SENTENCE RECOGNITION IN BILINGUAL CHILDREN WITH AND WITHOUT SPECIFIC LANGUAGE IMPAIRMENT

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May, 2016

CERTIFICATE

This is to certify that this dissertation entitled **"Sentence Recognition in Bilingual Children with and without Specific Language Impairment"** is the bonafide work in part fulfilment of the degree of Master of Science (Speech-Language Pathology) of the student (Registration No. 14SLP008). This study 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 Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled **"Sentence Recognition in Bilingual Children with and without Specific Language Impairment"** is the result of my own study under the guidance of Dr. K.C. Shyamala, Professor of 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 Diploma or Degree.

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DEDICATED TO

MY PARENTS

SHYAMALA MA'AM

FRIENDS

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INTRODUCTION

A classical definition of specific language impairment(SLI) is exclusionary in nature and it is defined as a form of developmental language disorder occurring in the absence of mental retardation, sensory deficits, frank neurological damage, serious emotional problems and environmental deprivation (Leonard, 1998).Profoundly impaired morpho-syntactic abilities, particularly morphology is the hallmark of SLI (Bishop,Adams, & Norbury, 2006; Leonard, Caselli, Bortolini, McGregor, & Sabbadini, 1992; Rothweiler, Chilla, & Clahsen, 2012).A study done by Rothweiler et al., (2012) accounts poor morpho-syntactic skills in comprehension and expression in children with SLI.

SLI can be explained using two approaches. The first approach proposes that language deficits in SLI are primary (Van der Lely, 2005). The other approach points that language deficits in SLI are secondary to impaired cognitive functioning. Researchers of the second approach have tried to find which cognitive factors lead to language impairment in SLI which are reduced processing rate and capacity limitations(e.g., phonological working memory: Gathercole & Baddeley, 1990).

To use language in an effective manner, one should have coordination of linguistic, social and cognitive resources. Children with are SLI thought to have only primary linguistic deficits however; the recent studies have put forth the results that they exhibit impaired cognitive functioning. Children with SLI may exhibit cognitive and language deficits (Im-Bolter,Johnston & Pascual-Leone, 2006).Theories which exclusively focus on linguistic aspect may fail to explain the possible difficulties that are seen in children with SLI,

therefore, the researchers need to consider the alternative explanation of cognitive processing aspect to account for the varied difficulties exhibited by these children.

On this note, in children with SLI the interface between the semantics and morpho-syntax is an interesting area to inquire as it allows us to separate the morpho-syntactic and cognitive abilities. In the past there have been many studies on morpho-syntax area in children with SLI, but little information is known about the role of cognitive aspect on morpho-syntax level.

In the present scenario, the number of people using two or more languages is significantly increasing. Speaking several languages leads to economical, cultural and cognitive advantage. But it's not clearly known that whether simultaneous or successive bilingual get cognitive advantage.

Bilingual advantage hypothesis states that, switching between, and alternately inhibiting the two languages offers better central executive functions (Bialystok, Craik, Green, & Gollan, 2009).Some of the findings that supports bilingual advantage hypothesis, bilingual children demonstrate cognitive advantages in a variety of domains (Bialystok &Majumder, 1998;Bialystok, 2010; Bialystok & Viswanathan, 2009), which includes problem solving (Bialystok & Codd, 1997; Kessler & Quinn, 1980), understanding of quantity (Bialystok, 1999), knowledge of grammar (Bialystok, 1988), and theory of mind(Kovacs, 2009; Goetz, 2003).Children with SLI clearly have no capacity limit in learning two languages. Bilingual children with SLI demonstrate similar language abilities in each of the language relative to monolingual children with SLI who speaks the same languages (Paradis, Crago, Genesee, & Rice, 2003).

A conditional clause expresses the idea that the 'if'clause states the condition, and the main clause states the result. Interpretation of conditional clauses requires high cognitive

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ability that is to create a hypothesis in memory. A study done by Yarbay Duman et al. (2015) on conditionals and non-conditionals in children with SLI and typically developing children, showed results that both groups found greater difficulty in comprehending conditional clauses compared to non-conditionals.

Semantically reversible sentence is a sentence where the subject and object of the sentence is reversed but still the sentence remains meaningful. For example ("Leopard races the deer") in this sentence when the subject "leopard" and object "deer" is reversed ("Deer races the leopard"), the sentence remains meaningful even though the sentence leads to a new meaning. In contrast to Reversible sentence, there is Irreversible sentence where the meaning will be lost and even does not leads to a new meaningful sentence when the subject and object of the sentence is reversed (Ex. "The dog chews the bone" to "The bone chews the dog").

Comprehension of semantically reversible sentences in typically developing children and in adults places more demand and are more prone to misinterpretation when compared to irreversible sentences. This added difficulty may be attributed to reduction in the constraints on thematic role assignment of the subject and the object for reversible sentences. Many recent studies have reported that Children with SLI and adults with "agrammatic" Broca's aphasia have difficulty in comprehending semantically reversible sentences. In the literature there are three explanations that is syntax-specific deficit, deficit in syntactic-semantic integration (a process which is crucial in understanding sentences and the difficulty in sentence processing is attributed to poor phonological working memory. A study done by Montgomery (1995) revealed that poor comprehension of redundant (longer) sentences in children with SLI was accounted to the diminished phonological working memory capacity. Stavrakaki (2001) conducted a study on comprehension of semantically reversible relative clauses in children with SLI and typically developing group. The results revealed that

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children with SLI performed poorly when compared to their counterparts and this result was attributed to their deficit in the competence grammar. Another study by Richardson et.al (2010) on neural activation for reversible sentences using fMRI technique revealed that there was an increased neural activation in anterior left temporo-parietal region for processing of reversible sentences and the same region was activated for a articulation task. This finding supports the hypothesis that comprehension of semantically reversible sentences may be attributed to the sub-articulation component of phonological working memory in children with SLI.

Need for the study

From the past, there is no definite consensus among the professionals in diagnosing children with SLI. The term SLI has been reserved while diagnosing them. During the assessment of children with SLI, the clinicians consider only linguistic aspects in them.

There is an increase in number of research studies carried out in the western context in the area of morpho-syntax and cognitive functioning i.e. phonological working memory using comprehension of grammatically complex sentences using performance based tasks and processing of the same kind sentences using imaging techniques. Considering both linguistic and nonlinguistic aspects during the assessment of bilingual children with SLI may give insights about the nature of the language impairment and bilingual advantage in them. The nature of underlying interface level of morpho-syntax and semantics (which uses higher cognitive mechanism using sentence comprehension tasks) has not been studied in the Indian context. Hence, there was a need to study the above issues.

Aim of the study:

1. To study the comprehension of conditional clauses and semantically reversible sentences in children with SLI and typically developing children.

*Objectives of the study***:**

1. To compare sentence (conditional and reversible) comprehension abilities in bilingual children with SLI and typically developing peers.

2. To compare comprehension abilities across conditional and non-conditional clauses and reversible and irreversible sentences.

Chapter-II

Review of literature

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

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

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

Children with SLI perform poorly on standardized language test batteries exhibiting below age expectations. These children with SLI portray a delayed in acquiring first word and further two-word combinations which extend the delay in overall language development to school age years. In other words, it can be said that children with SLI will be manifested as late talkers in the early days, but few late talkers will lead to SLI and others will be resolved. The children with SLI who manifests the delay in language development in school age will exhibit their poor abilities in reading and writing skills which is termed as Learning Disability.

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

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

Bilingualism

Speaking two or more languages for economical, educational, cultural and other beneficial reasons are increasing due to global expansion. In a country like India which has a very rich culture and variety of languages spoken, an individual will be exposed two or more languages due to social and educational consequences. Bilingualism means learning two languages but the course of development of these languages varies among the individuals due to the patterns of exposures to the languages and the social context they live in.

There is an advantage being bilingual than monolingual and it is called bilingual advantage. Bilingual advantage offers better central executive function. Bilingual children are similar to monolingual children in their milestones during language acquisition functions (Bialystok, Craik, Green, & Gollan, 2009).

Goetz (2003) studied effect of bilingualism on development of theory of mind in 3 year and 4 year old English monolinguals, Chinese mandarin monolinguals and English-mandarin bilingual children using three tasks named appearance-reality, level 2 perspective-taking and false-belief tasks. It was found that English-mandarin bilinguals outperformed the monolinguals in all the tasks showing greater inhibitory control ability, socio-linguistic interaction and meta-linguistic skills due to bilingual advantage. On similar lines, a study by Bialystok, Calvo and Morales (2013) reported that bilingual children performed better compared to monolingual children when the task required higher execution abilities and showing better working memory in them.

