Awareness of Morphological Complexity in Words and Its Impact on Reading

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May, 2015

CERTIFICATE

This is to certify that this dissertation entitled **"Awareness of morphological complexity in words and its impact on Reading"** is a bonafide work submitted in part fulfilment for the Degree of Master of Science (Speech Language Pathology) of the student (Registration No.: 13SLP008). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any of the University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled **"Awareness of morphological complexity in words and its impact on Reading"** is the result of my own study under the guidance of Dr.Shyamala.K.C, Professor in Language Pathology, Department of Speech Language Pathology, All India Institute of Speech and Hearing**,** Manasagangothri, Mysore and has not been submitted earlier to any of the University for the award of any other Diploma or Degree.

Mysore

May, 2015

Register No.: 13SLP008

DEDICATED TO

NAANA & AMMA

And To My (s)caring Family

Mother holds the baby close so that the baby knows it is his world, where Father takes him to the highest hill so that he can see what his world is like

-Mayan Indian Proverb

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CHAPTER-1

INTRODUCTION

Reading is a process of interpreting the printed word and understanding the written symbols. It is involved in both receiving the information and transmitting it. Language is the ultimate supplement for the acquisition of the reading skills. Hiebert et al., (1998) stated that, readers require structure (Syntax) and the meaning (Semantics) of the spoken language to decoding of the written text. Along with this, the minimal meaningful (Morphological) and non meaningful (phonological) components of language also helps in reading comprehension. Since reading comprehension is dependent on language, awareness of the phonology and morphology are vital.

Phonological awareness in reading comprehension

Phonology is the branch of linguistics, which deals with study of sound pattern in their respective language (Webster, 1961). The minimal units of language are called “phoneme” (Krueszewski, 1980s). These phonemes are obtained after the complete breakdown of the language which is non-meaningful in nature. Phonological awareness refers to manipulation of the sounds structures at syllabic and phonemic level. Many of the western languages are phonemic in nature, where they are influenced by the phonological awareness. This basic knowledge of manipulation of the sounds are found to help in reading comprehension. English is the one of the commonly used language which is majorly influenced by the phonological awareness. This manipulation involves phoneme blending, phoneme stripping, phoneme addition and phoneme deletion.

Example: Car- this word can be separated into three distinct sounds i.e. /k/, /a:/ and /r/. To separate word into phoneme, phonological awareness is important.

Phonological awareness is found to operate between 3-6years of age. For children more than 6 years of age. Morphological awareness is found to be important for reading comprehension (Carlise, 1996)

Morphological awareness in reading comprehension

Morphology refers to the understanding of linguistic forms. In linguistics *morphology* directs to the learning of words, their inner construction and mental processes that are entailed in formation of new words (O'Grady, Cuzman, 1997, Arnoff & Fudeman, 2005,). Manelis and Tharp (1977) and Buttherworth (1983) have projected that all morphologically compound words are stored in mental lexicon. Taft and Forster (1975) proposed that morphemic units and their combination restrictions are stored, without any wholistic representations. Morphology is concerned with the structure of words. Morphemes are the primary building blocks of words. Words can be split into minimal meaningful units called morphemes which provide a cue for meaning, spelling and uttering (Carlisle, 2003).

Morphemes are grouped into two: free and bound morphemes. A morpheme which can stand as an independent word in a phrase or sentence is called a free morpheme. A morpheme which cannot arise without help and must be attached to one more morpheme is said to be a Bound morpheme. Monomorphemic words *(*such as *table, eat,* and *tiger*) are also called root words. Multimorphemic words, such as 'houseful', 'international', are composed of multiple morphemes. In the words *international* and *national,* the root word is *nation.* Root words and stems are manipulated by inflectional and derivational

morphemes which convey syntactic and semantic details. Since readers require structure (Syntax) and the meaning (Semantics) of the spoken language to decoding of the written text (Hiebert et al.; 1998) Inflectional and derivational morphemes were taken into consideration which convey the syntactic and semantic information respectively.

