LEXICAL FAST MAPPING ABILITIES IN CHILDREN WITH INTELLECTUAL DISABILITY

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APRIL 2018

CERTIFICATE

This is to certify that this dissertation entitled "***Lexical Fast mapping abilities in children with Intellectual Disability***" is a bonafide work submitted in part fulfilment for degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 16SLP018. 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.

Mysuru
April 2018

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CERTIFICATE

This is to certify that this dissertation entitled "***Lexical Fast mapping abilities in children with Intellectual Disability***" is a bonafide work submitted in part fulfilment for the degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 16SLP018. This has been carried out 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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Guide

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DECLARATION

This is to certify that this dissertation entitled "***Lexical Fast mapping abilities in children with Intellectual Disability***" is the result of my own study under the guidance of Dr. Shymala. K.C, Professor in Language Pathology, Department of Speech Language Pathology, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysuru

April 2018

Registration No. 16SLP018

MY WORK IS

DEDICATED TO

ANNA, AMMA, AKSHAY

AND VIKKI

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INTRODUCTION

Language is one of the foremost, conspicuous and a fundamentally characteristic of the faculties of man which fosters an effective communication. It is not only an important mode of communication between the individuals but also a way of expressing their personality. The child will come to know most of the things around the world through language and also will learn new different words every day in their life during the period of development. Therefore, word learning is a fundamental building block in the acquisition of language (Pinker & Jackendoff, 2005).

Novel word learning often appears swift and effortless, as exemplified by the fast-mapping phenomenon (Carey & Bartlett, 1978) in which young children relate novel words and concepts within a small number of presentations. They elucidated that fast mapping of novel words happens in two stages: In the first stage, fast mapping of the novel words begins from the stage at which the child creates a new lexical representation of a new word which the child is not exposed. In the second stage, the child develops some information about that specific novel word which the child has already encountered. This stage is termed as '' Extended phase''. Novel words can be strongly represented in the child's memory if the child has developed the ability to match lexical representation of the newly learned words with the preceded word which the child was exposed to.

Literature suggests that novel words are acquired through fast mapping in typically developing children as young as 13 months of age (Woodward, Markman, & Fitzsimmons, 1994). A study done by Bion, Borovsky, &Fernald (2013) stated that typically developing children in the age range of 18-30 months fast map and retain novel words. Children were able to fast map more of concrete words especially nouns or descriptors, including colour and shape with a considerable amount of practice (Heibeck & Markman, 1985).

Word learning process involves acquisition process and repeated practice fine tunes the information about the particular novel word which the child was exposed (Rumelhart & Norman, 1978). Practice effects are very important in learning novel words (Newell & Rosenbloom, 1981). A study was done by Sushma, Amulya , Ranjini, & Swapna (2010) on fast mapping abilities in Kannada speaking children revealed that the high practice words produced neighbourhood activation, which promoted rapid learning of low practice words.

Children use both linguistic as well as non-linguistic strategies to encounter a novel word for the first time. (Beaver, 1970; Clark, 1973; Chapman, 1990). Pinker (1982) highlighted that during the process of learning novel words, they use the strategy known as "Ostension" which is defined as an act of pointing out or to make a connection between the word and the referent. Many studies reported that novel word learning is lexically triggered more in initial stages than in later stages (Kroll & Curley, 1988).

Till date, many studies have focused on fast mapping of novel words in monolinguals and to some extent on bilinguals. A study was done by Deepak (2016) on fast mapping abilities in normal bilingual children revealed that they could fast map novel words better in their native language compared to the second language.

Fast mapping skills have been extensively studied even in children with language impairments. Dollaghan (1987) compared fast mapping abilities in typically developing and language impaired children and results revealed that both the groups did not differ to make a connection between the referent and a novel word, to comprehend the novel word, and to recall some non-linguistic information associated with the referent. However, the language-impaired children showed poorer performance than the normal children in expressing the novel word, recalling significantly fewer of its three phonemes.

Intact intellectual functioning is one of the pre requisite for a child to accomplish novel word learning. Since this domain is affected in children with Intellectual Disability (that is underlying deficits in intellectual functioning), acquisition of normal speech and language becomes very challenging for this group.

According to American Association on Mental Retardation (2002), ‘’Mental retardation is a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills’’. This disability originates before age 18. The term ‘’Mental Retardation’’ is now replaced by ‘’ Intellectual Disability’’ as stated by DSM-5 (Diagnostic and Statistical Manual of Mental Disorders). Intellectual disability is estimated to affect 2-3 % world population. In India, 5 out of 1000 children are mentally retarded (The Indian Express, 13th March 2001). It is more common in boys than girls.

According to International Classification of Diseases (ICD-10, Chapter v), disorder is classified based on intelligent quotient, into Mild (IQ: 50-69), Moderate (IQ:35-49),Severe(IQ:20-34), Profound(IQ: Below 20). Regardless of the degree of severity, these children exhibit difficulty in numerous language areas, out of which one appears to be novel word learning.

To study novel word learning process in children with ID, investigators have used fast mapping paradigms. Schwartz , Bird & Chapman (2004) compared fast mapping abilities of new nouns in spoken story contexts in ID adolescents (ages: 12.8-20.3) and nonverbal mental-age matched controls (ages: 4.1-6.1). Results revealed ID group did not differ from TD group in novel word production but recalling of story propositions was poorer for ID group.

McDuffie, Sindberg, Hesketh, & Chapman (2007) compared 20 ID adolescents (ages:12-18) and 19 typically developing children (ages: 3-6 years) matched on syntax comprehension on fast mapping of novel nouns and verbs when word learning is dependent on speaker's syntactic or pragmatic cues. Results revealed both the groups used speaker intent in fast-mapping nouns but poor performance on verbs.

Need for the study:

The ability to learn novel words is particularly robust and is a very important aspect of speech and language development. One of the primary phenomena by which young children acquire their vocabularies is fast mapping. It has been widely studied in typically developing normal children and various language disorders such as Cognitive Impairment (Wilkinson & Green,1998; Wilkinson, 2007), Autism (McDuffie, Yoder, & Stone, 2006 ; Heibeck & Markman ,1985; Bincy,2017), Specific Language Impairment (Alt, Plante & Creusere, 2004; Gray, 2005; Jagacharan, 2017), Down Syndrome (Bird, Chapman & Schwartz , 2004), Hearing Impairment (Mandler & Bryant, P.,1981; Gaines, Mandler, & Bryant, 1981; Gilbertson & Kamhi ,1995; Stelmachowicz, Pittman, Hoover, & Lewis, 2004) . Therefore as per literature, most of the studies focusing on fast mapping skills have been carried out in the western context. Also, there is a dearth of literature emphasizing on fast mapping abilities in Intellectual Disability and it is even scarce in the Indian context. To study the novel word learning mechanisms in children with Intellectual Disability, it is required to study the acquisition of novel words in the same population using fast mapping paradigms. Hence the current study will help us to explore fast mapping abilities in Kannada speaking children with and without Intellectual Disability.

Aim:

The aim of the present study is to investigate the fast mapping abilities in Kannada speaking children with and without Intellectual Disability.

Objectives of the study:

- To study and compare the performance on fast mapping abilities of children with ID and typically developing Kannada speaking children.
- To compare children with ID and typically developing children on practice effect (5v/s 10 repetitions) in novel word learning.
- To compare children with ID and typically developing children on immediate and delayed recall abilities.

Hypothesis:

- There is no significant difference in the performance on fast mapping abilities between children with ID and typically developing Kannada speaking children
- There is no significant difference between children with ID and typically developing Kannada speaking children on practice effect (5v/s 10 repetitions) in novel word learning.
- There is no significant difference between children with ID and typically developing children on immediate and delayed recall of novel words

CHAPTER II

REVIEW OF LITERATURE

Language Acquisition:

Language is defined as a system with precise and meaningful arrangement of symbols and rules which enables us to communicate. It is the means through which human beings express thoughts, ideas and establish and maintain social relationships in their society. American Speech, Language and Hearing Association (ASHA), 1983, defined language as a "complex and dynamic system of conventional symbols that is used in various modes for communication and expressing thoughts''. There are 3 important components of language: Form (includes Phonology, Morphology and Syntax), Content (includes Semantics) and Use (includes Pragmatics) (ASHA, 1983).

Acquisition of language starts right from infancy period and continues throughout the developmental period. Therefore, Language acquisition is defined as the process by which people acquire the ability to comprehend and produce language which involves the usage of words and sentences to communicate. According to Glietman & Wanner (1982), developmental process of language is defined as "mysterious" and according to Bloom (1983) as "Magic". Overall, the development of language and speech is a dynamic constructive process (Thelen, 2005).

Language acquisition involves various stages and is described by several authors using different approaches. According to Skinner (1957), ''Language is a learnt behaviour and it can be modified according to the environmental stimulation". Language is acquired by the children with the support of parents through modelling and reinforcement. In contrast to Skinner's notion, Chomsky (1969) described the rule based device popularly known as ''Language Acquisition Device'' (LAD) which the children are innately equipped for

learning language. This knowledge about language acquisition helps in differentiating typically developing children from disordered population and has good implications in language assessment and intervention.

Language acquisition involves development in the following domains: Phonology, Vocabulary, Syntax and syntactic categories. Therefore, vocabulary acquisition also serves as one of the important area of development which the child has to acquire for successful understanding and production of language.

Vocabulary Acquisition:

Vocabulary is defined as ‘’set of words within person’s language repertoire and this serves as an important tool of communication and acquiring knowledge’’. The development of vocabulary is highly variable across different individuals. Most toddlers acquire 10-15 words at around 1 ½ years of age (Nelson, 1973). By around 2 years of age, their vocabulary expands to approximately 200-300 words; and by 3 years of age, they will have vocabulary of around 900-1000 words. They enter kindergarten with the capacity to comprehend or potentially utilize more than 2,000 words. (McLaughlin,1998). Studies have shown that more than 60,000 words are comprehended by the time of graduation.

Some of the factors influencing novel word learning are: exposure to language, education, socioeconomic status, dialect and native language (Mallikarjun, 2002).

Novel word learning in children also varies across age where younger children learn these new words by focusing on specific stimulus that is present in and around their environment. Gradually these learning styles will be substituted with more matured novel word learning form where children start linking with lexical –semantic map by connecting to the previous episodes of events.) Vocabulary development in younger children is more

lexically mediated than in older children (Potter, So, K., Eckardt, & Feldman,1984). Language learning is one of the important components of cognition. Various researchers who studied acquisition of language have highlighted on cognition, working memory and IQ because all are interrelated to each other (Fernald, 2008).