Filippi (2012) studied bilingual advantage in sentence comprehension task in 60 normal adults where 20 were English-Italian bilinguals,20 English monolinguals and 20 Italian monolinguals. The task was to withstand the language interference in order to interpret the sentence. The author found that Bilingual group was better in controlling the language

interference during the sentence comprehension when compared to the other groups. On similar lines, Filippi (2015) found that bilingual advantage of controlling the language interference will be developed early in the childhood and it will be maintained throughout the life in 7 to 10 year old monolingual and bilingual children in comprehending active and passive voice sentences.

It is evident that there is a difference in receptive and expressive vocabulary among monolingual and bilinguals. A study reviewed by Bialystok and Luk (2012) combined the data of 20 studies which included 797 monolinguals and 808 bilinguals within the age range of 17 to 89 years and they found that monolinguals had significantly greater receptive vocabulary scores when compared to their counterpart group.

It is not clearly known that whether successive, simultaneous or differing degree of bilingualism gets the benefits of bilingual advantage. Bialystok and Majumder (1998) studied three groups where English monolinguals, French-English balanced bilingual and Bengali-English partially bilingual for non-linguistic task requiring control of attention. It was found that balanced bilinguals group performed significantly better than the two groups and signifying balanced bilinguals get better bilingual advantage and they were able to transfer it to non-linguistic tasks.

Bilingualism and SLI

For children with SLI learning two languages is not appropriate developmental option because of their limited capacity to learn a language. It would be burden for children with SLI to acquire two languages. According to Miller (2001) slowing hypothesis, children with SLI have poor speed of processing which restricts them to learn, store and retrieve the linguistic and non-linguistic elements and this will hinder their language development. According to slowing hypothesis, if children with SLI learn two languages, they do not show

delay in their language development not only when compared to age matched typically developing monolingual peer but also when compared to a children with SLI who are monolingual. Contradicting the above discussion, many of the researchers have argued that learning two languages does not impoverish the language development in children with SLI.

Throughout the literature, the researchers have tried to find the benefit of bilingualism on children with Specific language Impairment. One of the evidence puts a note that bilingual SLI exhibit more grammatical difficulties when compared to their monolingual SLI children. The above evidence was supported by two studies, Crutchley, Conti-Ramsden and Botting (1997) compared the morpho-syntactic abilities in mono-lingual and bilingual children with SLI.It was found that bilingual children with SLI were poor in morpho-syntactic abilities when compared to the mono-lingual counterparts. Paradis and Crago (1998) found that bilingual children with SLI were poor in use of tense markers when compared to the mono-lingual group.

A case study by Restrepo and Kruth (2000) described linguistic abilities of bilingual typically developing child and child with specific language impairment. They concluded that bilingual child with SLI showed significantly more error in morpho-syntax and less variety of sentence types and grammatical forms when compared to bilingual typically developing child and mono-lingual child with SLI.And also showed language loss in first language after the exposure to the second language.

Contrary to the above studies, a study by Paradis, Crago, Genesee and Rice (2003) compared French-English bilingual children with SLI with French and English monolingual children with SLI for morpho-syntactic abilities. After analyzing spontaneous speech sample of the three groups, it was found that no difference in morpho-syntactic abilities among the three groups. The results concluded that children with SLI can learn two languages which do

not hinder the performance atleast in morpho-syntactic skills. Roeper (2012) investigated the benefit of bilingualism benefit on children with SLI and concluded that second language acquisition helps in acquiring both the languages in them.

SLI and Processing of sentences

In the recent times, the main focus of research in SLI is processing and linguistic approaches. In terms of processing approaches, the role of memory on language tasks mainly short-term memory tasks which include sentence imitation, non-word repetition found to be a clinical marker in diagnosing SLI (Gathercole and Baddeley, 1990).The speed of processing in children with SLI has been found to be slow in reaction time tasks using linguistic and non-linguistic paradigm (Miller, kail, Leonard and Thomblin, 2001). Due to deficit in working memory capacity, children with SLI show discrepancy in processing tasks.

To quote few studies about processing in SLI, a study by Ramsden (2003) compared monolingual SLI with typically developing children who were in the age range of 4 to 6 years for 2 processing tasks (Non-word repetition and digit recall) and 2 linguistic tasks (Past tense task and Noun phrase task). It was found that monolingual SLI group performed very poorly when compared to their counterparts highlighting that children with SLI exhibit processing difficulties.

Tallal (1981) proposed that children with SLI exhibits deficits in speech processing. They show difficulty in processing rapid and sequential speech information. Children with SLI are poor in differentiating short and long duration speech, voice and voicing contrasts. Tallal also quoted that processing rapid and sequential information is not only restricted to speech but also found in visual and tactile modalities.

Studies on role of working memory in processing of sentences in SLI became an interesting topic for the researchers to know more about the processing and linguistic approach in this group. One such study by Montgomery (1995), where he investigated the role of phonological working memory on processing of sentences in children with SLI and typically developing children. The results gathered from this study revealed that children with SLI were able to repeat fewer 3 to 4 syllable word length and can comprehend only redundant-longer sentence than short non-redundant sentences when compared to typically developing children indicating poor phonological working memory capacity which hinder their performance on comprehension of sentences. Another study by Montogomery and Evans (2013) did a similar study in the same line where they investigated the association of phonological working memory and attentional capacity with the comprehension of sentences in children with SLI and typically developing children. The study included three groups of participants, school age children with SLI, age matched typically developing children and language matched typically developing children .All the three groups completed non-word repetition task, simple and complex sentence comprehension task and completing language processing task. In the study they have used simple sentences and complex sentences (reversible sentences and reflexive sentences).The results of the study were that children with SLI performed poorly on all three tasks when compared to the other two typically developing children group. On comprehension of complex sentences, children with SLI and language matched children performed poorly when compared to age matched typically developing children. The results indicate that comprehension of complex grammar is highly cognitive demanding task for school age children with SLI due to their poor working memory capacities. To support the above mentioned study, Leonard, Deevy, Fey and Brendin-oja (2013) compared children with SLI and typically developing children for sentence comprehension using picture identification task. Sentences were varied in their length or

cognitive complexity (low, intermediate and high complex) and expected to point the target picture among the four pictures after listening to the target sentence. Results of the study was children with SLI performed very poorly when complexity of the sentence increased than typically developing children indicating their diminished working memory capacity to allocate and retain the elements of the target sentence to interpret the sentences.

From the studies discussed earlier, it was pointed out those children with SLI exhibit poor working capacity (phonological working memory). The phonological working memory helps in to perform simultaneous activities by storing information in it for a short duration of time during the act of processing the speech. Through the variety of tasks like non-word repetition, sentence imitation, digit span etc, the researchers have highlighted the role of phonological working memory. Due to the poor phonological working memory capacity, the children with SLI perform poor on the above mentioned tasks. The role of phonological working memory is also important in comprehension of complex language elements. In the process of comprehension of complex sentences like longer sentences, passive voice sentences, conditional sentences, reversible sentences etc demands complex cognitive processes like phonological and memory process i.e. to perceive, encode, storing and retrieval of language elements in comprehension or production of the target linguistic stimuli.

Conditional sentences

A conditional clause expresses the hypothetical condition and result. Conditional sentence contains two clauses in it and they are dependent clause which states the condition and main clause which points the result. An example for the conditional sentence is "If it rains, then the classes will be cancelled". In this sentence, "if it rains" acts as dependent clause expressing the condition and "the classes will be cancelled" will be main clause

depicting the consequence or result. The condition may either antecede or follow the consequence and it is evenly potential to say "The classes will be cancelled if it rains".

In simple, conditional sentences can be of two types and those are factual type and counterfactual type. Factual conditionals express the universal fact, a certainty or science law etc. An example of factual type is "If you heat water to 100 degrees, it boils". Counterfactual conditionals expresses a hypothetical condition which may be past, present or future, the condition may not always agree with the consequence. An example for counterfactual type is "If I were king, I could have thrown you out of the kingdom". Comparing factual and counterfactual conditionals, counterfactuals are very difficult to understand because it requires complex cognitive processes to interpret it.

A non-conditional sentence does not express any condition and consequence to it. An example for non-conditional sentence is "He ate the food and washed his hands". Non-conditional sentence does not contain 'if' embedded clause in it. It contains two clauses where it will be joined by a conjunction.No complex cognitive process is required to process non-conditional sentences.