As Kannada belongs to the south Indian Dravidian family of languages and which is morphemic in nature, study is mainly concerned with the morphological awareness. Kannada morphology is characterized as agglutinative in which nouns and verbs get inflected. Words are created by accumulation of suffixes to root words in a sequence. Words in the Kannada language are divided into three classes namely i) Uninflected words . ii) Verbs and iii) Declinable words. Declinable words are changed to distinguish between case, number and gender. Nouns, Pronouns and Adjectives are incorporated in this group. Verbs are conjugated to mark differences of person, gender, number, aspect and tense. In Kannada, a word is formed by manifestation of adjacent words. These combinations of words will occur in two ways- *Sandhi* and *Samasa*. *Sandhi* (Morphophonemics) deals with the formation of a new word with the combination of two words or different morphemes together. In Kannada, both verbs and nouns have morphological form (MF) s. Verbs undergo morphological changes to represent tense, gender and grammatical person. Nouns undergo morphological changes to represent singular or plural and grammatical case. These Morphological forms are created by adding the respective morphological suffix to the end of the pure form of the term. Several morphophonemic changes take place, when suffixes connect to the root word. Morpho- syntax is determined by the order of the suffixes that attach to the root word. These changes and manipulation of the morphemes in

the languages can be assessed through various methods and priming is one of the methods.

Priming

The Brain processes information through experience of particular concepts. This is done with the help of short term and long term memory. There are two kinds of long-term memory, one of which is called **declarative memory**. Declarative memory is divided into an *episodic* (personal experiences and events) and a *semantic memory section* (semantic, symbolic and iconic contents) and consciously activates and processes memories and the **non-declarative memory** is organized via priming events.

Priming (to prime=to plan, to instruct in prior) corresponds to a cognitive phenomenon that can be predicate on the establishment of context-based associations linking a stimulus and a response. Priming is often referred to as an implicit memory (Graf and Schacter, 1985; Schacter, 1987 & Roediger, 1990). Priming mirrors the mechanisms of classical conditioning, wherein a earlier presented stimulus (the *prime*) cues a response as soon as a related prime (then called *target*) is presented to the subject. The **priming effect** describes the condition that the "prior exposure to a stimulus (prime) can facilitate its succeeding identification and classification (target)".

In the current study the main focus is on children's abilities to differentiate and alter morphemes in order to create inflectional or derivational morphemes. Inflectional morphology and derivational morphology are two main domains of morphology. Inflections are concerned with changing the grammatical function of a word, without altering the word class. For instance the word *write* is changed by

adding '*en*' to it then the word *write* will change to *written*. This example explains that the noun becomes a verb by adding a bound morpheme to a root word. Derivations involve the creation of new words from morphemes which helps to change the meaning. For example if the word write is added with bound morpheme 'er' then the word becomes writer. These two main components of morphology have an impact on reading comprehension.

Aim: The purpose of the study is to examine the relationship of awareness of morphological complexity on reading comprehension in Kannada.

CHAPTER-2

REVIEW OF LITERATURE

Phonological awareness in reading comprehension

Phonology is the branch of linguistics which deals with study of sound pattern in their respective language (Webster, 1961). These sounds called "phoneme" (Krueszewski, 1980s) which are minimal units of language. A study was conducted by Burgess & Lonigan (1998), On phonological implication and result revealed that the awareness towards phonological units are directly impact on development of early reading skills and vice versa. Another study conducted by Lonigsan et al., (1998) indicated that phonological awareness is a precursor for development of reading skills at lower level and it is the path for the development of higher level of language units. Several researchers had investigated the connection between awareness of morphological units, reading aspects and vocabulary aspects separately for awareness of phonological units (Fowler and Liberman, 1995; Mahony *et al*., 2000, Carlisle, 2000) and suggested that there was an impact of phonological awareness on morphological knowledge. While others compared knowledge of the morphological and effect of phonological form and its impact on reading skills (McBride-Chang, 2005; Singson, 2000) and they insisted that children expertise in building vocabulary. McBride-Chang, Cho, Liu, Shu & Zhou et al, (2005) reported that phonological awareness to phonological forms was essential in reading English and French language. Since phonological units are confined to the lower grade, higher language components (morphology) were needed to be looked upon