The skill involved in novel word learning is primarily exponential and is one of the essential aspects in speech and language development. Children falling between 2-3 years of age are appreciated to learn around 2 new words per day; in contrast, 8-12 year old children learn approximately 12 words per day (Bloom, 2000). To gain this vocabulary size, child must be involved in learning novel words on an everyday basis throughout his/her adolescence (Bloom, 2000). The child learns a new word by assigning meaning to the particular word.

Several researchers have reported that children in the age of 2.5 -4 years choose an unfamiliar object as a novel word referent and they map that word through repeated exposure. Several theories speculate that novel word learning happens by linguistic experience in the developmental period. The strategy of learning unfamiliar word through novel mapping is one such example. (Lederberg & Prezbindowski,2000).

Word learning links the connection between linguistic and conceptual organizations in infants (Bloom, 2000; Gelman, Coley, Rosengren, Hartman, & Pappas, 1998). In linguistic domain, words and phrases are learnt through melody of human language and in conceptual domain, the connection between objects and events takes place. Several researchers have reported that there is a strong connection between conceptual and linguistic domain during the infant's stage of word learning. To accomplish successful word learning, infants should have the ability to recognize relevant conceptual units, linguistic units and make a strong mapping between these two units. And each of these units requires a certain amount of

abstraction. For instance, a given word or phrase must be linked to abstract phonological representation and should have abstract concept associated with it. And vocabulary acquisition is measured through a skill known as fast mapping.

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 & Bartlett, 1978). In cognitive psychology**,** fast mapping is defined as the hypothesized mental process where a new concept is learned only on a single exposure to a given piece of information. This serves to explain the immense rate at which children acquire vocabulary. In order to successfully accomplish fast mapping process, a child must acquire the ability to make use of "referent selection" and "referent retention" of a novel word.

The word fast mapping is considered to be critical in the first stage of novel word learning, which requires intact phonological and semantic processing skills (Weismer & Evans, 2002; Gray, 2005). Several investigators studied novel word learning and reported that with a single exposure to a new phonological and semantic form of the word, children will create a ‘map’, which is the initial stage of novel word learning. During this stage, phonological, semantic or syntactic information are represented. In typically developing children, novel word learning creates particular lexical-semantic map and this is refined through various experiences across communicative contexts (Dollaghan, 1987; Weismer & Hesketh, 1993, 1996, 1998; Weismer & Evans, 2002; Gray, 2003, 2004, 2005, 2006; Alt, Plante, & Creusere, 2004; Matsuo, 2005; Capone & Mcgregor, 2006)

Carey & Bartlett (1978) elucidated that there are two stages in fast mapping of novel words: In the first stage, novel word learning begins when the child forms a new lexical representation of the novel word which the child not exposed before. This serves as a primary

stage and is termed as ‘’Quick mapping’’. In the second stage, the child refines some information about that specific novel word which the child has already encountered. This stage is termed as ‘’ Extended phase’’.

Lederberg (2000) described two types of word learning: rapid word - learning (fast mapping) where child is given an explicit reference and novel mapping (quick incidental learning) were child has to establish link between the novel word and unfamiliar referent. In the current study fast mapping is employed.

Ideally, fast mapping tasks consists of two phases: exposure phase and probe phase. In exposure phase, child listens to a novel word and looks into the corresponding referent which will 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 assessed with two tasks namely, recognition and expression probes (Weismer & Evans, 2002). In ideal situations, fast mapping task is executed without specific feedback or teaching over short period of time. In the current study, both the mentioned phases have been assessed

Literature suggested that receptive probe is better than expression probe in monolingual preschool children. Gray (2003) opined that child’s fast mapping receptive scores might be a strong predictor of child’s ability to express the learnt novel word. Hence, reception becomes a necessary part for expressing the word.

Factors affecting fast mapping:

Various studies have reported that there are several factors influencing fast mapping of novel words in typically developing children. First, age serves as a primary contributor in the process of novel word learning. Fast mapping and age are directly related to each other with evidence of older children performing better than young children (Alt, Plante, &

Creusere, 2004; Gray, 2005, 2006). Second influencing factor is cohesion of child's underlying language system. The third important factor influencing novel word learning is their persistent language knowledge (Gray, 2003, 2004). Fourth contributing factor is phonotactic probability which is defined as frequency of occurrence of sounds in isolation and in combination with other sounds. It is reported that behavioural effects of phonotactic probability provides insight about the role of phonological representation in language processing (Vitevitch & Luce,1999). Children learn high phonotactic probability words easily than low phonotactic probability words (Rogers, 2000; Storkel, 2001).

Retention of Fast-Mapped Words:

The novel word learning phenomenon happens in a series of steps across time. After initial exposure to a novel word, children stores some traces of the word-meaning they have deduced and expand it with every exposure. Carey & Bartlett (1978) defined this long and slow process of refining the depiction of a word and its meaning as slow mapping. Children's retention of novel words (learnt through fast mapping) measured after some time is one of the important sand crucial steps in the slow mapping process. Several studies on fast mapping have discussed retention of fast mapped words in younger children (Dollaghan, 1985; Golinkoff, Pasek, Bailey, & Wenger, 1992; Wilkinson & Mazzitelli, 2003; Wilkinson, Ross, & Diamond, 2003; Spiegel & Halberda, 2011; Bion, Borovsky, & Fernald, A, 2013; Zosh, Brinster, & Halberda, 2013).

Few studies have assessed the retention of recently fast mapped words after some significant delay. The results have shown that children in the age range of 1-2 years could remember referents of novel words they are taught through ostensive naming for not less than 24 hours (Tomasello, Mannle, & Werdenschlag, 1988; Waxman & Senghas, 1992; Woodward, Markman, & Fitzsimmons, 1994). There are evidences which have also shown

that young children hold referents of words they have incidentally learned (Carey & Bartlett, 1978; Markson & Bloom, 1997). Horst and Samuelson (2008) reported there is no retention of fast mapped words for more than 5 minutes at 24 months of age unless those words are taught extensively.

Deepthi, Trupthi, Shwetha, Nikhil & Deepa (2009) studied fast mapping skills in Kannada speaking children in the age range of 2.5-4.5years on a naming task. Here, the children were initially trained with names and they were asked to remember them after 10 minutes and after one week. The main focus of the study was to assess accuracy of naming. The results revealed that older children performed better compared to younger children and performance of naming was poorer after one week when compared to naming task carried out after 10 minutes.

Zosh, Brinster, & Halberda (2013) conducted a study by comparing 3-year-old children's novel word learning through inference and direct teaching methods. The results revealed that the children were more likely to retain words when the word's meaning had been inferred than when it had been specifically instructed with no distracter.

Therefore, these studies suggested that younger children retain novel words for a considerable amount of time, hours, and even weeks.

Fast Mapping in Different Populations:

Several studies have been carried out by researchers to see how novel word learning takes place through fast mapping paradigm across different disordered population in comparison to typically developing children. This knowledge about novel word learning across various disorders will help us in planning rehabilitation program.

Typically Developing Children:

Carey & Bartlett (1978) studied fast mapping of novel words in typically developing children. Here, children were given the task of retrieving an object from field of two, one familiar and one new object. The results revealed that through brief presentation and in contrast to a familiar object, children could fast map novel words. Children were assessed after one week in an alternate setting and they could demonstrate fast mapping of novel words. Carey & Bartlett's findings have been supported by other related studies (Heibeck & Markman, 1985; Gershkoff & Hahn, 2007).

Heibeck & Markman (1985) conducted a similar study on typically developing children in which three lexical domains were evaluated: shape, color and texture. Here, children were assessed on their ability to learn and retain unfamiliar words in the same session (measuring immediate recall). To assess comprehension, children were presented with target item along with other three familiar and three unfamiliar items and were asked to identify target item out of it. The results revealed that fast could be successfully accomplished for children in the age range of 3-4.8 years. Researchers also found that children could comprehend color and shape words better than texture words. Therefore, they concluded that the new words are fast mapped and retained by typically developing children. Fast mapping of concrete vocabulary such as nouns or descriptors, including color and shape seems to be more successful than any other categories (Heibeck & Markman, 1985).

Deepthi (2009) conducted a study to assess fast mapping abilities in Kannada speaking children in the age range of 2.5-4.5years. All were native speakers of Kannada and were given naming task. The results revealed that older children performed better compared to younger children.

Sushma, Ranjini, Amulya & Swapna (2010) investigated fast mapping abilities in typically developing toddlers in the age range of 16-20 months. Children were trained with

24 novel words representing unfamiliar objects over a period of 24 days (approximately 12 sessions). Children were divided into two groups: Experimental group who received training as well as assessment in all the sessions and Control group who received training and testing only in first and last session. The results have shown that experimental group performed better than control group. Therefore, the study concluded that novel word learning occurs through fast mapping paradigm in toddlers and consistent practice is essential to fast map novel words.

A study done by Bion, Borovsky, & Fernald (2013) concluded that fast mapping and retention of novel words occur as early as 18 months in typically developing children.

Bilingual population:

Vishnu, Ranjini, Sapna & Shyamala (2011) explored novel word learning in Tulu-Kannada – English multilinguals and Malayalam – English bilingual children. They were engaged in referent identification and picture naming tasks. The results revealed that bilingual children learnt novel words faster in L1 (Malayalam) than L2 (English) whereas multilingual children learned novel words faster in L3 (English) followed by L1 (Tulu) and L2 (Kannada). And authors also opined that amount of exposure; language proficiency and opportunities to use the language are some of the contributing factors for novel word learning.

Danielle & Pui (2016) investigated fast mapping abilities in preschool children whose L1 was Spanish and L2 was English, across 2 different contexts: storybook reading and cartoon viewing. These children were exposed to 8 novel words for a period of 4 sessions in both the contexts. The results revealed that there was no significant difference in learning novel words in storybook reading or cartoon viewing and the authors opined that both

storybook and cartoon viewing helped the children in learning novel words in both L1 and L2.

Deepak (2016) investigated the fast mapping abilities in bilingual children. Children were given with the tasks of recognition and naming. The results revealed that with single exposure, children could fast map novel words and could perform better in recognition task compared to naming task.

Disordered Population:

Fast mapping abilities have been studied in various disordered population like Hearing Impairment, Specific Language Impairment, Autism, Cognitive Impairment etc.