One of the critical components of logical reasoning is conditional reasoning where conditional reasoning involves making inferences. Conditional reasoning requires cognitive competency which is inaccessible to children but children can make inferences. According to Beck, Riggs and Gornaik (2009) children at the age 4, they are able to comprehend counterfactual questions in English.

Yarbay, Blom and Topbas (2015) studied the comprehension of non-conditionals, factual and counterfactual conditionals in 13 typically developing Turkish children in the age range of 5 to 6 years and it was compared with 13 children with SLI. Picture identification and repetition task for these 3 types conditional sentences was devised for the children of the

two groups. It was found that comprehension of 3 kinds of sentences were difficult in the increasing order i.e. non-conditionals, factual and counterfactual in both the groups. Conditional sentence was found to be difficult when compared to non-conditional sentence in both the groups. Counterfactuals conditionals was found to be more difficult in comprehending in SLI group when compared to typically developing children which highlights the need of complex cognitive processes in order to understand it. There was no significant difficulty found in repeating these sentences in children with SLI when compared to comprehension task and to their counterparts.

Reversible Sentences

Reversible sentence is a sentence where the subject and object of the sentence is reversed but still the sentence remains meaningful. For example ("The girl is chasing the dog") in this sentence when the subject "girl" and object "dog" is reversed ("Dog is chasing the girl"), the sentence remains meaningful even though the sentence leads to a new meaning. Reversible sentence taps the syntactic aspects of the language. The subject and the object in the sentence will be distinguished through syntactic ordering. Reversible sentence can be in active voice or passive voice. While interpreting the active voice, need to assume or remember the sentence order. For example "Ravana kidnapped sita ".While interpreting the passive form of reversible sentence, one needs to know the deep structure of the sentence. For example "Sita was kidnapped by ravana". In contrast to Reversible sentence, there is Irreversible sentence where the meaning will be lost and even does not leads to a new meaningful sentence when the subject and object of the sentence is reversed (Ex. "The boy is kicking the ball" to "The ball is kicking the boy"). In irreversible sentence, there is no active form and passive form difference as found in reversible sentences .It is not complex to interpret the irreversible sentences because there will be semantic cues available from the

sentence. From the above example 'a ball cannot kick the boy', so there will be no ambiguity in judging this kind of sentence when compared to reversible sentences.

Comprehension of reversible sentences in typically developing children and in adults places more demand and are more prone to misinterpretation when compared to irreversible sentences. This added difficulty may be attributed to reduction in the constraints on thematic role assignment of the subject and the object for reversible sentences. Many recent studies have reported that Children with SLI and adults with"agrammatic" Broca's aphasia have difficulty in comprehending semantically reversible sentences. In the literature there are three explanations that is syntax-specific deficit, deficit in syntactic-semantic integration (a process which is crucial in understanding sentences and the difficulty in sentence processing is attributed to poor phonological working memory.

A study by Richardson, Thomas and Price (2010) investigated the brain activation for processing of reversible sentences in normal individuals.41 subjects had participated in the study of the age range 7 – 69 years old and whose language was English. The participants were recruited after ensuring their reading abilities, reception and cognitive abilities are adequate to perform the task. The authors designed the experiment with four tasks and those are processing stimuli via visual mode, auditory mode, hand action retrieval and articulation. Three kinds of sentences like reversible sentences, irreversible sentences and scrambled sentences (which are not meaningful) which were 40 in number were used in the study. Reversible and irreversible were consisted of different types like active, passive, locative, dative, subject cleft and object cleft. The subjects were made to listen for auditory stimuli and silently read the visual stimuli. In articulation task, the subjects were made to read the digits '1' and '3' alternatively aloud and these digits were taken because while articulating digit'1' it involves pursing the lips gesture and for '3' it will be protruding the lips. So these alternative movements might activate the articulatory loop, which is a component of

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phonological working memory. Another task was object action task where the subject was made to see the common object pictures (like scissors, comb, key etc) and make action for it in their right hand. To check the effect of memory for sentences while processing, memory test for sentences and memory test for pictures were carried out. During these tasks performed, fMRI was carried out. The results of the study was left temporal-parietal region was activated for reversible and irreversible sentences. When compared to reversible and irreversible sentences, reversible sentences elicited greater activation and under modality specific, it was visual sentences had greater activation suggesting silent reading involving articulatory processes present while processing and it was found to be more for reversible sentences. Area activated while processing reversible sentences is located in an area which is more associated with articulation than semantic or syntactic processing. It was concluded that processing of reversible sentences places ore demand on phonological working memory.

Even behavioural task of processing of reversible sentence has been found to be complex supporting the results of passive processing task. A study by Ferreira (2003) investigated the judgement of reversible, irreversible and symmetrical sentences in 48 undergraduates whose first language was English. The decision about the target sentence was of 6 types- do-er of the action, acted upon, action, location, colour and when the event/action took place. Reaction time was measured. Results of the study were reaction time was slower for passive forms of the all the three types of the sentences- reversible, irreversible and symmetric was difficult when compared to active form sentences. Across sentences, reversible sentence was found to be more complex in judgement.

Due to the high demands placed by complex sentences in processing them, individuals with language disorders might show difficulty in understanding complex sentences like reversible sentences. In adults with agrammatic aphasia show significant difficulty in processing complex sentences due to their reduced processing capacity (Caplan

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et.al, 2007). Processing complex sentences like reversible sentences require good semantic and syntactic processing capacity and even working memory capacity is more important to keep the sentence elements in memory while creating hypotheses and maintain it in order to interpret the sentence. This can be accounted to SLI condition where they show a diminished phonological working memory capacity which might hinder the semantic-syntactic comprehension.

Few studies regarding the comprehension of reversible in children with SLI are found in the literature. A study by Harris et.al (1990) investigated the comprehension ability of SLI children for reversible sentences. In the study, 14 children with SLI and age matched typically developing in the age range of 4.10 to 7.10 years participated. The study was twofold, first experiment was act- on task and second experiment was picture identification task. Stimuli used were 36 reversible sentence which were varied in 3 thematic contents (transitive, locative and dative) and in word order (canonical and non-canonical).In the first act-on task, the subjects were made to perform the action with respect to target sentence which was presented using the six toys given. In the second experiment, for same stimuli, picture pointing task was carried out.It was found that SLI children showed poor performance on both experiment when compared to their counterparts. The errors were more for transitive and locative thematic roles and showed more difficult for passive form (non-canonical) of word order. Another study which supports Harris et.al (1990) study was by Stavrakaki (2001), comprehension of reversible sentence in 8 Greek children with SLI and typically developing age matched and language matched children. The task was same as Harris et.al study and the results were children with SLI performed poorly when compared to the other two groups. The additional demands placed while processing complex sentences like reversible sentences in children with SLI leads to poor performance when compared to their counterpart peers.

<center>**Chapter-III**</center>

<center>**METHODOLOGY**</center>

Participants

Two groups of participants were included in the study. Group 1 consisted of 10 children who were diagnosed as SLI and group 2 consisted of 20 typically developing children who were free from any speech, language, hearing and communication disorders as screened by 'WHO ten question screening checklist' (Singhi, Kumar,Malhi & Kumar, 2007) was recruited. All the participants within the age range of 4-7 years, whose native language was Kannada and second language as English was included in the study. To check for their use of language, language use questionnaire (Shanbal & Prema, 2007) was used. Both the group of children was matched with age and non-verbal intelligence. The details about the participants are mentioned below. Table 1 includes the demographic details of typically developing children and Table 2. Represent the demographic details of children with SLI.

Table 1

Number of typically developing male and female children with respect to their age range.

Age groups (in years)	Male	Female	Total
4-4.11	1	4	5
5-5.11	3	2	5
6-6.11	2	3	5
7-7.11	3	2	5

Table 2: *Demographic details of children with SLI*

Children with SLI	Age(years: months)	Gender
1	4:0	M
2	4:3	M
3	4:9	F
4	5:0	M
5	5:0	M
6	5:9	M
7	6:3	M
8	6:3	F
9	6:5	F
10	7:0	M

Materials

A sentence-picture matching task with 4 conditions was developed.4 different types of sentences were used and those were non-conditional clauses, conditional clauses, semantically reversible sentences and semantically irreversible sentences. The test stimuli were developed in such a way that it will not evoke any emotions such as contrastive psychological appraisals. In the first stage, 4 different types of sentences were developed and were given to four trained speech language pathologists (MASLPs) for validation. In the second stage, pictures were developed for those validated sentences where the pictures depicted the sentence. In the third stage, the developed pictures were given for validation. There were 40 stimuli per participant (10 sentences × 4 conditions).The validated stimulus sentences were recorded in CSL 4500 instrument by a female native speaker of Kannada.