Role of morphological awareness and its impact on reading ability

Morphological awareness is described as the capability to understand the rules of word formation and combining among sounds/letters and meanings (Kuo & Anderson, 2006). Awareness of morphological structure deals with the ability to replicate and manipulate that structure of a word which intend helps readers to decompose morphologically complex words and recognize morphological relationships between words (Carlisle, 1995). In directional term, morphological awareness towards morphological units leads to reading expertise, but not the other way around.

Morphological awareness serves as a fundamental aspect in developing knowledge which mainly concern for reading. Morphemes include phonological, semantic, and syntactic properties (e.g. *–ing* in the verb *writing* shows the action (Singson, Mahony & Mann, 2000) which conveys the function of a given word in the reading context. Also, building up of vocabulary of words depending upon phonological properties with morphological knowledge. (Sandra, 1994). Inflections of morphemes can supplement to each word contained by the identical grammatical class and word class does not change to which they are affixed to. Therefore, reading acquisition takes place when an individual is capable of manipulating morphemes at both implicit and explicit levels

A study by Carlisle (2000) was conducted on a group of school going children to examine the relationship between children's knowledge of meaning of morphologically complex words and their awareness of word structure. The result showed that ability of understanding morphologically complex words depends on awareness of the structure. Study on morphological awareness and its impact on reading were conducted by Rubin et al (1991) in second graders; language-learning

disabled children, and adults with literacy problems. Result revealed that individuals perform poorly on tasks required them to apply morphological rules in spoken language and to analyze the morphemic structure of spoken words. Similarly Leong's (1999) conducted a study to see how morphological processing helps in reading between typically developing children and Dyslexics at word level. The results support those students with dyslexia exhibit difficulty with implicit transformation rules compared to the typically developing children. Readers could perceive phonological abnormalities and spelling with morphological knowledge. So these studies implies that the connection between morphological awareness and reading are directional (Chung & Hu, 2007, Kuo and Anderson, 2006).

Morin (2003) studied development of comprehension and production vocabulary knowledge by the effect of derivational morphology instruction. Comparison of the performance was done between the normal group and disorder group in the 1st semester and the 2nd semester. The results specify that vocabulary knowledge benefit in both productive and receptive was benefited by morphological instruction, particularly for 2nd semester students. Morphological instruction also assists in learning new unfamiliar words, and which helped in escalating vocabulary size.

Understanding the morphemes and morphemic structure helps to reproduce and influence morphological structure of words which intend assist in development of the morphological knowledge (Carlisle, 1995; Carlisle & Stone, 2003). Awareness towards inflectional forms will be achieved prior than to derivational forms (Carlisle and Stone, 2003). The vocabulary of morphological knowledge

has had an impact on the development on other subordinate components (orthographic, semantic aspects) (Kuo & Anderson, 2006).

Ku & Anderson (2003) hypothesised that awareness morphological units plays an important role in acquisition of morphological knowledge and reading ability among 2nd, 4th and 6th American and Chinese students of English and Chinese languages. Reading comprehension test and set of tests were administered. These included a test for recognition of morpheme, morpheme interpretation test and test for pseudoword judgment. The findings revealed the experience of the language impact on gradual development on awareness of morphology, and awareness of morphological units is essential for English and Chinese reading proficiency and vocabulary acquisition. Casalis (2004) the aim was to analyze impact of the impairment in phonological units in dyslexics dealing with morphemes (larger units of language). Result revealed that dyslexic children were weaker in the morphemic segmentation tasks compared with the reading age control group, they performed on average for their reading level in the sentence competition tasks.

Another study on morphological awareness was conducted by Catherine et, al (2005) in children for acquisition of vocabulary among 115 kindergarten and results revealed that both the morphological structure awareness and morpheme identification significantly had their impacts on vocabulary development.