Hearing Impairment:

Lederberg, Prezbindowski, & Spencer, P (2000) studied language acquisition in hearing impaired children in the age range of 3-6 years. Two aspects were studied: rapid word learning and novel mapping. The results revealed that performance in rapid word learning was better than the novel mapping. And also there was a significant correlation between receptive vocabulary and performance.

Stelmachowicz , Pittman, Hoover, Lewis & Moeller (2004) explored learning of novel words varying in form (nouns v/s verbs), stimulus level (50 v/s 60 db SPL) and number of repetitions (4 v/s 6) in 11 hearing impaired children with Moderate hearing loss and 20 typically developing children in the age range of 6-9 years. Children were asked to view 4-minute animated slide show which contains 8 novel words and later they were asked to identify each novel word from a set of 4 pictures. The effects of age, audibility, hearing status, PPVT raw scores, word form, word recognition scores, repetition, and stimulus level were evaluated. The results revealed that performance of typically developing children was 60% and 41% for hearing impaired children even with adequate training and exposure.

Variables like PPVT raw scores, repetitions, stimulus level and hearing status served as significant predictors whereas, age, word recognition scores, word form and audibility were not significant predictors of children's performance. Therefore, the study concluded that children's ability to learn novel words can be predicted from stimulus level, hearing status, vocabulary size and number of exposures and also they found that presentation level can serve as an effective tool for studying several forms of hearing aid signal processing algorithms.

Hansson, Forsberg, Löfqvist, Mäki-Torkko & Sahlén (2004) investigated the role of working memory in novel word learning by comparing children with Specific Language Impairment and Mild-to-Moderate Bilateral Sensorineural Hearing Loss in the age range of 9–12 years. The results revealed that performance of HI children was better than children with the SLI. And also found that the best predictor of novel word learning in children with SLI and HI is the complex working memory.

Pittman, Lewis, Hoover & Stelmachowicz (2005) examined rapid word learning in children with hearing impairment and typically developing children in the age range of 5-14 years. The effects of age, receptive vocabulary and high-frequency amplification were examined. The results revealed that hearing impaired group performed poorer than typically developing children in learning new words. Also, there was no correlation between overall performance and the age of identification and age of amplification in the children with hearing impairment. In both the groups, performance was consistent with their receptive vocabularies and better in extended bandwidth condition.

Specific language impairment:

Alt, Plante, & Creusere (2004) have studied novel word learning in terms of fast mapping novel words that represent novel lexical labels and fast mapping the semantic

features of objects and actions in 26 children with SLI and 26 typically developing children in the age range of 4-6 years who were matched for age and gender. Children were exposed to novel words representing novel objects and actions through computer program. Later they were asked questions related to semantic attributes of these novel objects and actions(for novel objects, semantic features considered were color, pattern presence of eyes and animacy and for actions, the features included were sound, shape change, causation and speed). Children were instructed to respond to questions by pressing either of the two buttons which were paired up with a picture of either smiling or crying creature. They pressed button corresponding to smiling creature to indicate the presence of correct attribute in the question and crying creature to indicate the presence of wrong attribute in the question. Results revealed that for both the groups, questions related to semantic attributes of actions were more difficult than related to objects which is attributed to lack of concrete references, morphological variation, multiple representations, syntactic complexity and also later mastery of action verbs compared to nouns. With respect to fast mapping context, children with SLI recognised fewer novel objects and actions and fewer semantic features compared to typically developing children attributed to impaired knowledge of the phonological characteristics of lexical labels and poor inherent connection between the skills (which are involved in fast mapping lexical labels and semantic features) required for novel word learning.

Gray (2005) concluded in his study that children with SLI exhibits difficulty in learning novel words due to poor phonological representations and phonological-semantic links for novel word learning.

Gray & Brinkley (2011) conducted a study to see the effect of phonological or semantic encoding cues on fast mapping performance in preschoolers with SLI and typically developing children. 42 preschoolers with SLI and 42 typically developing preschoolers matched for age and gender were included in the study. Both the groups learnt words in a

supported learning context. Novel word learning and fast mapping performance were assessed. The results revealed that there was no effect of encoding cues on fast mapping performance for both the groups or on the number of words learnt by children to comprehend. Therefore, the study concluded that encoding cues are not beneficial for any group.

Jackson, Leitao & Claessen (2015) studied the relationship between phonological short-term memory, receptive vocabulary and fast mapping in children with SLI. 23 children with SLI and 26 typically developing children were recruited for the study. All of them were given the task of learning nine novel objects with non-word labels. A Peabody Picture Vocabulary Test and a non-word repetition test were administered as measures of receptive vocabulary and phonological short term memory capacity respectively. The results revealed that children with SLI had significantly poorer scores on fast mapping production task, PPVT test and non word repetition task (suggesting reduced phonological STM capacity) compared to typically developing children. The study also revealed that receptive vocabulary and phonological STM capacity appeared as significant predictors of fast mapping performance in both the groups.

Jagacharan (2017) studied fast mapping abilities in Kannada speaking children in the age range of 4-7 years with Specific language impairment. 10 children with SLI and 10 typically developing children were included in the study. All children were involved in learning 10 novel words which were presented via laptop through Microsoft Power point Presentation and their performance was assessed through recognition and production tasks. Results revealed that SLI group had poorer fast mapping abilities compared to typically developing children attributed to limited capacity in aspects related to cognitive processes (phonological working memory, short-term and long-term memory) and weaker lexical-semantic representation of the words. Also it was found that both the groups performed better

on recognition task compared to production task attributed to the fact that production requires active retrieval compared to recognition and hence production scores poorer compared to recognition.

Autism:

A study done by McDuffie, Yoder, & Stone (2006) on 29 children with autism spectrum disorders in the age range of 24-46 months investigates if fast-mapping mediates the relationship between attention and vocabulary size. Children were presented with eight objects representing brightly colored wooden shapes. Attention trials and fast mapping trials were conducted. During attention trials, the object was labeled. During fast mapping trials, new objects were presented with previously labeled objects. The results revealed that fast mapping in combination with repeated attention-following cues brings about successful acquisition of nouns in children with autism.

A study done by Luyster & Lord (2009) concluded that similar to typically developing children, even children with autism spectrum disorders use social information in the process of novel word learning to guide word-object mapping.

Few studies on novel word learning have suggested that attention cues facilitate fast mapping skills in children with autism spectrum disorders and they use their own direction of gaze rather than relying on examiner's direction of gaze to fast map novel words.

More recent fast mapping studies of children with autism focused on their use of attention, gaze, and social information, rather than their capacity to learn and retain vocabulary (Brock, Norbury, Einav & Nation, 2008; Luyster & Lord, 2009).

Norbury, Griffiths & Nation (2010) compared novel word learning in children with autism spectrum disorders and typically developing children. They aimed at testing phonological and semantic knowledge of children by giving them the task of naming novel objects immediately after learning and after four weeks. The results revealed that recall of

phonological information was noteworthy at both time frames for verbal participants with ASD.

Katherine, Walton & Ingersoll (2013) compared the effect of orienting cues on receptive and expressive fast-mapping skills in children with autism spectrum disorders and typically developing children. All of them participated in three novel word learning conditions. In the follow-in condition, the examiner labelled an object which focuses on child's attention. In the redirecting condition, the examiner labelled an object which was the focus of their own attention. In the orienting cue condition, the examiner used a verbal cue to get child's attention and then labelled an object which was the focus of their own attention. The results revealed that children with ASD learned receptive labels exhibits correct receptive fast mapping during orienting cue condition than during redirecting condition. Typically developing children exhibited correct receptive mapping in all conditions. During expressive trials, both the groups fast mapped words successfully during follow-in and orienting cue condition than during redirecting condition.

Haebig, Saffran, & Weismer (2017) compared statistical word learning and fast mapping abilities in school going children with specific language impairment and autism spectrum disorders. Statistical word learning was examined through a word segmentation task and fast-mapping skill was assessed through object-label association task. The results revealed that children with SLI performed poorer on both word segmentation and fast mapping tasks relative to children with autism spectrum disorders.

Bincy (2017) investigated fast mapping skills in Kannada speaking children with Autism Spectrum disorders in the age range of 4-7 years. 10 children with ASD and 10 typically developing children were recruited for the study. All children were presented with 10 novel words via laptop through Microsoft Power Point Presentation and were taught by the examiner. The performance of the children was assessed through recognition and

production tasks. Results revealed that ASD group performed poorer than typically developing children in both recognition and production tasks implicating poor fast mapping skills in children with ASD. Also it was found that performance on recognition task was better than production task in both the groups.

Cognitive Impairment:

Wilkinson & Green (1998) investigated fast mapping abilities in individuals with cognitive impairment via two conditions namely, successive and concurrent introduction of items. A computer-based approach was used instead of usage of physical objects. Individuals in the age range of 5-22 years who were diagnosed with moderate to severe cognitive impairment were included in the study. In the concurrent exposure condition, two novel words were presented in first and second sessions respectively and were then assessed for acquisition in the last session. Participants were provided with twelve exposures for each word. In the successive introduction condition, one novel word was introduced during the first session, and two words (word from the first session and a novel word) were introduced in second and third sessions respectively. Novel word learning was assessed after three days. The first word was introduced 18 times and the second word for 6 times in a modified fast mapping trial. The results revealed that individuals could fast map novel words in successive introduction condition better than concurrent introduction. Therefore, the researchers concluded that individuals with expressive language delay benefit from novel word learning via successive introduction approach.

Wilkinson & Mazzitelli (2003) concluded in their study that typically developing children benefit from fast mapping via successive introduction approach and individuals with cognitive impairment less benefit from both concurrent and successive introduction

conditions. Therefore, receptive vocabulary acquisition seems to be challenging for children with cognitive impairment.

Fast mapping in Intellectual Disability:

Intact intellectual functioning is one of the pre requisite for a child to accomplish novel word learning. Since this domain is affected in children with Intellectual Disability (that is underlying deficits in intellectual functioning), acquisition of normal speech and language becomes very challenging for this group. And one such language domain which the children with Intellectual Disability exhibit difficulty is learning novel words. There are numerous studies reported in literature which have focused on exploring fast mapping abilities in children with ID.

Robin (1990) compared fast mapping of novel words in 48 children and adolescents with Intellectual Disability (ages 5.6-20.6) and 48 typically developing children matched for mental age (chronological ages 2:0-6:0). Results revealed there was no significant difference between typically developing and ID groups in their ability to comprehend and produce novel words. But when the same was retested after an hour with other activity, ID group showed a significant decrement in production task only.