Procedure

To check for their use of language, language use questionnaire (Jayashree & Prema, 2007) was used.

1. 6 questions from the language use questionnaire were asked to the parents to know the use and exposure of Kannada and English. The responses to the questions were rated based on their answer (sometimes, most of the time and always).

2. These answers were coded, sometimes= 1, most of the time=2, always=3.

3. When the child was not exposed to that language in a specific setting, answer was not rated. For example, when child did not attend school, answer to the question-language used at school was not considered.

In a one to one setting, the experimenter presented the recorded auditory stimuli via the headphones and the participants listened and pointed to the target picture which matched the target sentence among the four pictures (other three pictures acted as distracters). The distracters were target items with action unfulfilled (AU), lexical distracter which the action fulfilled (LEX) and lexical distracter with action unfulfilled (LEX+AU).40 stimulus sentences were randomized in their order of presentation to increase the complexity and to ensure the target sentence and picture would vary throughout the testing. Before the actual experiment, the participants were given three practice trials. When the participants made errors in the practice trial, feedback was given to them. But no feedback was given during the actual experiment. The correct responses were noted and response errors were also documented.

Scoring

1. A maximum score of 80 could be obtained from this task.

2. A score of 2 was given if the response elicited is correct.

3. A score of 1 was given when it was incorrect but the response elicited was within the category or subject-object or object –object interchanged while identifying the target correct picture.

4. A score of 0 was given for complete incorrect response.

Incorrect responses were documented using the codes.

1. More than one time stimulus presented= A

2. Alternate word given for the target word in the sentence to elicit the response=B

3. Stimulus(sentence) was rephrased or simplified by tester to elicit the response=C

4. Second or third attempt of pointing the target picture= D

CHAPTER IV

RESULTS AND DISCUSSION

The aim of the present study was to investigate comprehension of conditional clauses and semantically reversible sentences in children with specific language impairment (SLI) and typically developing children (TDC) in 4-7 year old kannada-English bilinguals. Objectives of the present study were

1. To compare sentence (conditional and reversible) comprehension abilities in bilingual children with SLI and typically developing peers.

2. To compare comprehension abilities across conditional and non-conditional clauses and reversible and irreversible sentences.

To compare the performance of TDC and children with SLI, across different types of sentences in both the groups. The data obtained from both group i.e., clinical and control group was analysed on measures of accuracy of scores.

Qualitative analysis

There were three picture distracters for one target correct picture i.e.,

1. Target item with action unfulfilled (AU),

2. Lexical distracter which the action fulfilled (LEX) and

3. Lexical distracter with action unfulfilled (LEX+AU).

Incorrect responses were documented. Based on the analysis, it was observed that

1. Children of younger age group that is 4-4.11 years and 5-5.11 years when compared to other two TDC groups utilized more cues/help from the tester while identifying the picture.

2. Younger the age group, children needed more than one time stimulus presentation, sentences rephrased/simplified in TDC and irrespective of age in children with SLI group. This can be attributed to lack of attention span in the TDC younger group and in children with SLI group.

3. Most of the children from both the groups required alternated word for the target word in the sentence (for example: apple for /seebu/).

    a. List of alternate words required- sharpener for /mendar/

        i. Apple for /seebu/

        ii. Tiger and Lion for /Huli and Simha/

        iii. Paapu (baby) for /magu/

        iv. Ironed for /istri/

        v. Deer for /dzInke/

    b. This is can be attributed to the bilingual effect, where children are exposed to English words in all the context and also few words in kannada are not stimulated in the daily situation among kannada speakers due to the influence of English (for example: /istri/ for Iron, apple for /sebu/, /magu/ for paapu etc).

4. While pointing the target picture, younger children from both the groups took second attempt or third attempt while pointing to the target picture. This can be attributed to the guessing the answer or lack of attention span (younger children not think much before judging which is the correct answer).

5. Children from both the groups pointed at incorrect picture to the target sentences presented.

6. For Conditional sentences, both the group of children tend to point the incorrect picture depicting target item with action unfulfilled (AU).The consistency of error was found to be more in younger group of typically developing children and

irrespective of age group in children with SLI. This can be attributed to the fact that difficulty in processing the complex semantic component and morpho-syntactic structure in conditional sentences which requires higher cognitive resources. Children with SLI find difficulty in comprehending the if-embedding conditional sentences and make a inference on it.

7. For reversible sentences, both the group tends to point the incorrect picture. Children with SLI were consist in pointing the picture depicting subject –object or object-subject interchange. For example: if the target sentence is 'The car hits the bike'. Children with SLI tend to point the picture which depicts 'The bike hits the car'. This confusion in identification of target picture is due to the inability to assign the thematic role (subject and object elements) present in the sentence while processing the target sentence. This can be attributed to poor syntactic, semantic and working memory capacity.

A. Comparing the performance of typically developing children based on their language exposure and use.

Table 3: *Scores for language use questionnaire for typically developing children (TDC).*

TDC participant (in age)	Language exposure score
TDC1 (4.0)	14
TDC 2 (4.1)	15
TDC 3 (4.2)	14
TDC 4 (4.3)	14
TDC 5 (4.6)	15
TDC 6 (5.0)	14
TDC 7 (5.4)	14
TDC 8 (5.4)	15
TDC 9 (5.4)	16
TDC 10 (5.8)	14
TDC 11 (6.3)	14
TDC 12 (6.6)	15
TDC 13 (6.8)	15
TDC 14 (6.9)	16
TDC 15 (6.9)	15
TDC 16 (7.0)	15
TDC 17 (7.2)	15
TDC 18 (7.6)	15
TDC 19 (7.6)	15
TDC 20 (7.11)	15

Table 3 shows the information about the raw scores obtained based on the ratings of the responses given for language use questionnaire (Shanbal & Prema, 2007) . Raw scores obtained depict their use and exposure to language across situations for both Kannada and English.

a) Language used for communication at school, to teach literacy skills at school and home was English always. Use of English to communicate was sometimes in home situation, Preference to use a language was English and academic performance was equal in both English and Kannada. Most of the children were stimulated in English at home environment due to their academic requirements.

b) The performance on picture identification task for sentence comprehension did not vary across the children in typically developing group. But most of the children were found to have difficulty in comprehending few Kannada words. It may be because those words were not stimulated or children might not have had exposure to it.

c) These results are contrary to the findings of Bialystok (1999), where she concluded that children with higher proficiency in language who are bilingual show greater performance on linguistic and non-linguistic tasks.

d) In the present study, this result may be because that the language exposure may not be significant explicit variable in contributing to cognitive advances to perform better on the given task.

B. Comparing the performance of children with SLI based on their language exposure and use.

Table 4: Scores for language use questionnaire for children with SLI

Children with SLI (in age)	Language exposure score
SLI 1 (4.0)	13
SLI 2(4.3)	13
SLI 3 (4.9)	11
SLI 4 (5.0)	11
SLI 5 (5.0)	13
SLI 6 (5.9)	12
SLI 7 (6.3)	14
SLI 8 (6.3)	14
SLI 9 (6.5)	15
SLI 10 (7.0)	15

Table 4 shows the information about the raw scores obtained based on the ratings of the responses given. Raw scores depict their use and exposure to language across situations for both Kannada and English.

a) Language used for communication at school, to teach literacy skills at school and home was English most of the time. Use of English to communicate was sometimes in home situation, Preference to use a language was Kannada and academic performance was better in Kannada. Most of the children were stimulated in Kannada at home environment due to their language disturbances. Three out of ten children with SLI was not attending school.

b) The performance on picture identification task for sentence comprehension did not vary across the children with SLI within their group. These results are contrary to the findings of Thordardottir and Brandeker (2013), where bilingual children with SLI who had higher levels of language exposure performed better on Non-word repetition and sentence imitation task when compared lesser levels of exposure.

Quantitative analysis

The data was subjected to statistical analysis for measures of accuracy for both groups across different types of sentences. Task was picture identification task. Different sentence types were conditional type, non-conditional type, reversible type and irreversible type.. As the samples did not follow a normal distribution for TDC group, non - parametric tests for typically developing children and parametric tests for SLI group were used.

The data was analysed using the following statistical procedure:

1. Descriptive statistics was carried out to find the mean, median and standard deviation (SD) of performance of TDC and SLI from picture identification task for comprehension of sentences.