Leikin Mark & Hagit (2006) employed the masked-priming paradigm along with evaluation knowledge of morphological and phonological form, relationship between morphological abilities and reading in adult with dyslexia. Result revealed that there was difference in the word decoding pattern in phonological and morphological forms by regular and dyslexic group. Michael & Nonie. K.(2007) aimed to examine the relationship between morphological knowledge of

morphological units and reading comprehension among Spanish speaking English language learners from fourth to fifth grade. The results revealed that there was significant association between knowledge of morphological units and reading comprehension between fourth and fifth grade. Author also stated that morphological awareness was a very important predictor of reading comprehension. Morphological awareness had significant contribution to reading comprehension at all the 3 groups.

The impact of the morphological awareness skills on reading was compared between English language learners and dyslexics by Seigal and Linda (2008) and result revealed that lack of morphological awareness was important contributor to the insufficiency in reading and spelling in Dyslexics**.** Similar study was conducted John R. Kirby (2011) had conducted research on children's morphological awareness and reading ability and the result indicated that morphological awareness was an important predictor of reading precision of both words and pseudo words.

Studies related to the phonological and morphological awareness in Indian context

A relationship between the phonological awareness and reading in Oriya and English languages were performed by Mishra & Stainthorp (2007) among 5^{th} grade children. The performance was checked by using phonological awareness, word reading and pseudo word reading. Results revealed that word reading task was better in Oriya language compared to English and pseudo word reading were better in both the language children. Children performed significantly better in Oriya than in English for phonological awareness.

A study conducted by Seetha (2010) to check the performance of the children of 5th to 7th grades on metaphonological skills. Results revealed that the children performed better on syllables than phonemes and performance were differ across each grades on metaphonological skills. The author concluded that Metaphonological skills are important in reading and writing.

Since the Dravidian languages are syllabic in nature, knowledge of morphology plays very important role in reading comprehension. Ceana (2013) conducted a study with the aim of comparing metalinguistics skills of the children with malayalam language as L1 and English as L2 across 5th grade to 7th grade. Result revealed that English morphological awareness lag behind Malayalam language and Malayalam and English phonological awareness reached plateau by 5th grade.

Development of morphemes take place in a different way in across different languages and a study conducted by (Devaki, 1983) on development of various types of morphemes in Kannada and author insisted that all morphemes of Kannada were achieved by the 7th grade. Few studies on Indian language have been reported that phonemic awareness does not a play vital role in acquisition for reading (; Prakash, 1987, Prakash, Rekha, Nigam, & Karanth, 1993; Karanth & Prakash, 1996; 1999; Prema, 1998).

Priming Experiments

The main effect obtained in a priming paradigm is that base of the complex words could be identified of its base or another morphologically related word in association to an unrelated baseline. For example, the detection of the simple word *harden* is sooner when it is by *hardening* than by an unrelated control word like

structural, showing that the representation that during the recognition of the derived word, base is activated. Morphological priming effects have been gained in several languages

Several authors have conducted various experiments on priming concept by using pseudowords. Bentin and Feldman (1990) reported no priming effect seen between pseudowords primes and real words in sharing a common root by using a visual priming concept with long interval. Drews and Zwitserlood (1995) conducted study by Dutch inflected pseudowords as primes and their roots as targets, did not find any priming effect in a visual priming paradigm.

Casalis, Severine et,al (2009) conducted an experiment on fourth grade French students by visual lexical decisions task to derived words lead by primes input either a morphological or an orthographic relationship among the target. Results revealed that both morphologically and orthographically related primes are facilitated by priming effects at the shortest prime duration.