Chapman, Bird & Schwartz (1990) compared fast mapping abilities in adolescents with Intellectual Disability (ages 5.6-20.6) and typically developing children (ages 2.0-6.0) matched for non verbal mental age. Participants were engaged in 3 tasks: Recognition, Production and Location task. They were exposed to novel words through a hiding activity. For comprehension, the children were asked to recognise novel object through pointing among series of objects that were lined up in front of them. For production, the experimenter holds up the objects and asks the child to name them. For location task, they were expected to recall the location of hidden novel referents. Immediate and delayed recall (after 1 hr) was

measured across all the tasks. The results revealed that for immediate recall, 62%, 100%, 82%, 85% of the younger ID group, older ID group, younger control group and older control group respectively, passed the comprehension task. 23%, 62%, 9% and 77 % of the younger ID group, older ID group, younger control group and older control group respectively, passed the production task. 54 %, 92%, 64% and 100% of the younger ID group, older ID group, younger control group and older control group respectively, passed the location task. For Delayed recall, 58%, 77%, 64% and 92% of the younger ID group, older ID group, younger control group and older control group respectively, passed the comprehension task. 17%, 31%, 0% and 8% of the younger ID group, older ID group, younger control group and older control group respectively, passed the production task. 67 %, 100%, 36% and 100% of the younger ID group, older ID group, younger control group and control group respectively, passed the location task. Overall, the results suggest that there was no significant difference between normal children and ID children for immediate recall whereas, for delayed recall, there was significant difference between two groups only in production task. Comparison between younger and older children revealed that both the groups performed equally in location task, ID group performed better in comprehension task and control group performed better in production task.

Mervis & Bertrand (1995) studied the application of Novel Name-Nameless category (N3C) principle in children with Down syndrome aged 2.4-3.3 years. According to N3C principle, novel words map to objects/categories for which the child does not yet have a name (Golinkoff et al., 1994; Mervis & Bertrand, 1993). It is one of the developmental lexical principles during which vocabulary spurt can be seen. It allows the child to acquire new words based on implicit input that is without the need of other people to provide an explicit direct link between a novel word and its referent. According to developmental lexical principle framework, the N3C principle is not available in the initial stages of language

acquisition rather it starts operating during rapid phase of lexical development. Results of the study revealed that children who used the N3C principle possessed significantly larger vocabularies than those who did not and also acquired new words more rapidly than the latter ones.

Romski, Sevcik, Robinson, Mervis, & Bertrand (1996) explored word-learning abilities of 12 school-age participants with Moderate – Severe Intellectual Disability. Their results revealed that among 12 subjects, 7 of them were able to fast map meanings of symbols for novel objects on first exposure. Follow-up assessments revealed that mappers could retain comprehension of some of the novel words up to delays of 15 days and generalized their knowledge to production. They concluded that fast mapping ability was attributed to symbol achievement status.

Elizabeth, Gaskell, Babineau, & Macdonald (2000) compared novel word learning in Intellectual Disability children (ages: 2.1 to 5.2) and mental-age matched typically developing children (ages: 1.4 to 2.6). Novel word learning carried out in 3 conditions: signed only, spoken only, signed and spoken combined. Responses to comprehension and production probes and spontaneous imitations were assessed after 5, 10, and 15 exposures. Results revealed that across different conditions, Intellectual Disability children comprehended fewer words than typically developing children but there was no significant difference between 2 groups in terms of frequency of spontaneous imitations or probed productions which were obtained.

Bird, Chapman & Schwartz (2004) compared fast mapping abilities of new nouns in spoken story contexts in adolescents with Intellectual Disability (ages: 12.8-20.3 years) and nonverbal mental-age matched controls (ages: 4.1-6.1 years). Results revealed that ID group did not differ from TD group in novel word production but recalling of story propositions

was poorer for ID group. They concluded for both the groups, story recall was poorer for text units containing novel words than text units not directly associated with novel words suggesting a trade-off effect in processing.

Chapman, Sindberg, Bridge, Gigstead, & Hesketh (2006) compared 19 adolescents with Intellectual Disability and 18 healthy normal children matched on syntax comprehension for fast mapping of new words (comprehension, production and speed) facilitated by memory support and elicited production Results revealed that compared to typically developing syntax comprehension-matched children, ID children's comprehension speed of fast-mapped words was differentially increased by memory support. Elicited production improved fast-mapping of production for all subjects, and in the absence of elicited production, memory support improved it.

McDuffie, Sindberg, Hesketh &Chapman. (2007) compared 20 adolescents with Intellectual Disability (ages:12-18 years) and 19 typically developing children (ages: 3-6 years) matched on syntax comprehension on fast mapping of novel nouns and verbs when word learning is dependent on speaker's syntactic or pragmatic cues. They were engaged in 4 fast-mapping tasks. Both comprehension and expression of novel words were assessed for each task. Results revealed both the groups used speaker intent in fast-mapping labels to object referents but poor performance on fast-mapping verbs. Both the groups did not use grammatical cues to disambiguate the intended referent. They concluded that syntax comprehension was a major predictor for fast-mapping comprehension in ID group and for typically developing children; both syntax comprehension and chronological age were major predictors of fast mapping.

Mosse & Jarrold (2011) studied novel word learning in 17 children with Intellectual disability and examined whether there is an effect of incidental procedure based memory

demands and stimuli word likeness on novel word learning. The participants were engaged in paired associate word and non word learning tasks which require them to learn names of novel characters. The results revealed that novel word learning by individuals with Intellectual disability was more than what was expected for their verbal short term memory capacity.

To conclude, the above studies mentioned provide few interesting findings related to fast mapping abilities in typically developing children, different disordered population and also in the context of monolinguals and bilinguals which included both western and Indian population. Also, these studies reflect the significance of amount of exposures, influence of L1 vs. L2 and difference in the recall abilities. But however, there is a dearth of literature emphasizing on fast mapping abilities in Intellectual Disability and it is even scarce in the Indian context. To study the novel word learning mechanisms in children with Intellectual Disability, it is required to study the acquisition of novel words in the same population using fast mapping paradigms. Hence the current study explores the fast mapping abilities in Kannada speaking children with and without Intellectual Disability.

CHAPTER III

METHOD

Aim:

The current study aimed to investigate fast mapping abilities in Kannada speaking children with Intellectual Disability.

Objectives of the study:

The main objective of the current study was to investigate fast mapping abilities in children with Intellectual Disability across recognition and production tasks.

Further, the study also examined,

1. Comparison of novel word learning abilities across recognition and naming tasks in children with ID and typically developing children

2. Comparison of practice effect (5 vs.10 repetitions) in novel word learning in children with ID and typically developing children.

3. Comparison of immediate and delayed recall abilities in novel word learning in children with ID and typically developing children

Participants:

In this study, two groups of participants were recruited, that is the control group and the clinical group.

Clinical group:

The clinical group considered of total 10 children with ID.

Inclusion criteria:

Children having

- Kannada as their native language.
- Diagnosis of Below Average Intelligence (IQ: 70-80) and Mild ID (IQ: 50-69) by Psychologist.
- Mental age within the age range of 3-4 years
- Language age assessed using REELS ((Receptive and Expressive Emergent Language Scale, Bzoch & League,1971) and Extended REELS (Department of Speech Language Pathology, AIISH).
- No underlying issues related to neurological, motor, hearing and any other medical related complications.

Table 1*: Demographic details of the participants included in clinical group*

Sl. No	MENTAL AGE/ GENDER	LANGUAGE AGE	SEVERITY OF ID
1.	3.8 yrs/F	RLA: 30-33 months ELA:24-27 months	Mild ID
2.	4yrs/ F	RLA: 27-30 months ELA: 27-30 months	Mild ID
3.	3.10 yrs/F	RLA: 22-24 months ELA: 22-24 months	Mild ID
4.	4yrs/ M	RLA: 33-36 months ELA: 24-27 months	BAI
5.	3.6 yrs/M	RLA: 33-36 months ELA: 24-27 months	BAI
6.	4yrs/ M	RLA: 30-33 months ELA: 30-33 months	BAI
7.	3.10 yrs/M	RLA: 27-30 months ELA: 24-27 months	Mild ID
8.	3.9 yrs/ M	RLA: 24-27 months ELA: 24-27 months	Mild ID
9.	4yrs/M	RLA: 33-36 months ELA: 33-36 months	BAI
10.	3.8 yrs/F	RLA: 30-33 months ELA: 30-33 months	BAI

Control group:

- The control group included total of 10 mental age matched typically developing children free from issues related to neurological, hearing, cognitive, psychological and motor abilities, ensured using the 'WHO ten question screening checklist' (Singhi et.al,2007) .
- Language age was assessed using REELS (Receptive and Expressive Emergent Language Scale, Bzoch & League,1971) and Extended REELS (Department of Speech Language Pathology, AIISH).

An informed consent was taken from all the participants or caregivers before starting off with the actual testing.

Table 2: *Demographic Details of the participants included in control group*

SL. NO	AGE/ GENDER	EDUCATION
1.	4 yrs/ M	Preschool
2.	3.9 yrs/ F	Preschool
3.	3.11 yrs/ F	Preschool
4.	4 yrs/ F	Preschool
5.	4yrs/ M	Preschool
6.	3.11 yrs/ F	Preschool
7.	4 yrs/M	Preschool
8.	3.11 yrs/ M	Preschool
9.	4 yrs/M	Preschool
10.	4 yrs/ M	Preschool

Study design:

Standard Group Comparison

The Operational definition of a novel word and Fast mapping:

Novel word is defined as an entirely a new word which is not there in the child's vocabulary.

Fast mapping is defined as a phenomenon where a new concept is learned only on a single exposure to a given piece of information.

Stimuli preparation:

A set of 40 meaningful picturable words were selected and were validated by three Speech Language Pathologists who were native speakers of Kannada.

The novel words were checked for equal phonological complexity and length. For every novel word selected, the relevant colour picture was saved as bmp file and its respective name was recorded as audio file.

Selection of novel words:

1) Novel words were randomly selected from the Kannada text books of grade I-II.
2) To assess novelty, pictures depicting those target words were presented to typically developing children in the age range of 3-4 years where they were asked to name each of them one by one.
3) The words which were difficult and could not be expressed by the children were considered as unfamiliar and were selected as novel words for further procedures.