2. Wilcoxon signed rank test was used to do the pair-wise comparison between different types of sentences in TDC group.

3. Spearman correlation was performed to find the correlation between the different types of sentences in TDC group.

4. Mann Whitney test was used to compare the performance of picture identification task between TDC and children with SLI groups.

5. Paired T-test was used to do the pair-wise comparison between different types of sentences in SLI group.

6. Pearson correlation was performed to find the correlation between the different types of sentences in SLI group.

7. Spearman correlation was performed to find the correlation between language use and exposure and accuracy measure of picture identification for both the groups.

8. Mann Whitney test was used to compare the performance of picture identification and language use and exposure between TDC and children with SLI groups

The results were discussed under the following headings:

4.1 Performance of TDC on picture identification task.

4.2 Performance of children with SLI on picture identification task.

4.3 Comparison of performance of TDC and children with specific language impairment on picture identification task.

4.1.1   Performance of TDC (Typically developing Children) on Picture Identification Task.

Mean and Standard Deviation (SD) scores of TDC on picture identification task was calculated, as shown in table 4.1

Table 4.1: *Performance of TDC for accuracy measures on Picture identification task in age (4.00-4.11) group.*

Age Group	Sentences	Mean	Median	SD
4- 4.11 years	Conditional (20)	14.00	13.00	3.536
	Non-conditional(20)	17.00	18.00	3.464
	Reversible(20)	15.40	16.00	3.286
	Irreversible(20)	16.40	17.00	2.074
	Total(80)	62.80	60.00	8.758

The data obtained was analyzed for accuracy measures of 4 different sentences in TDC group in 4.00 to 4.11 age group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences. Table 4.1a shows performance of TDC for accuracy measures on Picture identification task for 4 different sentences. Results revealed that performance for all the 4 sentences in a descending order i.e., Non-conditional (Mean = 17.00, SD = 3.464), Irreversible (Mean = 16.40, SD = 2.074), Reversible (Mean = 15.40, SD = 3.286) and Conditional (Mean = 14.00, SD = 3.536).

Mean and Standard Deviation (SD) scores of TDC on picture identification task was calculated, as shown in table 4.1a

Table 4.1a: *Performance of TDC for accuracy measures on Picture identification task in age(5.00-5.11) group.*

Age Group (in years)	Sentences	Mean	Median	SD
5-5.11 years	Conditional (20)	15.40	15.00	3.209
	Non-conditional(20)	18.00	18.00	2.000
	Reversible(20)	17.20	17.00	1.304
	Irreversible(20)	18.80	19.00	0.837
	Total(80)	69.40	69.00	5.595

The data obtained was analyzed for accuracy measures of 4 different sentences in TDC group in 5.00 to 5.11 age group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences depicted in Table 4.1b. Results revealed that performance for all the 4 sentences in a descending order i.e., Irreversible (Mean = 18.80, SD = 0.837), Non-conditional (Mean = 18.00, SD = 2.000), Reversible (Mean = 17.20, SD = 1.304) and Conditional (Mean = 15.40, SD = 3.209).

The mean and standard deviation (SD) score of TDC on picture identification task was calculated, as shown in table 4.1b

Table 4.1b: *Performance of TDC for accuracy measures on Picture identification task in age (6.00-6.11) group.*

Age Group (in years)	Sentences	Mean	Median	SD
	Conditional (20)	18.80	19.00	1.304
	Non-conditional(20)	20.00	20.00	0.000
6-6.11 years	Reversible(20)	19.60	20.00	0.548
	Irreversible(20)	20.00	20.00	0.000
	Total(80)	78.40	79.00	1.342

The data obtained was analyzed for accuracy measures of 4 different sentences in TDC group in 6.00 to 6.11 age group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences depicted in Table 4.1c. Results revealed that performance for all the 4 sentences in a descending order i.e., Irreversible (Mean = 20.00, SD = 0.000), Non-conditional (Mean = 20.00, SD = 0.000), Reversible (Mean = 19.60, SD = 0.548) and Conditional (Mean = 18.80, SD = 1.304).

Mean and Standard Deviation (SD) scores of TDC on picture identification task was calculated, as shown in table 4.1c

Table 4.1c: *Performance of TDC for accuracy measures on Picture identification task in age (7.00-7.11) group.*

Age Group (in years)	Sentences	Mean	Median	SD
	Conditional (20)	19.20	20.00	1.789
	Non-conditional(20)	20.00	20.00	0.000
7-7.11 years	Reversible(20)	19.00	19.00	1.000
	Irreversible(20)	19.40	20.00	0.894
	Total(80)	77.60	79.00	3.362

The data obtained was analyzed for accuracy measures of 4 different sentences in TDC group in 7.00 to 7.11 age group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences depicted in Table 4.1d. Results revealed that performance for all the 4 sentences in a descending order i.e., Non-conditional (Mean = 20.00, SD = 0.000), Irreversible (Mean = 19.40, SD = 0.894), Reversible (Mean = 19.00, SD = 1.000) and Conditional (Mean = 19.20, SD = 1.789).

Mean and Standard Deviation (SD) scores of TDC on picture identification task was calculated, as shown in table 4.1d

Table 4.1d: *Overall performance of TDC for accuracy measures on Picture identification task.*

Sentences	Mean	Median	SD
Conditional (20)	16.85	17.50	3.31
Non-conditional(20)	18.75	20	2.26
Reversible(20)	17.80	18	2.39
Irreversible(20)	18.65	19	1.78
Total(80)	72.05	76.50	8.28

The data obtained was analyzed for accuracy measures of 4 different sentences in TDC group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences. Table 4.1 shows overall performance of TDC for accuracy measures on Picture identification task for 4 different sentences. Analysis of results as shown in table 4.1e indicates that accuracy of picture identification for all the 4 sentences in a descending order i.e., Non-conditional (Mean = 18.75, SD = 2.26), Irreversible (Mean = 18.65, SD = 1.78), Reversible (Mean = 17.80, SD = 2.39) and Conditional (Mean = 16.85, SD = 3.31).

Pair wise Comparison of performance on sentences in TDC group.

Pair wise Comparison of performance on sentences of TDC on picture identification task was calculated, as shown in table 4.1e

Table 4.1e: *Pair wise Comparison of performance on sentences in TDC group.*

	Non-conditional- conditional	Irreversible- reversible
Z	-3.089	-1.687
Asymp. Sig. (2-tailed)	.002	.092

Wilcoxon signed ranked test was done to compare the performance between conditional vs non-conditional and reversible vs irreversible sentences. The results revealed significant difference between the pair conditional and non-conditional ($|z| = 3.089$, $p < .05$) and ($|z| = 1.687$, $p < .05$).for the pair reversible and irreversible.

Correlation of performance among sentences in TDC group

Correlation of Performance of TDC group among four sentences was found using correlation analysis, as shown in table.4.1f

Table 4.1f: *Correlation of performance among sentences in TDC group*

		C	N-C	R	Irr
C	Correlation Coefficient	1.000	.796[**]	.628[**]	.645
	Sig. (2-tailed)	.	0.00	0.003	0.002
N-C	Correlation Coefficient	.796[**]	1.000	.648[**]	.482[**]
	Sig. (2-tailed)	0.00	.	0.002	0.032
R	Correlation Coefficient	.628[**]	.648[**]	1.000	.761[**]
	Sig. (2-tailed)	0.032	0.002	.	0.00
Irr	Correlation Coefficient	.645[**]	.482[*]	.761[**]	1.000
	Sig. (2-tailed)	0.002	0.032	0.000	.

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

*. Correlation is significant at the 0.05 level (2-tailed).

C= conditional, N-C=Non-conditional=Reversible, Irr=Irreversible

To find the relation between the sentences (conditional, non-conditional, reversible and irreversible) in TDC group, spearman correlation was performed and it reveals that there is significant correlation for each sentence with other 3 sentences (P < .001 and < .005).

4.2 Performance of children with SLI (Specific Language Impairment) on picture identification task.

Mean and Standard Deviation (SD) of children with SLI on picture identification task was calculated, as shown in table 4.2

Table 4.2: *Overall performance of SLI for accuracy measures on Picture identification task.*

Sentences	Mean	Median	SD
Conditional (20)	8.60	8.00	3.534
Non-conditional(20)	14.00	14.00	2.357
Reversible(20)	8.40	8.00	2.171
Irreversible(20)	12.90	14.00	3.178
Total(80)	43.50	42.50	6.852

The data obtained was analyzed for accuracy measures of 4 different sentences in children with SLI group. The mean, median and standard deviation (SD) of the accuracy measures were calculated for all 4 different sentences. Table 4.4 shows overall performance of TDC for accuracy measures on Picture identification task for 4 different sentences. Analysis of results as shown in table 4.4 indicates that accuracy of picture identification for all the 4 sentences in a descending order i.e., Non-conditional (Mean = 14.00, SD = 2.357), Irreversible (Mean = 12.90, SD = 3.178), Conditional (Mean = 8.60, SD = 3.534) and Reversible (Mean = 8.40, SD = 2.39).