Review of the study suggests that there is substantiation towards the role of morphological awareness and reading comprehension. The current studies associate morphological knowledge and vocabulary development in alphabetic language. However Kuppuraj, Abhishek &Prema (2012) had conducted a study on relationship between morphology and reading in Kannada which followed children from Grade IV to VI. They examined the morphological Knowledge of the children in two phases. One is by sentence completion using appropriate morphemes and second is by morphological priming task. Results revealed that participants from Grade IV to VI showed gradual increase in performance for all 3 tasks- word reading, sentence completion tasks and priming tasks. But the results

also revealed that there was a lesser correlation value between morphological awareness and reading across Grade VI in inflectional and in derivational contexts and a lesser correlation were seen in Grade V and VI.

Since the association and the consistency between inflectional and derivational morphemes across grades was not achieved in the above mentioned study, the current study aims to check for the correlation and consistency by considering children with higher grade for the study. The study also aims to examine both implicit and explicit morphological knowledge of the children by sentence completion task and Morphological judgement tasks.

CHAPTER-3

METHOD

Participants: A total of 30 typically developing children were included in the study. Based on their grade, children were divided into three groups. In each group,5 boys and 5 girls. Where all the children were enrolled from a school of Mysore. The native language of speakers and medium of instruction at school was Kannada.

The following inclusion and exclusion criteria were satisfied by children:

- No history of speech and Language deficits, psychological or neurological problems as per parental report,
- No oro-motor problems as per an informal oral motor examination, iii) No hearing loss on the basis of informal screening and
- Adequate academic performance as reported by teachers.

Preparation of stimuli: The participants were required to perform two tasks, (a) Sentence Completion Task (b) Morphological Judgment Task (MJT). Sentence Completion Task (SCT) was an open ended task, where totally 30 sentences were considered. The sentences were divided into two components, 15 inflectional morphemes and 15 derivational morphemes for completion task. Case markers of Kannada were taken into consideration as a inflectional morphemes in sentence completion task (/ge/, /ke/ /a/ and /annu/). Adjectives were considered as derivational morphemes in sentence completion task.

Morphological judgement task was a priming task, where14 stimuli were considered. 7 stimuli were considered for judgment of inflectional morphemes and 7 for derivational morphemes.

Procedure: All children were tested separately in a quiet environment i.e. in their respective school. Informed consents were taken from teachers before running the test since it was a residential school.

Task-1: Sentence completion task (SCT): Here the task was to complete sentences with the proper morphemes. 30 sentences were divided into 2 sets of 15 sentences. In the first set, the participants were filled the sentences by using inflectional morphemes (e.g nanu ooru … hogide). Inflectional morpheme for this context is 'ge'. In the same line, another set of 15 sentences which were to br filled with derivation were considered. E.g.avanu siri … (vantha has to be added for this context). The children were instructed to fill the sentences with appropriate morphemes. Prior to the administration, 2 practice items were given in order to familiarise the concepts.

Scoring: For scoring, binary scoring system was adopted for sentence completion task. Here for each correct bound morpheme for sentence completion task using Inflection morpheme (SCT-I) and sentence completion task using derivation morpheme (SCT-D), the participants got score of "1" and "0" for incorrect bound morpheme. The obtained raw scores were taken for analysis.

*Task 2: Morphological Judgment Task (MJT***):** Under Morphological judgement task, 14 stimuli used. Seven in each for derivational and inflectional morpheme were presented. The prime was appearedat the top of the screen for 1000 milliseconds following the target, which was displayed at the centre of the screen and appeared for 2000 milliseconds. Here target word is root word and the prime is a bound morpheme. The participants were

instructed to identify the presented bound morpheme with the root word as correct or not. 2 practice items were given in order to familiarise the task. Here both accuracy of the response and reaction time were considered. Reaction time in identifying correct inflectional morpheme (RI) and Reaction time in identifying correct derivational morphemes (RD) were noted.

Scoring:

Accuracy: In scoring the accuracy of the response, correctly identified inflection (AI) and derivation (AD)bound morphemes for the target were given score of "1" and incorrect score as "0". The obtained raw scores were analysed.

Instrumentation: DMDX software was used for morphological judgment task. 14 Kannada stimuli were uploaded in the respective software. Mainly to check accuracy and reaction time, this software was used.