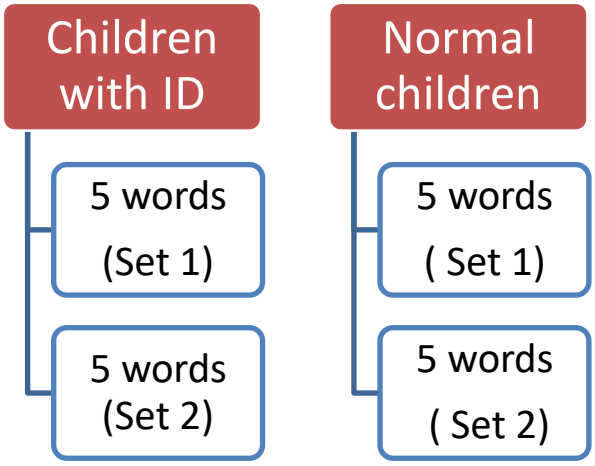

Figure 1: This shows the usage of 10 Kannada novel words. Out of 10, 5 words from set 1 were trained for 5 times in 1st phase and next 5 words were trained for 10 times taking from set 2.

After the selection of 10 novel words, the respective bmp picture and audio file were saved. Power Point presentation files of two different sets were prepared. One set of Power Point presentation file was prepared with 5 repetitions of novel words and second power point file with 10 repetitions which were used for both recognition and production tasks. In this way, two different sets of Power Point files of novel words were prepared for both children with ID and typically developing children. Only in training phase, slide show option was used to present the stimulus.

Procedure:

Training Phase:

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

Phase I:

In this phase, 5 novel words (from set 1) were presented. Each of them was presented one by one for 5 times in the laptop using Microsoft Power Point presentation software. They were presented simultaneously through auditory and visual mode with the presentation duration of 7000 ms for each novel word and inter stimulus interval of 6000 ms. The novelty of the words were checked by asking the child to name each of the pictures one by one. If the child does not name a particular word, then those were assumed as novel words and testing was continued.

During the training period, for typically developing children, prompts or visual cues were not given. They were instructed to carefully listen and watch the novel word they encounter and also to remember the same.

A similar training procedure was carried out for children with ID but during the initial training phase, prompts and visual cues were given to ensure that they sustain their attention on the screen.

Phase II:

Similar procedure was carried out in the second phase. Here, next 5 novel words (set 2) were presented for 10 times.

Response Phase:

Immediate and delayed recall of novel words were checked after presenting each set of words in both the phases. Delayed recall was measured after 6 hours of novel word presentation. The responses for both immediate and delayed recall were obtained through 2 tasks:

1. Recognition task

2. Production Task

In recognition task, four pictures were presented to children via laptop (Lenovo with Windows 7 operating system) through slide show presentation consisting of one trained target novel word and three other non-trained words. They were asked to identify the trained target novel word by pointing to it when named by an examiner. A score of '1' was given for every response and '0' for incorrect response.

For the production task, children were presented with pictures one by one which depicts all novel words and were asked to name them accordingly. The pictures were presented through the laptop. For every correct response, a score of '1 was given.

To rule out the task effect (Recognition and Production) on the responses, counter balancing was done. Here 5 children performed production task first, followed by recognition task and next 5 children performed recognition task first followed by production task.

Instructions to participants:

The participants were instructed to carefully listen to the novel words which were presented via the headphone and also to watch the picture related to that particular novel word and memorize it.

Scoring and Analysis:

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

1. 5 and 10 repetitions trial condition
2. Immediate and delayed recall condition

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

CHAPTER IV

RESULTS AND DISCUSSION

The current study aimed to investigate fast mapping abilities in children with Intellectual Disability using recognition and production tasks. To measure recognition and production responses, statistical analysis was done for both the group of participants in the following conditions:

1) Fast mapping abilities in children with Intellectual Disability and typically developing children across recognition and production tasks.

2) Effect of repetition: 5 (S1) v/s 10 (S2) repetitions after training phase in children with Intellectual Disability and typically developing children on fast mapping.

3) Immediate (I) v/s Delayed recall (D) abilities of novel words in children with Intellectual Disability and typically developing children.

Following statistical measures were applied to the data collected for recognition and production scores obtained by 10 Intellectual Disability children and 10 typically developing children.

i) To obtain recognition and production scores across the above mentioned three conditions, descriptive statistical analysis was done.

ii) To examine pair wise difference between children with Intellectual Disability and typically developing Kannada speaking children, non parametric Manwhitney -U test was applied on the data.

iii) To examine pair wise difference between the conditions for two sets such as 5 repetitions (S1) and 10 repetitions (S2), non-parametric Wilcoxon Signed rank test was carried out on the data.

iv) Similarly, to examine the pair wise difference between the immediate and delayed recall conditions, Wilcoxon Signed rank test was carried out on the data.

To see whether the data obtained for analyzing recognition and production scores across all the three conditions (as mentioned above) follows normal distribution, Shapiro-Wilke's test for normality was carried out. The test results revealed that the data doesn't follow normal distribution that is data was skewed ($p<0.05$).Therefore, Non-Parametric tests were applied to see if there was any significant difference irrespective of the groups and within the group across all the conditions. To see significant difference between typically developing children and Intellectual Disability, Non-Parametric Mann-Whitney U-test was applied on the data. To examine the significant difference across the conditions: 5 v/s 10 repetition trial condition and Immediate v/s Delayed recall condition on recognition and production tasks, Wilcoxon Signed rank test was carried out on the data.

Totally eight variables were studied.

Table 3: *Expansion of variables considered in the study*

CONDITIONS	EXPANSION
NIS1	Normal Immediate recall subtest one
NIS2	Normal Immediate recall subtest two
NDS1	Normal Delayed recall subtest one
NDS2	Normal Delayed recall subtest two
I'IS1	ID Immediate recall subtest one
I'IS2	ID Immediate recall subtest two
I'DS1	ID Delayed recall subtest one
I'DS2	ID Delayed recall subtest two

Note:
N: Typically Developing Children and I': Intellectual Disability
I: Immediate Recall and D: Delayed Recall
S1 (Subtest 1): Novel words presented to children with 5 repetitions
S 2 (Subtest 2): Novel words presented to children with 10 repetitions.

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

Objective 1: Fast mapping abilities in children with Intellectual Disability and typically developing children: Recognition and production

The mean, median and standard deviation measures were obtained for variables: NIS1, NDS1, NIS2, NDS2, I'IS1, I'DS1, I'IS2 and I'DS2 for both recognition and production tasks are tabulated in table 4.

Table 4:

Mean, Median and standard deviation measures for children with Intellectual Disability and typically developing children in recognition and production tasks

VARIABLES	**RECOGNITION**			**PRODUCTION**		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.000	2.20	2.00	0.422
I'IS1	4.80	5.00	0.422	1.3	1.00	0.823
NIS2	5.00	5.00	0.000	2.60	3.00	0.516
I'IS2	5.00	5.00	0.000	1.7	2.00	0.483
NDS1	4.80	5.00	0.422	1.30	1.50	0.823
I'DS1	3.80	4.00	1.033	0.50	0.50	0.527
NDS2	5.00	5.00	0.000	1.50	1.50	0.527
I'DS2	4.30	4.50	0.823	0.70	1.00	0.675

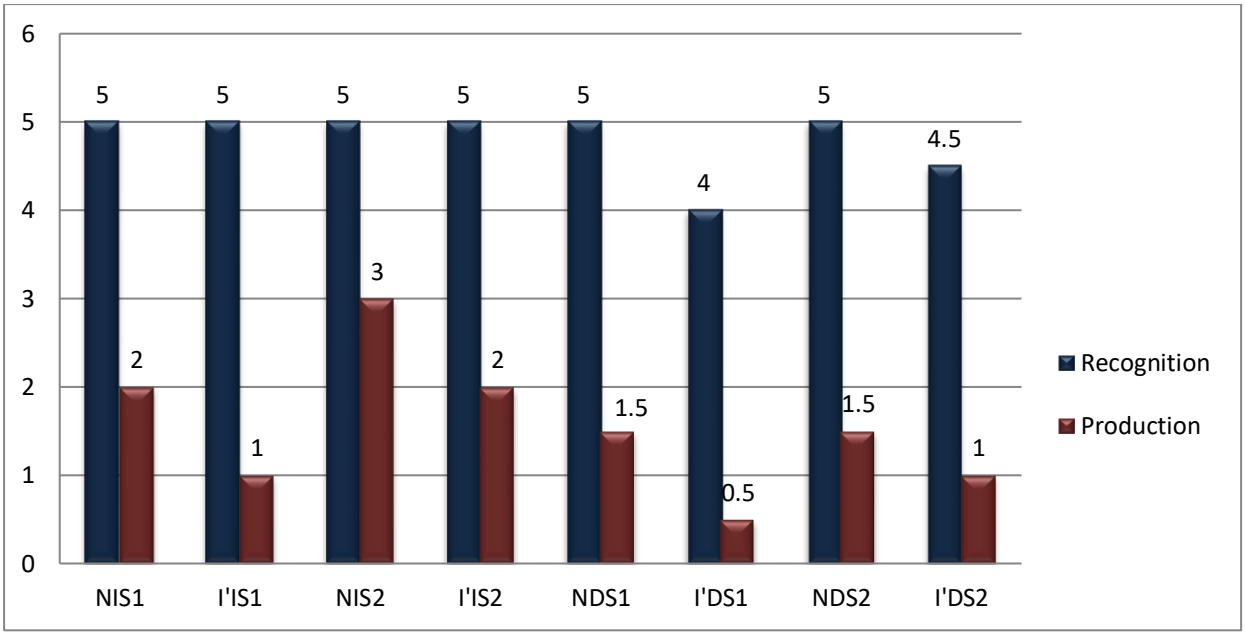

Figure2: Median of recognition and production tasks in Intellectual Disability and typically developing children

From Table 4 and figure 2, it was noted that the median scores for immediate recognition of Subtest 1 (S1) and Subtest (S2) in typically developing children and children with ID were '5' and '5' respectively. The median scores for immediate production of S1 in typically developing children and children with ID were 2 and 1 respectively whereas for immediate production of S2 were 3 and 2 respectively. The median scores for delayed recognition of Subtest 1 in typically developing children and children with ID were '5' and '4' respectively whereas, for delayed recognition of Subtest 2 were '5' and '4.5' respectively. The median scores for delayed production of S1 in typically developing children and children with ID were 1.5 and 0.5 respectively whereas for delayed production of S2 were 1.5 and 1 respectively. There was difference in median values between typically developing children and children with ID across recognition and production tasks. The median values were same (score of '5') for both typically developing children and children with ID in recognition task except the variables I'DS1 and I'DS2.There was difference in median scores between typically developing children and children with ID for both immediate and delayed

production of S1 and S2 where typically developing children performed better than children with ID for all the variables.