4.2a. Pair wise Comparison of performance on sentences in children with SLI group.

Comparison of sentences and its performance was analysed using paired t-test and as shown in table 4.2a

Table 4.2a: *Pair wise Comparison of performance on sentences in children with SLI group*

	Non-conditional- conditional	irreversible- reversible
T	-4.669	-5.158
Sig. (2-tailed)	.001	.001

Paired t- test was done to compare the performance between conditional vs non-conditional and reversible vs irreversible sentences. The results revealed significant difference between the pair conditional and non-conditional (t = -4.669, p < .05) and (t = -5.158, p < .05) for the pair reversible and irreversible.

4.2b Correlation of performance among sentences in Children with SLI group

Correlation of Performance of children with SLI group among four sentences was found using correlation analysis, As shown in table.4.2b

Table 4.2b: *Correlation of performance among sentences in children with SLI group*

		C	N-C	R	Irr
C	Correlation Coefficient	1.000	0.280	0.371	-0.182
	Sig. (2-tailed)	.	0.433	0.292	0.615
N-C	Correlation Coefficient	0.280	1.000	0.261	0.504
	Sig. (2-tailed)	0.433	.	0.467	0.137
R	Correlation Coefficient	0.371	0.261	1.000	0.522
	Sig. (2-tailed)	0.291	0.467	.	0.122
Irr	Correlation Coefficient	-0.182	0.504	0.522	1.000
	Sig. (2-tailed)	0.615	0.137	0.122	.

C= conditional, N-C=Non-conditional=Reversible, Irr=Irreversible

To find the relation between the sentences (conditional, non-conditional, reversible and irreversible) in children with SLI group, Pearson correlation was performed and it reveals that there is no significant correlation for each sentence with other 3 sentences ($p < .005$).

4.3 Comparison of performance of TDC and children with specific language impairment on picture identification task.

Mean and Standard Deviation (SD) of TDC and children with SLI on picture identification task was calculated, as shown in table 4.3

Table 4.3: *Performance of TDC and children with SLI for accuracy measures on picture identification task for 4 different sentences.*

	Group							
	TDC				SLI			
	No.	Mean	SD	Median	No.	Mean	SD	Median
Conditional	20	16.85	3.313	17.50	10	8.60	3.534	42.50
Non-conditional	20	18.75	2.268	20.00	10	14.00	2.357	8.00
Reversible	20	17.80	2.397	18.00	10	8.40	2.171	14.00
Irreversible	20	18.65	1.785	19.00	10	12.90	3.178	8.00
Total	20	72.05	8.21	76.50	10	43.50	6.852	14.00

To calculate mean, median and standard deviation for accuracy of picture identification task for 4 different types of sentences between TDC and children with SLI group descriptive statistics were used. Table 4.3 shows performance of TDC and children with SLI for accuracy measures on picture identification. The results reveal that overall performance of picture identification task for all 4 sentences, TDC group had greater accuracy scores (Mean = 72.05, SD = 8.21) when compared to children with SLI group (Mean = 43.50, SD = 6.852). Similarly, the TDC group had greater accuracy on each of the sentence types when compared to children with SLI group. Both the groups had relatively poor accuracy on conditional and reversible sentences when compared to other two sentences.

4.3 To compare the performance of groups on 4 different sentences.

Performance of both the groups on 4 different sentence was analysed using Mann-Whitney test and is shown in table 4.3a

Table 4.3a: *To compare the performance of groups on 4 different sentences*

	Z	Asymp. Sig. (2-tailed
Conditional	-4.004	.000
Non-conditional	-3.927	.000
Reversible	-4.343	.000
Irreversible	-4.142	.000
Total	-4.388	.000

Mann Whitney test was done to compare the performance of picture identification task between TDC and children with SLI group. Results revealed that there was significant difference between group across all different sentences i.e., conditional ($|z| = 4.004$, $p < .05$) , non-conditional ($|z| = 3.927$, $p < .05$),reversible ($|z| = 4.343$, $p < .05$) and irreversible ($|z| = 4.142$, $p < .05$).The overall performance of picture identification task on all four sentence had significant difference between TDC group and children with SLI group ($|z| = 4.388$, $p < .05$) .

4.4a Correlation of performance between Language exposure and accuracy measures on picture identification task in typically developing children (TDC)

Correlation of performance between language exposure and accuracy measures on picture identification task in TDC was analyzed using Spearman correlation and is shown in table 4.4a.

Table 4.4a: *Correlation of performance between Language exposure and accuracy measures on picture identification task in typically developing children*

		LES	PIS
LES	Correlation Coefficient	1.0	0.266
	Sig. (2-tailed)	.	0.257
PIS	Correlation Coefficient	0.266	
	Sig. (2-tailed)	0.256	1.00 .

LES=Language exposure score,PIS=Picture identification score

To find the correlation of language exposure and performance on picture identification task in typically developing children, Spearman correlation analysis was performed and it revealed that there is no significant correlation between language exposure score and picture identification score (P < .005)

4.4b Correlation of performance between Language exposure and accuracy measures on picture identification task in children with SLI

Correlation of performance between language exposure and accuracy measures on picture identification task in children with SLI was analyzed using Spearman correlation and as shown in table 4.4b.

Table 4.4b: *Correlation of performance between Language exposure and accuracy measures on picture identification task in children with SLI.*

	LES	PIS
LES Correlation Coefficient	1.0	-0.186
Sig. (2-tailed)	.	0.607
PIS Correlation Coefficient	-0.186	1.00
Sig. (2-tailed)	0.607	.

LES=Language exposure score, PIS=Picture identification score

To find the correlation of language exposure and performance on picture identification task in typically developing children, Spearman correlation analysis was performed and it revealed that there is no significant correlation between language exposure score and picture identification score (P < .005).

4.4c. To compare the performance of children with SLI between greater language exposure and lesser language exposure

The scores greater than 13 on language use questionnaire is considered greater language exposure and use and vice versa if it less than 13.Comparison of more language exposure and use with less language exposure and use within the children with SLI group. From table 4.4c can see the comparison of performance within the group.

Table.4.4c: *To compare the performance of children with SLI between greater language exposure and lesser language exposure*

	Z	Asymp. Sig. (2-tailed)
PIS	-0.570	0.569
LES	-2.446	0.014

Mann Whitney test was done to compare the performance of picture identification task and Language exposure score between greater language exposure and use and lesser language exposure and use in children with SLI group. Results revealed that there was no significant difference between groups across performance of picture identification task ($|z|$ = 0.570, p > .05) and has significant difference in Language exposure ($|z|$ = 0.569, p < .05).This reveals that there was no difference in the performance on picture identification task and language exposure between greater language exposure and use and lesser language exposure and use.

4.4d. To compare the performance of groups on language exposure and picture identification score

Performance of groups on language exposure and picture identification task was analyzed using Mann-Whitney test and as shown in table.4.4c

Table.4.4d: *To compare the performance of groups on language exposure and picture identification score.*

	Z	Asymp. Sig. (2-tailed)
PIS	-4.388	.000
LES	-3.169	.002

Mann Whitney test was done to compare the performance of picture identification task and Language exposure between TDC and children with SLI group. Results revealed that there was significant difference between groups across performance of picture identification task ($|z| = 4.388$, $p < .05$) and Language exposure ($|z| = 3.169$, $p < .05$).

Hence, on comparing the comprehension of 4 different sentences between TDC group and children with SLI group, Children with SLI group had poorer performance when compared to TDC group with respect to all 4 sentences. On comparing the comprehension of sentences, conditional vs non-conditional and reversible vs irreversible sentences, typically developing children (TDC) and children with SLI had poorer comprehension for conditional sentences when compared to non-conditional sentences. Typically developing children showed relatively poor comprehension on conditional sentences when compared to non-conditional sentences but children with SLI had poorer comprehension still. This can be attributed to the fact that conditional sentences are more complex grammatical sentences to processes when compared to the non-conditional sentences and also due to the fact that children with SLI have poor morpho-syntactic abilities. These results of the present study are in consonance with the findings by Yarbay, Blom and Topbas (2015) study.