Statistical Analysis: Statistical computation was done by Statistical Package for Social Sciences (SPSS) version 18.0. The mean and standard deviation were obtained for the all the parameters by descriptive statistical tool. Two way multivariate analysis of variance (MANOVA) was used to find overall significant difference in sentence completion task. A non-parametric test Kruskal Wallis Test and Mann-whitney was done to find if there is any significant difference between pair wise comparisons across grades.

CHAPTER-4

RESULTS AND DISCUSSION

The main aim of the study was to examine the relationship of awareness of morphological complexity on reading comprehension in Kannada. Specifically, the study aimed at investigating the usage of inflectional and derivational morphemes in both sentence completion task and morphological judgment task between and within the grades among children.

The objectives of the current study were:

- To study the performance of the typically developing children across grade 5^{th} to 7^{th} with proper usage of morphological knowledge on reading comprehension in Kannada.
- To compare the performance of typically developing children on inflection and derivation skills across grades

The data was statistically analysed and computed with appropriate tests. Analysis was done to check the proper usage of morphemes in Sentence Completion Task and reaction time and accuracy in Morphological Judgement Tasks. Sentence completion required the participants to complete the sentence with inflection morphemes and derivational morphemes. A score of '1' was given for correct response and '0' for incorrect. In Morphological judgment task, the participants had to judge if the root word and morphemes were appropriate together. If the participants perceived appropriate morpheme for root word, he/she had to press '1' and '0' for incorrect bound morphemes. Performance on Morphological judgment task was depicted through Reaction time and Accuracy of the response. The data was analysed in the following section.