Overall, the median values were higher for both the groups in recognition than production tasks. Further, Manwhitney –U test was applied on the data to examine pair wise statistical significance between children with ID and typically developing children for both recognition and production tasks which is tabulated in table 5.

Table 5: *Comparison of performance in recognition and production tasks for children with ID and typically developing children*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	p value	[z]	p value
I'IS1-NIS1	-1.453	0.146	-2.711	0.007*
I'IS2-NIS2	0.000	1.000	-3.033	0.002*
I'DS1-NDS1	-2.426	0.015*	-2.216	0.027*
I'DS2-NDS2	-2.492	0.013*	-2.471	0.013*

***p<0.05-significant difference**

From Table 5, it is revealed that in recognition task there was a significant difference between children with ID and typically developing children for the delayed recognition of S1 (I'DS1-NDS1 |Z|=2.426, p=0.015) and delayed recognition of S2 (I'DS2-NDS2 |Z|=2.492, p=0.013) but no statistically significant difference observed for immediate recognition of S1 and S2. For production task, statistically significant difference was observed across all the pairs that is immediate production of S1 (I'IS1-NIS1 |Z|=2.711, p=0.007), immediate production of S2 (I'IS2-NIS2 |Z|=2.471, p=0.013), delayed production of S1 (I'DS1-NDS1 (|Z|=2.216, p=0.027) and delayed production of S2 (I'DS2-NDS2 |Z|=2.471, p=0.013).

Therefore, median scores and Mann Whitney-U test results suggest that typically developing children performed better than children with ID across all the tasks. And also both the groups performed better in recognition task compared to production task.

This can be explained in the following ways:

Earlier studies have recognized that the cognitive processes like attention, learning and memory underlie the process of fast mapping (Bloom, 2000; Hollich, Hirsh-Pasek, K., Bailey, L. M.,& Golinkoff, 2000). In other words, for successful novel word learning, the above mentioned cognitive processes play an important role and serves as essential resources to acquire new vocabulary.

Role of memory in word learning:

Memory is one of the important cognitive processes by which information/ message is encoded, stored, and retrieved. It also plays a crucial role in the process of novel word learning. Many research studies have shown that children with Intellectual Disability exhibit memory deficits which have a serious impact on their ability to learn different component of language (Courbois,1996: Rosenquist, Conners, & Ewoldsen, 2003: Jarrold, C., & Brock, J. 2012).

Gathercole, Service, Hitch, Adams & Martin (1999) found a strong connection between phonological memory skills and vocabulary acquisition in elderly children which suggests that phonological memory serves a pre-requisite for novel word learning. The operation of the phonological loop is related to vocabulary acquisition in typically developing children (ages 4-5 years) and the rate at which unfamiliar words are learned by adults (Gathercole & Baddeley, 1993).

The findings of the study is supported by Vallar & Papagno (1993) who conducted a single case study by considering 23-year old woman with Intellectual disability who had

relatively preserved functioning of phonological memory exhibited an excellent acquisition of vocabulary and foreign language learning skills. Therefore, the results suggest that intact phonological processing facilitates successful development of vocabulary and learning.

Similar research was carried out by Jarrold, Thorn and Stephens (2009) who studied the relationship between verbal short term memory, phonological awareness and novel word learning in typically developing children and children with Intellectual disability. The results revealed that typically developing children were able to learn phonological form of novel words but not the physical referent of new words whereas children with ID showed impaired verbal short term memory and impaired phonological form due to inaccurate phonological representation within short term memory which is required for novel word learning.

Conners et. al (2003) studied storage and rehearsal component of phonological memory in typically developing children and Individuals with Intellectual Disability. Their results revealed that both the groups did not differ in storage component of phonological memory whereas children with ID had difficulty in rehearsal component due to inefficient subvocal rehearsal function (Hulme & Mackenzie, 1992). Therefore, subvocal rehearsal processes are required in order to facilitate phonological store to maintain information in phonological code.

Hulme & Mackenzie (1992) concluded that verbal short-term memory is affected in individuals with intellectual disability due to inefficient or absent subvocal rehearsal processes which in turn affects long term memory which leads to poor access in retrieval. This is in support of previous study giving the interpretation that phonological memory deficits are present in individuals with ID which create a barrier in learning new words.

Lexical semantic networks:

Healthier the exposure, richer is the semantic network. Children require more exposure to learn lexical label (Rice, Buhr, & Nemeth, 1994; Gray, 2004).This implies that greater the exposure better is the ability to learn novel words. Overall the findings suggest that a healthy exposure leads to richer semantic network which in turn leads to better fast mapping skills.

Children with ID demonstrate weaker lexical-semantic representations of words than typically developing children (Nash & Snowling, 2008). Studies have shown that children with ID exhibit difficulty in comprehending how words relate to each another and how to incorporate new lexical-semantic information with previously learned one, which additionally substantiates diminished semantic networks in ID children.

Nash & Snowling (2008) particularly focused on semantics and have shown that children with ID exhibit poorer fast mapping abilities for semantic features. The semantic information provides a way for lexical acquisition, but children with ID are at disadvantage due to their poor lexical- semantic network and exhibit diminished depth of semantics. They also found that children with ID demonstrate difficulties in producing as many words as possible in all categories and particularly in verbs.

Hence from the above supporting studies it can be revealed that poor phonological memory and weaker lexical-semantic representations of words are some of the contributing factors for poorer performance by children with ID in novel word learning. In other words, children with ID demonstrate limited capacity in certain aspects of cognitive processes and substantially the production in ID could be impaired.

Objective 2: Effect of repetition: S1 (5 repetitions) v/s S2 (10 repetitions) after training phase: Recognition and Production

The mean, median and standard deviation measures were obtained for variables: NIS1, NIS2, NDS1, NDS2, I'IS1, I'IS2, I'DS1 and I'DS2 to compare the effect of practice trials for both recognition and production tasks in children with ID and typically developing children are tabulated in table 6.

Table 6: *Mean, Median and standard deviation measures for children with Intellectual Disability and typically developing children in recognition and production tasks*

VARIABLES	**RECOGNITION**			**PRODUCTION**		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.000	2.20	2.00	0.422
NIS2	5.00	5.00	0.000	2.60	3.00	0.516
NDS1	4.80	5.00	0.422	1.30	1.50	0.823
NDS2	5.00	5.00	0.000	1.50	1.50	0.527
I'IS1	4.80	5.00	0.422	1.3	1.00	0.823
I'IS2	5.00	5.00	0.000	1.7	2.00	0.483
I'DS1	3.80	4.00	1.033	0.50	0.50	0.527
I'DS2	4.30	4.50	0.823	0.70	1.00	0.675

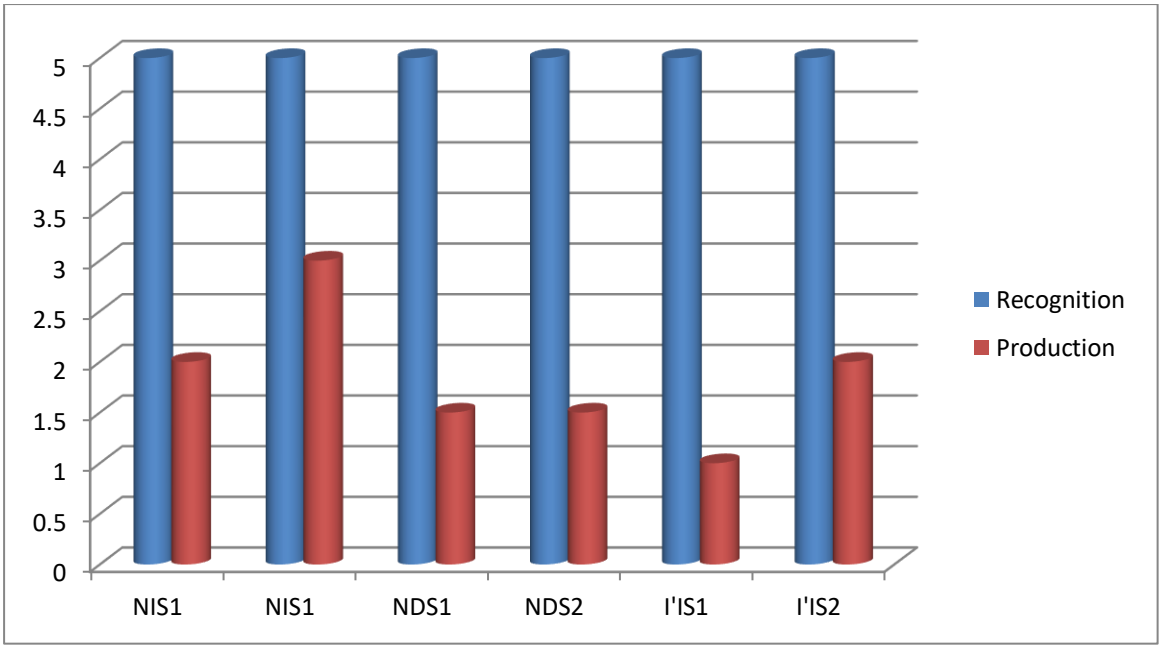

Figure 3: Median of recognition and production task in S1(5 Repetition) vs. S2(10 Repetition) trials

From table 6 and figure 3, it was noted that in typically developing children median scores for immediate and delayed recognition of S1 and S2 were the same (score of '5'). For immediate production of S1 and S2, the median scores were '2' and '3' respectively while delayed production of S1 and S2 were the same (score of 1.5). In children with ID, the median scores for immediate recognition of S1 and S2 were the same (score of '5') where as delayed recognition of S1 and S2 were '4' and '4.5' respectively. For immediate production of S1 and S2, the median scores were '1' and '2' respectively and delayed production of S1 and S2 were '0.5' and '1' respectively.

Overall, the performance was better for recognition task for 5 and 10 repetitions compared to production task in both the groups. Wilcoxon Signed Rank test was applied on the data to examine pair wise statistical significance on S1 v/s S2 for both recognition and production tasks which is tabulated in table 7.