When reversible and irreversible sentences were compared for comprehension between typically developing children and children with SLI, poorer comprehension for reversible sentences was observed. In typically developing children, comprehension of reversible sentences was relatively difficult when compared to irreversible sentences. But in children with SLI comprehension of reversible sentences was highly a difficult to process when compared to irreversible sentences. This complexity of processing may be attributed to the difficulty in thematic role assignment and high demands on working memory. Poor phonological working memory in children with SLI is attributed to the difficulty in semantic-syntactic comprehension in them. These findings are consistent with the earlier results of studies done by Harris et.al (1990), Stavrakaki (2001), Ferreira (2003) and Caplan et.al (2007).

Thus, the present study found poor comprehension of complex sentences by children with SLI when compared to typically developing children in a picture identification task. The children with SLI exhibited more difficulty in comprehending conditional sentences and reversible sentences when compared to other sentences, which is supported by the study of Yarbay, Blom and Topbas (2015) where children with SLI exhibited more difficulty in interpreting conditional sentences when compared to non-conditional sentences. Studies by Harris et.al (1990), Stavrakaki (2001), Ferreira (2003) and Caplan et.al (2007) also supported the findings of difficulty in processing reversible sentences when compared to irreversible sentences. The difficulty in interpreting complex sentences in children with SLI highlights their reduced morpho-syntactic, semantic and working memory capacities. It was also found that performance on picture identification task was not dependent on language use and exposure in both the groups. This result of present study contradicts with the findings of Bialystok (1999) and Thordardottir.E and Brandeker.M (2013).

CHAPTER V

SUMMARY AND CONCLUSION

The present study explored comprehension of conditional clauses and semantically reversible sentences in children with specific language impairment (SLI) and typically developing children (TDC) in 4-7 year old Kannada-English bilinguals. In this study 20 typically developing and 10 children with SLI were included. Conditional, non-conditional, reversible and irreversible sentences served as stimuli. The task was picture identification task where four pictures were there for each sentences. Out of four pictures, three pictures acted as distracters. The responses were noted and calculated the accuracy scores for both the groups.

The overall data was subjected to statistical analysis using SPSS software version IBM 21. Data was subjected to descriptive statistics and based on the normality criteria, parametric and non-parametric tests were employed.

On testing the comprehension abilities of 4 different sentences using picture identification task in typically developing children group and children with SLI group. It was found that typically developing children performed better for all sentences when compared to children with SLI. Across sentences, it was found that conditional sentences and reversible sentences were difficult when compared to non-conditional and irreversible sentences respectively in both the groups. This performance supports that conditional sentences and reversible sentences are complex grammatical sentences which require high cognitive resources and processing to interpret. Children with SLI had poorer comprehension of these sentences due to their poor phonological working memory and poor morpho-syntactic and semantic integration in processing the complex sentences.

Implications of the study:

- The results of the present study lead to better understanding of the nature of underlying interface level of morpho-syntax and semantics in children with SLI.

- It leads to the better understanding of nature of language impairment in children with SLI.

- The results of the study can be used to design diagnostic and intervention procedure in children with SLI.

- This study can be utilized as reference for further studies to see comprehension of complex sentences in adult language disordered population like aphasia (agramatics).

Future Direction

The study could be carried out on a larger group of children with SLI to develop a sentence comprehension test or for diagnostic criteria for SLI. Reaction time in processing the complex sentences in children with SLI will be poor due to their reduced cognitive resources. This attribute was not used in the present study and could be considered for future research.

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APPENDIX

Sentence stimuli

Conditional sentences

ಮೀನು ಬದುಕಿದ್ದರೆ,ಅದು ನೀರಿನಲ್ಲಿರುತ್ತದೆ.

(mInu badukidare,adu niirinalirutade)

ಸೇಬನ್ನು ಮೇಲಕ್ಕೆಸೆದರೆ,ಅದು ಕೆಳಗೆ ಬೀಳುತ್ತದೆ.

(seebannu meelakkesedare,adu kelage biilutade.)

ಅಣ್ಣನ ಹತ್ತಿರ ಬುಕ್ ಇದ್ದರೆ,ಅವನು ಓದುತ್ತಿದ್ದ.

(annana hatira buk iddare,avanu odutidda)

ಬಟ್ಟೆ ಒಗೆದಿದ್ದರೆ,ಅದು ತಂತಿಯ ಮೇಲೆ ಇರುತ್ತದೆ.

(batte ogediddare,adu tantiya mele iruttade)

ಶರ್ಟ್ ಇಸ್ತ್ರಿಯಾಗಿದ್ದರೆ,ಅದು ಕಪ್ಬೋರ್ಡ್ನಲ್ಲಿ ನೇತು ಹಾಕಿರುತ್ತಾರೆ.

(shartu istriyagiddare,adu kapbordnalli netu haakirutaare)

ಕರೆಂಟ್ ಇದ್ದರೆ,ಟಿವಿ ಬರುತ್ತದೆ.

(karenT iddare,Tivi baruttade)

ಗಾಜಿನ ಲೋಟ ಕೆಳಗೆ ಬಿದ್ದರೆ,ಅದು ಹೊಡೆದು ಹೋಗುತ್ತದೆ.

(gaajina loTa keLage biddare,adu hoDedu hoguttade)

ಮಳೆ ಬಂದರೆ,ರಸ್ತೆಯಲ್ಲಾ ನೀರಿನಿಂದ ತುಂಬಿರುತ್ತದೆ.

(male bandare,rasteyala niirininda tumbiruttade)

ಹುಡುಗನ ಹತ್ತಿರ ಮೆಂಡರ್ ಇದ್ದರೆ,ಅವನು ಪೆನ್ಸಿಲ್ನ್ನು ಚೂಪು ಮಾಡಿರುತ್ತಾನೆ.

(huDugana hattira mendar iddare,avanu pensilannu chuupu maaDirutaane)

ಅಕ್ಕನ ಹತ್ತಿರ ಪೆನ್ ಇದ್ದರೆ,ಅವಳು ಬರೆಯುತ್ತಿದ್ದಳು.

(akkana hattira pen iddare,avaLu bareyuttidaLu)

ಮಳೆ ಬರುತ್ತಿದ್ದರೆ,ಛತ್ರಿ ಉಪಯೋಗಿಸ ಬೇಕಾಗುತ್ತದೆ.

(male baruttiddare,chatri upayOgisa beekaaguttade)

Non-conditional sentences

ಹುಡುಗ ಹಣ್ಣನ್ನು ಕತ್ತರಿಸಿ ಟೀಬಲ್ ಮೇಲೆ ಇಟ್ಟ.

(huDuga haNannu kattarisi Tebal mele iTTa)

ಅಣ್ಣ ಚಿಟ್ಟೆಯನ್ನು ಹಿಡಿದು ಬಾಟಲ್ ಒಳಗೆ ಹಾಕಿದ.

(anna chiTTeyannu iDidu baaTal olage haakida)

ನಾಯಿ ಊಟ ತಿಂದ ಗೇಟ್ ಹತ್ತಿರ ಮಲಗಿತು.

(naayi uuTa tindu geT hattira malagitu)

ಅಣ್ಣ ನೀರು ಕುಡಿದು ಲೋಟವನ್ನು ಟೀಬಲ್ ಮೇಲೆ ಇಟ್ಟನು.

(anna niru kuDidu loTavannu Tebal mele iTTanu)

ಹುಡುಗ ಓಡುತ್ತಿದ್ದಾಗ ಅವನು ನೆಲದ ಮೇಲೆ ಬಿದ್ದ.

(huDuga oDuttidaaga avanu nelada mele bidda)

ಅವನು ಬಾಳೆಹಣ್ಣನ್ನು ತಿಂದು ಸಿಪ್ಪೆಯನ್ನು ನೆಲಕ್ಕೆ ಹಾಕಿದ.

(avanu baaLehaNannu tindu sippeyannu nelakke haakida)

ಹುಡುಗ ಗಾಳಪಟ್ಟವನ್ನು ಮಾಡಿ ಅದನ್ನು ಮೇಲಕ್ಕೆ ಹಾರಿಸಿದ.

(huDuga gaaLipaTavannu maaDi adannu melakke haarisida)

ಅಣ್ಣ ಕಾರಿನ ಒಳಗೆ ಕುಳತು ಬಾಗಿಲು ಮುಚ್ಚಿದನು.

(anna kaarina olage kuLitu baagilu muchidanu)

ಹುಡುಗ ಬ್ಯಾಗ ಹಾಕಿಕೊಂಡು ಸ್ಕೂಲ್ ಹೋಗುತ್ತಿದ್ದಾನೆ.

