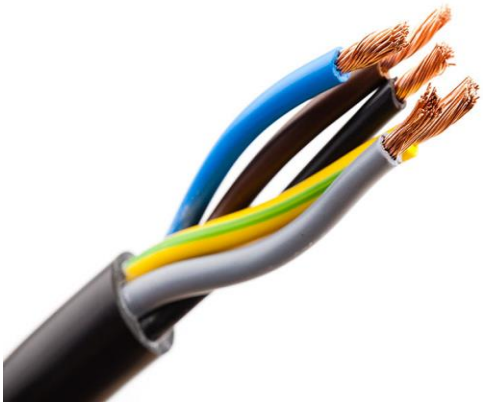
S1-A: Subtest 1 (5 repetition)

S2-A: Subtest 2 (10 repetition)

Appendix (B)

Pictures used to teach novel words

S1-A (5 repetitions)



S2A(10 repetitions)

Appendix (C)

CHECKLIST 1

A TEN – QUESTION DISABILITY SCREENING TEST

These questions can be used in a house-to-house survey to identify children who could benefit from extra stimulation or special care. This could also be used in child centres and schools where teachers might be able to provide direct assistance or refer children with particular needs to special health or educational facilities.

1. Compared with other children, did the child have any serious delay in sitting, standing or walking?
2. Does the child speak at all?
3. Can the child make himself understood in words; can he say recognizable words?
4. Does the child having difficulty seeing?
5. Does the child have any difficulty hearing?
6. When you ask the child to do something does he seem to understand what you are asking?
7. Does the child have any weakness and/or stiffness in the limbs and/or difficulty in walking or moving his arms?
8. Has the child had often fits, become rigid or lost consciousness in the last six months?
9. Has the child had any other serious accidents or illness?
10. Compared with other children his age, does the child appear in any way backward, slow or dull?