Table 7: *Comparison of S1 and S2 performance for recognition and production tasks in children with ID and typically developing children*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	p value	[z]	p value
NIS1-NIS2	0.000	1.000	-1.633	0.102
NDS1-NDS2	-1.414	0.157	-0.587	0.557
I'IS1-I'IS2	-1.414	0.157	-1.155	0.248
I'DS1-I'DS2	-1.406	0.160	-0.707	0.480

***p<0.05-significant difference**

From table 7, on analyzing the effect of repetition of 5 v/s 10 repetition for recognition task, the results revealed that there was no statistically significant difference found across the variables like NIS1-NIS2 (|Z|=0.000, p=1.000), NDS1-NDS2 (|Z|=1.414, p=0.157), I'IS1-I'IS2 (|Z|= 1.414, p= 0.157) and I'DS1-I'DS2 (|Z|=1.406, p=0.160). Similarly, for production task, there was no statistically significant difference observed across the variables like NIS1-NIS2 (|Z|= 1.633, p= 0.102), NDS1-NDS2 (|Z|=0.587, p=0.557), I'IS1-I'IS2 (|Z|=1.155, p=0.248) and I'DS1-I'DS2 (|Z|=0.707, p=0.480). Therefore, median scores and Wilcoxon Signed rank test results suggest that for both 5 and 10 repetitions, the performance was same in both recognition and production tasks. And also performance was better in recognition task for both 5 repetitions and 10 repetitions compared to production task in both the groups.

As children with ID received extended training of novel words, their performance was correspondingly similar to typically developing children across both recognition and production tasks. Practice effects are, of course, ubiquitous in learning (Newell & Rosenbloom, 1981). In most of the models of lexical retrieval, the accessibility of a word depends on the speaker's past history of use of words , namely, how often and how recently a

word has been practiced (Anderson & Schooler, 1991). Gershkoff-Stowe & Smith (1997) reported a rise and fall in retrieval errors where more errors observed when child just began to produce many new words and errors rapidly declined in the weeks that followed. They attributed this curvilinear pattern is to changes in strength of activation of new words in response to increased competition.

Therefore the authors concluded that systematic changes observed in lexical processing arise in children as a result of their ability to learn new words with repeated practice and from continued exposure to familiar words that is, as the number of training trials increases, the ability to learn novel words by younger children progresses. MacDonald & Christiansen (2002) suggested that number of input frequencies directly strengthen the knowledge representation of the language. Therefore, the above studies support the notion that the more often the word is selected for comprehension/production; the stronger will be the level of lexical activation and hence greater the probability of access.

In other words, novel word learning progresses proportionately when the number of training trial increased due to the reason that more the number of repeated trials, the more will be the strengthening of 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 & Hahn, 2007). According to Parallel Distributed Model proposed by McClelland (1995), over the course of extended training, the lexical network successively readjusts the connection weights and results in representing the information. In this way, knowledge about language is stored in the lexical network connections and these connections are used for processing the information.

Automaticity is considered as a crucial process which emerges gradually as a result of sustained and consistent practice. Recent studies employing fMRI techniques have indicated noticeable changes in the brain activity secondary to the development of automaticity

(Schneider & Chein, 2003). Specifically, there is a reduction in the amount of cortical activity associated with attentional control and working memory as new skills are acquired. This change in cortical activity is attributed to a shift from serial to parallel processing. A similar shift may occur in the act of learning new words which is accomplished through fast mapping phenomenon associated with the vocabulary spurt (Reznick & Goldfield, 1992; Mervis & Bertrand, 1994).

This has been supported by few ERP studies which revealed an emerging specialization of neural systems which mediate language comprehension before and after the period of rapid vocabulary growth in infants and this neural specialization are linked to language experience (Mills, Coffrey-Corina, & Nelville, 1997). Specifically, studies have shown that the neural changes occur as a function of vocabulary size and familiarity with individual novel words and also neural processes become more automatic when the brain's activity needed to discriminate words decreases while working memory capacity increases (Mills, Plunkett, Prat, & Schafer, 2005).

Since, greater exposures lead to stronger mapping of new words; children should possess better recognition and production abilities. But this is not supported by the findings of the present study as this study indicated poor production skills compared to that of recognition. And also there was no significant difference observed in practice effects between 5 v/s 10 repetition trials.

There are three possible explanations for this: Firstly, the performance of 5 repetition trials would be as 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. Retrieving an item from the memory requires more information from storage than recognizing an item. (Postman, Jenkins,& Postman, 1948).The production task in mapping a picture stimulus/ an auditory word requires many associations which need to be remembered

in order to answer declarative statement. The declarative memory system can be as fast as possible, even after a brief, single exposure to the information. Retrieval of information from declarative system is often conscious through recognition and recall processes (Squire & Knowlton, 1995). Children with ID demonstrate reduced cognitive processing abilities. (Weismer, 1997; Weismer & Hesketh, 1998; Montgomery, 2002; Hoffman & Gillam, 2004).The steps involved in cognitive processing includes attention, encoding into short term memory followed by long term memory, access and finally retrieval.

In the present study the production task directly focuses on children's intentional declarative memory. The younger children learn to produce declarative memory by associating working and procedural memory (Neville, Coffey, Holcomb, & Tallal, 1993; Ullman & Pierpont, 2005; Fonteneau & Lely, 2008). 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 which could be attributed to poorer production scores. On the other hand, children with ID exhibit difficulty in word rehearsal (Hulme & Mackenzie, 1992; Conners, 2003) which in turn affects their declarative memory. This study supports the findings that children with ID have poor production abilities compared to typically developing children.

Objective 3: Immediate Recall v/s Delayed Recall: Recognition and Production

The mean, median and standard deviation measures were obtained for variables: NIS1, NDS1, NIS2, NDS2, I'IS1, I'DS1, I'IS2 and I'DS2 to compare the performance of children with ID and typically developing children on immediate and delayed recall tasks for both recognition and production are tabulated in table 8.

Table 8: *Mean, Median and standard deviation measures for children with Intellectual Disability and typically developing children in recognition and production tasks*

VARIABLES	**RECOGNITION**			**PRODUCTION**		
	Mean	Median	SD	Mean	Median	SD
NIS1	5.00	5.00	0.000	2.20	2.00	0.422
NDS1	4.80	5.00	0.422	1.30	1.50	0.823
NIS2	5.00	5.00	0.000	2.60	3.00	0.516
NDS2	5.00	5.00	0.000	1.50	1.50	0.527
I'IS1	4.80	5.00	0.422	1.3	1.00	0.823
I'DS1	3.80	4.00	1.033	0.50	0.50	0.527
I'IS2	5.00	5.00	0.000	1.7	2.00	0.483
I'DS2	4.30	4.50	0.823	0.70	1.00	0.675

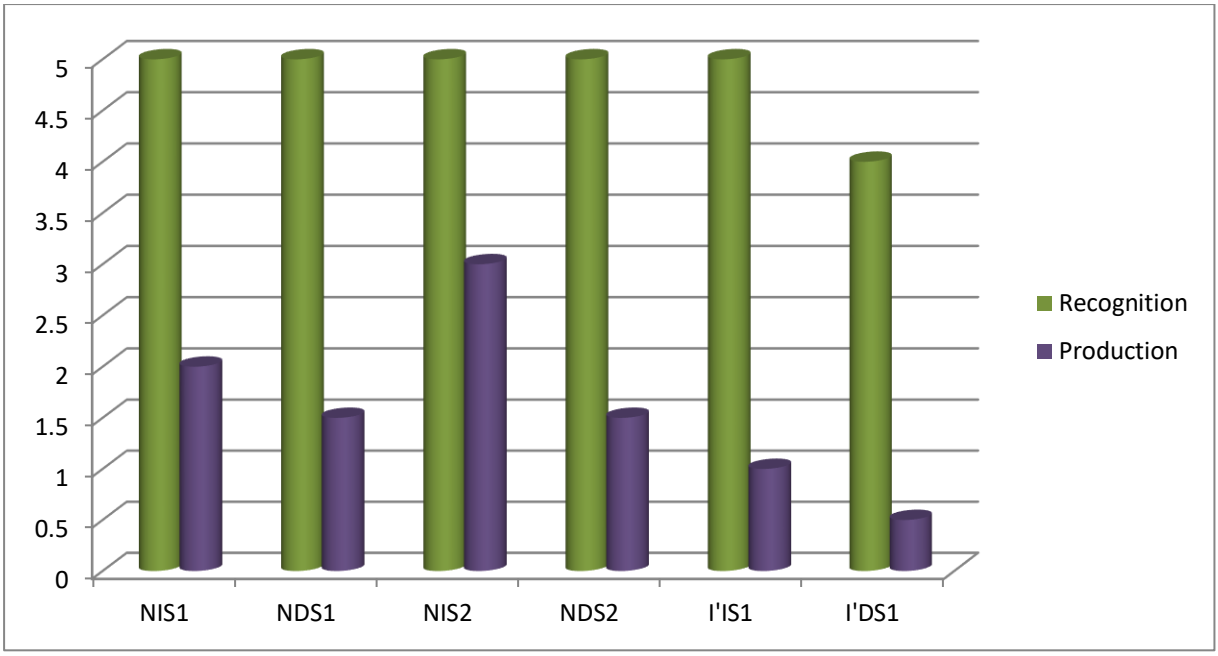

Figure 4: Median of recognition and production tasks in Immediate v/s Delayed recall conditions

From table 8 and figure 4, in typically developing children median scores for immediate and delayed recognition of S1 and S2 were the same (score of '5'). For immediate and delayed production of S1, the median scores were '2' and '1.5' respectively and for immediate and delayed production of S2, the median scores were '3 and '1.5' respectively. In children with ID, the median scores for immediate and delayed recognition of S1 were '5' and '4' respectively whereas immediate and delayed recognition of S2 were '5' and '4.5'respectively. For immediate and delayed production of S1, the median scores were '1' and '0.5'respectively and for immediate and delayed production of S2, the scores were '2' and '1' respectively.

Therefore, the results revealed that median scores for immediate recall were better than delayed recall for both recognition and production tasks. And also, recognition scores were better than production scores for both immediate and delayed recall tasks in both the groups. Wilcoxon Signed rank test was applied on the data to examine pair wise statistical

significance between on immediate and delayed recall for both recognition and production tasks which is tabulated in table 9.