(huDuga bag haakikondu skulge hoguttidaane)

ಅಕ್ಕ ಓದಿದ್ದು ಮುಗಿದ ಮೇಲೆ ಬುಕ್ನ್ನು ಮುಚ್ಚಿ ಇಟ್ಟಳು.

(akka odiddu mugida mele bukannu muchchi iTTalu)

ಅಮ್ಮ ಪಾತ್ರೆಗಳನ್ನು ತೊಳೆದು ಅದನ್ನು ಅಡುಗೆಮನೆಯಲ್ಲಿ ಇಟ್ಟಳು.

(amma paatregaLannu toLedu adannu aDugemaneyalli iTTalu)

Reversible sentences

ಹುಡುಗ ಹುಡುಗಿಯ ಹಿಂದೆ ನಿಂತನು.

(huDuga huDugiya hinde nintanu)

ಸಿಂಹ ಹುಲಿಗಿಂತ ಜೋರಾಗಿ ಓಡುತ್ತದೆ.

(simha huliginta jOraagi oDutide)

ಬೈಕ್ ಕಾರ್‌ಗೆ ಗುದ್ದಿತು.

(baik kaarge gudditu)

ಹುಡುಗ ಹುಡುಗಿಗೆ ನೀರನ್ನು ಕುಡಿಸುತ್ತಿದಾನೆ.

(huDuga huDugige nIrannu kuDisuttidaane)

ಅಕ್ಕ ಬಾಲ್‌ನ್ನು ಅಣ್ಣನಿಗೆ ಎಸೆಯುವಳು.

(akka baalannu annanige eseyuvaLu)

ಅಪ್ಪ ಮಗುವಿನ ಹತ್ತಿರ ಓಡುತ್ತಿದ್ದಾನೆ.

(appa maguvina hattira oDuttidaane)

ಅಕ್ಕ ತಮ್ಮನಿಗಿಂತ ಉದ್ದ.

(akka tammaniginta udda)

ಹುಡುಗ ಹುಡುಗಿಗೆ ಹೊಡೆಯುತ್ತಿದ್ದಾನೆ.

(huDuga huDugige hoDeyuttidaane)

ಮಗಳು ಅಪ್ಪನಿಗೆ ಬಟ್ಟೆ ಕೊಡುತ್ತಿದ್ದಾಳೆ.

(magaLu appanige baTTe koDuttidaaLe)

ಅಮ್ಮ ಮಗುವನ್ನು ಕರೆಯುತ್ತಿದ್ದಾಳೆ.

(amma maguvannu kareyuttiddaale)

ಅಮ್ಮ ಮಗುವಿಗೆ ಮುತ್ತು ಕೊಡುತ್ತಿದ್ದಾಳೆ.

(amma maguvige muttu koDuttiddaale)

Irreversible sentences

ಇರುವೆ ಆನೆಯ ಮೇಲೆ ಇದೆ.

(iruve aaneya mele ide)

ಬೆಕ್ಕು ಇಲಿಯನ್ನು ಹಿಡಿಯಿತು.

(bekku iliyannu iDiyitu)

ಬೆಕ್ಕು ನಾಯಿಯನ್ನು ನೋಡಿ ಓಡುತ್ತಿದೆ.

(bekku naayiyannu noDi oDutide)

ಪಾಪು ಚೇರ್ ಮೇಲೆ ಕುಳಿತಿದೆ.

(paapu cher mele kuLitide)

ಸೋಮವಾರದ ನಂತರ ಮಂಗಳವಾರ.

Somavaarada nantara mangalavaara)

ರೈಲು ಬಸ್ಸಿಗಿಂತ ಉದ್ದವಿದೆ.

(raIlu bassiginta uddavide)

ಅಣ್ಣ ತಂಗಿಗೆ ಜಡೆಯನ್ನು ಹಾಕುತ್ತಿದ್ದಾನೆ.

(anna tangige jaDeyannu haakuttidaane)

ಸಿಂಹ ಜಿಂಕೆಯನ್ನು ತಿನ್ನುತ್ತಿದೆ.

(simha jinkeyannu tinntide)

ಆನೆ ನಾಯಿಯನ್ನು ತುಳಿಯುತ್ತಿದೆ.

(aane naayiyannu tuLiyuttide)

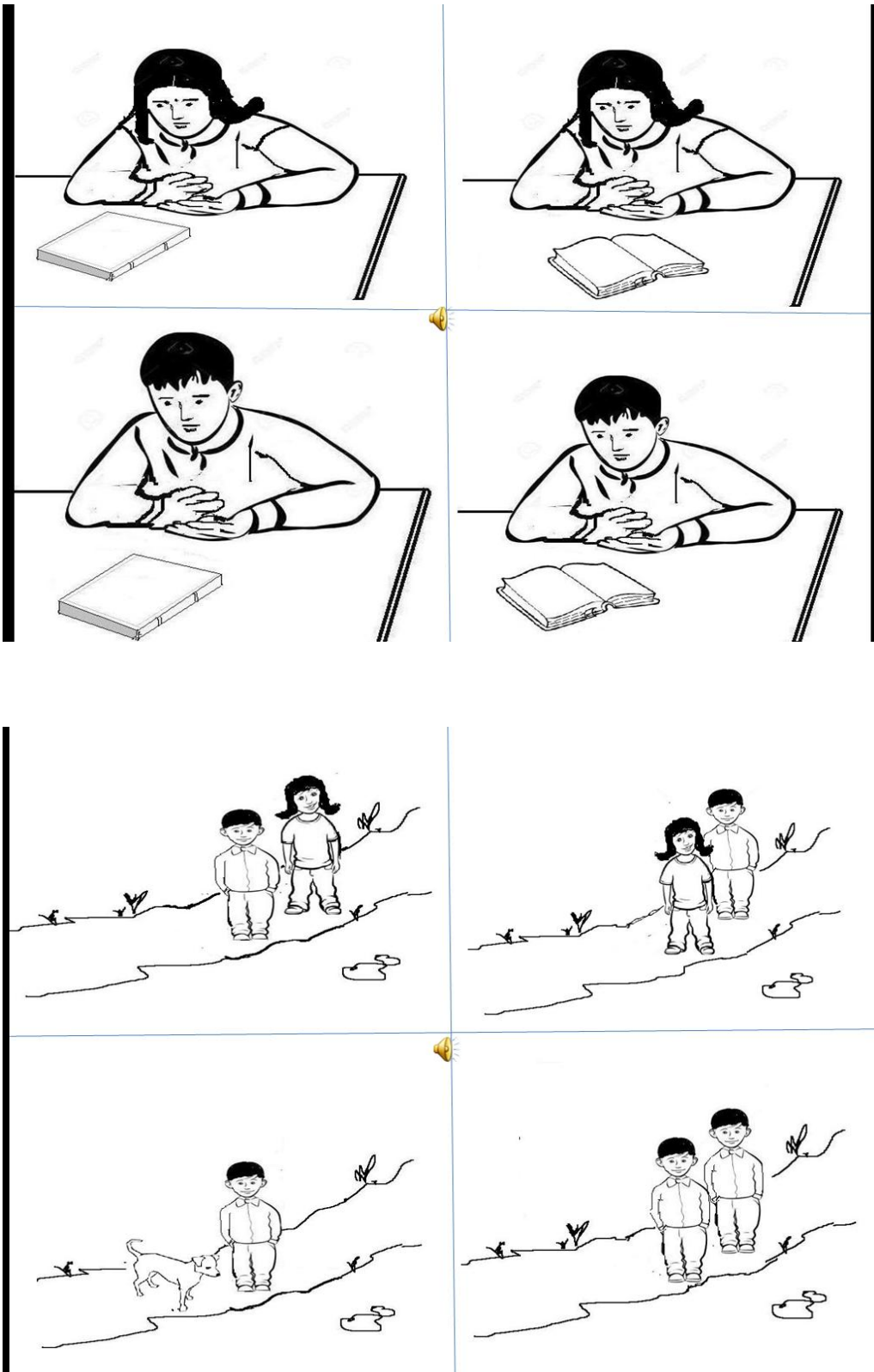ಹುಡುಗ ನಾಯಿಗೆ ಕಲ್ಲು ಹೊಡೆಯುತ್ತಿದ್ದಾನೆ.

(huDuga naayige kallu hoDeyuttidaane)

ಸಿಂಹ ಇಲಿಯನ್ನು ಹಿಡಿಯಿತು.

(simha iliyannu hiDiyitu)

Picture stimuli

Practice items

Test items