Table 9*: Comparison of performance across Immediate v/s Delayed recall conditions in recognition and production tasks in children with ID and typically developing children*

PAIRS	RECOGNITION		PRODUCTION	
	[z]	p value	[z]	p value
NIS1-NDS1	-1.414	0.157	-2.251	0.024*
NIS2-NDS2	0.000	1.000	-2.598	0.009*
I'IS1-I'DS1	-2.232	0.026*	-2.271	0.023*
I'IS2-I'DS2	-2.070	0.038*	-2.428	0.015*

***p<0.05-significant difference**

From table 9, on analyzing the effect of Immediate v/s Delayed recall for recognition task, the results revealed that there was no statistically significant difference found except the variables like I'IS1-I'DS1(|Z|= 2.232, p= 0.026) and I'IS2-I'DS2 (|Z|= 2.070, p=0.038). For production task, there was statistically significant difference observed across all the variables like NIS1-NDS1 (|Z|= 2.251, p= 0.024), NIS2-NDS2 (|Z|=2.598, p=0.009), I'IS1-I'DS1 (|Z|=2.271, p=0.023) and I'IS2-I'DS2 (|Z|=2.428, p=0.015).

Overall, median scores and Wilcoxon Signed rank test results suggest that performance for immediate recall was better than delayed recall in both the groups across recognition and production tasks.

The findings of this study support the study done by Deepak (2016), wherein he found that bilingual children in the age range of 5-8 years were able to recognize and name novel words better in immediate recall condition compared to delayed recall. Learning and retention of novel words evolve from three memory processes: encoding, storage and retrieval. The older memories are stronger and have richer network whereas newer memories are susceptible to conflicts or they may interfere with older memories.

In order to make newer memory stronger, sufficient amount of exposure as well as number of rehearsals are required (Suzuki & Frankland, 2004). Hence greater exposures to new words result in better learning and memory retention of those words over the older learnt words. Immediate recall of newly learned words are triggered by short term memory which is independent of any rehearsals whereas delayed recall is by long term memory which is directly dependant on frequent rehearsals. Hence this explains the superiority of immediate recall over delayed recall.

Fast mapping phenomenon may not be sufficient enough to improve lexicon. Hence, children may not retain all the words learnt from the fast mapping process. Therefore, a subsequent extended slow mapping would be necessary for novel word learning. Hence 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 (Deepthi , 2009). So after the stage of fast mapping there should be a stage of slow mapping in order to make delayed recall abilities stronger which in turn requires sufficient amount of exposures and rehearsals. This could be another possible reason for immediate recall to be better than delayed recall and this finding supports the study done by Trupthi (2009).

From overall statistical analysis of the study, following results were revealed:

1. Typically developing children performed better than children with ID across recognition and production tasks. And also both the groups performed better in recognition task compared to production task.

2. In both children with ID and typically developing children, practice effect was not seen that is for both 5 and 10 repetitions, the performance was same in both recognition and production tasks. And also performance was better in recognition task for both 5 repetitions and 10 repetitions compared to production task.

3. In both children with ID and typically developing children, immediate recall was better than delayed recall for both recognition and production tasks. And also, recognition was better than production for both immediate and delayed recall tasks.

CHAPTER V

SUMMARY AND CONCLUSION

The current study aimed to investigate the fast mapping abilities in children with Intellectual Disability across recognition and production tasks. In this study, two groups of participants were recruited, that is the control group and the clinical group. Control group consisted of 10 typically developing children aged 3-4 years and clinical group consisted of 10 children with ID. Children were trained for a set of 10 novel words in Kannada. Out of ten novel words, five words were trained for 5 repetitions and another five words were trained for 10 repetitions. These words were trained through audio-visual mode that is words were presented using their respective pictures and audio recordings. After the training phase, children were tested for recognition and production tasks in terms of immediate and delayed recall task. Hence results were unfolded and studied across three conditions; 1) Comparison of fast mapping abilities in children with ID and typically developing children across recognition and production tasks 2) Effect of training phase: 5 (S1) v/s 10 (S2) repetitions after training phase in children with ID and typically developing children on fast mapping 3) Immediate (I) v/s Delayed recall (D) abilities of novel words in children with ID and typically developing children. Scores obtained in each condition were calculated separately for each participant and overall data was statistically analyzed using SPSS software version IBM 21. The obtained data was subjected to descriptive statistics and based on the normality criteria, non-parametric tests were applied.

When comparing fast mapping abilities in children with ID and typically developing children across recognition and production tasks, results indicated that typically developing children performed better than children with ID across recognition and production tasks. And also both the groups had better fast mapping skills in recognition task compared to production task. This was attributed to magnitude of language exposure. Poor production of novel words

in children with ID when compared to typically developing children could be attributed to impaired phonological memory, weaker lexical-semantic network and impaired retrieval/ access for production.

On examining the effect of 5 v/s 10 repetition trials, results revealed that there was no significant practice effect seen for both 5 and 10 repetitions. This may be ascribed to the fact that the performance of 5 repetition trials would be as effective as that of 10 repetition trials. Secondly the children are in the process of acquiring intentional declarative memory skills which could be attributed to least difference between two types of repetition tasks.

On examining the effect of immediate v/s delayed recall, the results revealed that performance was better in immediate recall condition compared to delayed recall. Greater exposures to new words result in better learning and memory retention of those words over the older learnt words. Immediate recall of novel words is triggered by short term memory which is independent of any rehearsals, whereas delayed recall is actively functional by long term memory which is directly dependant on frequent rehearsals. Hence this explains why immediate recall is better than delayed recall.

From the current study, it can be concluded that Fast mapping is a valid process for achieving vocabulary acquisition in children with Intellectual Disability. Recognition is specifically easier for any child compared to production, since the nature of demands imposed by the former is least. Even though, children learn new words with a brief, single exposure to them through fast mapping phenomenon, it may not be sufficient enough for the development of lexicon. Hence, a subsequent extended slow mapping would be necessary for novel word learning. Fast mapping can be applied across settings and situations to introduce new vocabulary. Children with Intellectual Disability responded well to the fast mapping strategies of novel word learning.

Implications of the study:

- The current study adds to the existing knowledge about how novel word learning takes place in children with ID.
- The results of this study can be utilized to observe the effects of practice trials in different clinical population since it results in strong lexical connections to the particular novel word through both auditory and visual modes.
- Knowledge about how novel word learning takes place through fast mapping process helps us in planning language intervention strategies for children with ID.
- This study can be used as a reference for forthcoming studies focusing on how novel word learning takes place in other clinical population.

Limitations of the study:

- The current study considered a small sample size of 10 subjects in both clinical and experimental group. Hence generalization of the study's findings to larger population may be restricted.
- Word length has an effect on novel word learning. In the current study, this variable was not controlled as it included only bi-syllabic and tri-syllabic novel words. Effect of word length on fast mapping abilities can be studied independently.
- Only children with BAI (IQ: 70-80) and Mild ID (IQ: 50-69) were studied.

Future directions:

- Fast mapping abilities can be studied in children with Intellectual Disability across different age groups and see how these words are acquired by children in each age group.

- Fast mapping abilities in children with different degrees of Intellectual Disability can be studied.

- Fast mapping abilities can be studied across different lexical categories like noun v/s verbs across different age groups.

- Effect of word length on fast mapping skills can be studied.

- Reaction time taken for learning novel words can be incorporated in future studies.

- Fast mapping abilities in children with Intellectual Disability can be compared with other disordered population like Specific Language Impairment, Autism etc.

- Long term retention of fast mapped novel words can be studied.

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APPENDIX (A)

Sl. No	S1 (5 repetitions)			
	CB1	**CB1**	**CB2**	**CB2**
1	ಗೋಳ	/goḷa/	ಮುತ್ತು	/mUṯṯU/
2	ಚರಕ	/ʧaraka/	ಬಾವಲಿ	/ba:valI/
3	ಕೊಡಲಿ	/ko:dalI/	ಪರದೆ	/paraḍ̯Ɛ/
4	ಧನಿಯ	/ḏanIja/	ತಂಬೂರಿ	/ṯamburI/
5	ಪಗಡೆ	/pagadƐ/	ಇದ್ದಿಲು	/Iḍ̯ḏ̯IlU/

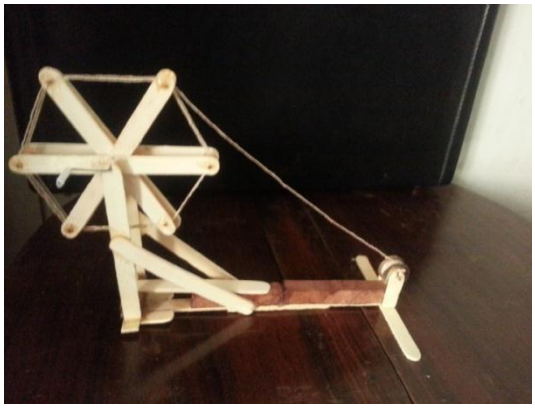
Sl. No	S2 (10 repetitions)			
	CB1	**CB1**	**CB2**	**CB2**
1.	**ಗದೆ**	/gaḍ̯Ɛ/	**ಗಂಧ**	/ganḏa/
2.	**ಕಳಶ**	/kaḷaʃa/	**ಬಸಳೆ**	/basaḷƐ/
3.	**ಕರಳೂ**	/karaḷU/	**ಅಣಬೆ**	/aṇ̯abƐ/
4.	**ತುಳಸಿ**	/ṭ̯UḷasI/	**ಕಾಗದ**	/ka:gaḏa/
5.	**ಕಿರೀಟ**	/kIriTa/	**ಕೊಳವೆ**	/koḷavƐ/

Note:
CB1: Counterbalance 1
CB2: Counterbalance 2
S1-A: Subtest 1 (5 repetition)
S2-A: Subtest 2 (10 repetitions)

APPENDIX (B)

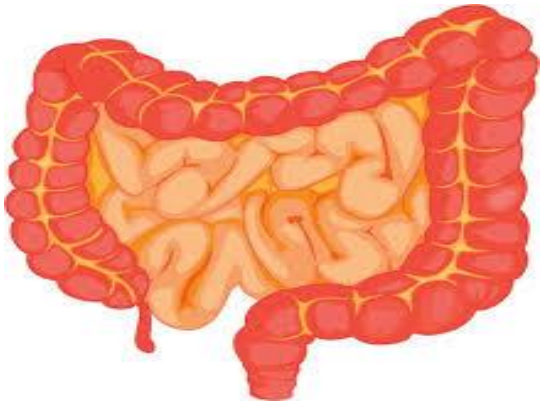
Pictures used to teach novel words

CB1: S1-5 repetitions



CB2: S1-5 repetitions

CB1: S2-10 repetitions



CB2: S2-10 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 having 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