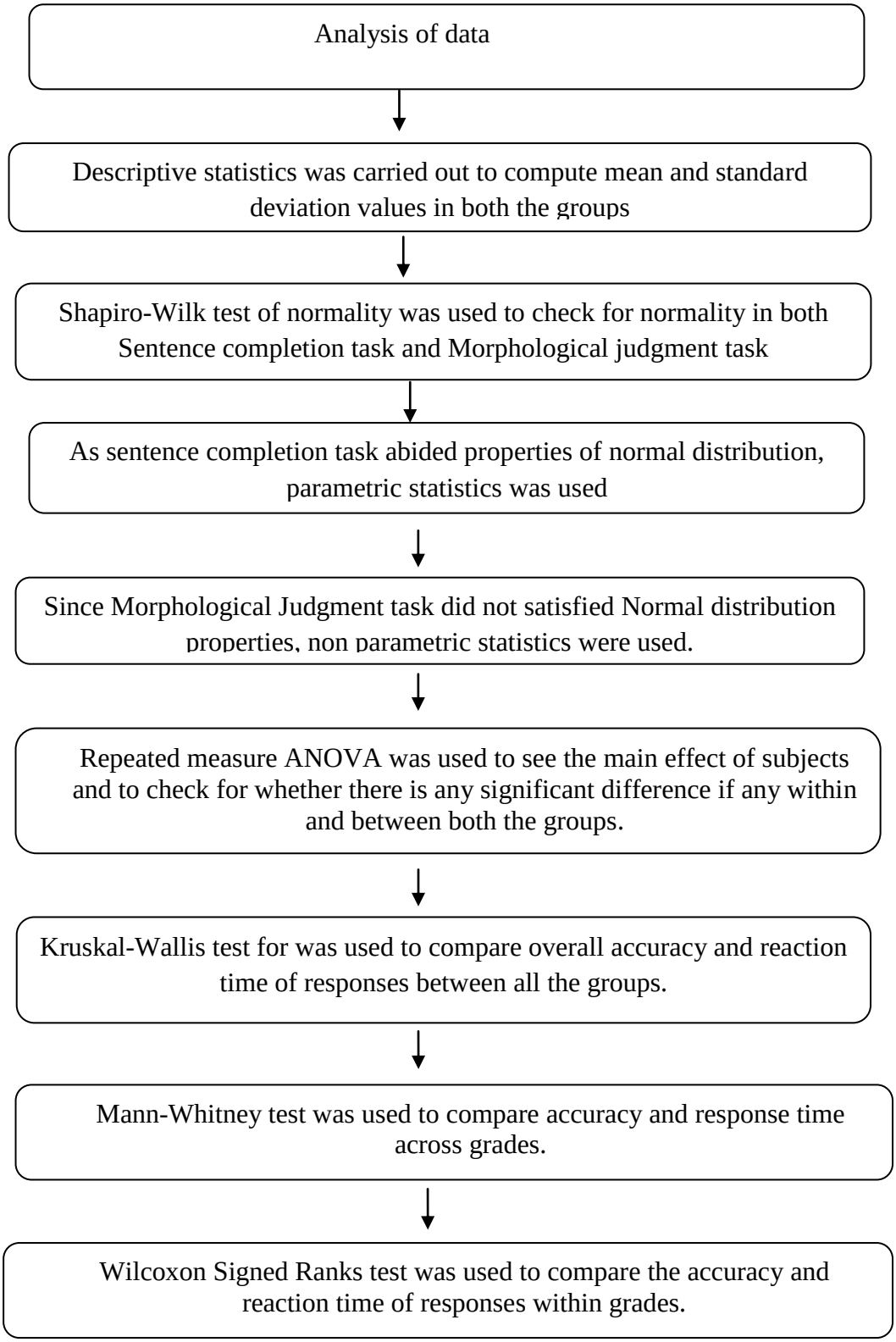

Figure 4.1 Flow chart depicting the statistical analysis performed in sentence completion task and Morphological judgment task.

The results of the current study are described in following sections

4.1 Comparison of performance on sentence completion tasks across grades i.e. 5^{th}, 6^{th} and 7^{th} on inflection versus derivational morphemes

4.2 Comparison of overall performance on two sub tasks of sentence completion task.

4.3(a) Comparison of reaction time in morphological judgment task across grades i.e. 5^{th}, 6^{th} and 7^{th}.

4.3(b) Comparison of reaction time in both inflectional and derivational morphemes within each grade.

4.4(a) Comparison of accuracy in morphological judgment task across grades i.e. 5^{th}, 6^{th} and 7^{th}.

4.4(b) Comparison of accuracy in both inflectional and derivational morphemes within each grade

4.1. Comparison of performance of children on sentence completion tasks across grades i.e. 5^{th}, 6^{th} and 7^{th}. (5v/s6, 6v/s7, 5vs7).

A check of normality was done by using Shapiro-Wilk test. The p values on sentence completion task for infection and derivation tasks are indicated below, and the p values showed normality ($p>0.05$) for both inflection and derivation tasks. As a result, parametric tests were done to analyze the significant difference across grades for sentence completion task.

Table 4.1 *Results of the Shapiro-Wilk test of normality for the sentence completion task*

Tasks statistics	Grade		p value
SCT-D	5th	0.08	0.86
SCT-I		0.50	0.93
SCT-D	6th	0.55	0.94
SCT-I		0.67	0.95
SCT-D	7th	0.21	0.90
SCT-I		0.46	0.93

***p>0.05-Significant difference**

Note: SCT-I= Sentence Completion task by inflectional morphemes, SCT-D= Sentence Completion task by Derivational morphemes.

The mean, median and standard deviation for sentence completion task using inflection and derivational morphemes measures was computed and is depicted in Table4.2

Table 4.2 M*ean, Median and Standard deviation for sentence completion task using inflection and derivation morphemes*

Grade	Stimulus	Mean	Median	SD
5th	SCT-D	5.9	5.0	2.60
	SCT-I	8.7	8.0	1.94
6th	SCT-D	8.6	8.5	1.95
	SCT-I	9.8	10	1.61
7th	SCT-D	10	9.5	2.5
	SCT-I	11.3	11.5	1.33

***p<0.05-Significant difference **p<0.01-Highly significant difference**

Note: SCT-I= Sentence Completion task by inflectional morphemes, SCT-D= Sentence Completion task by Derivational morphemes.

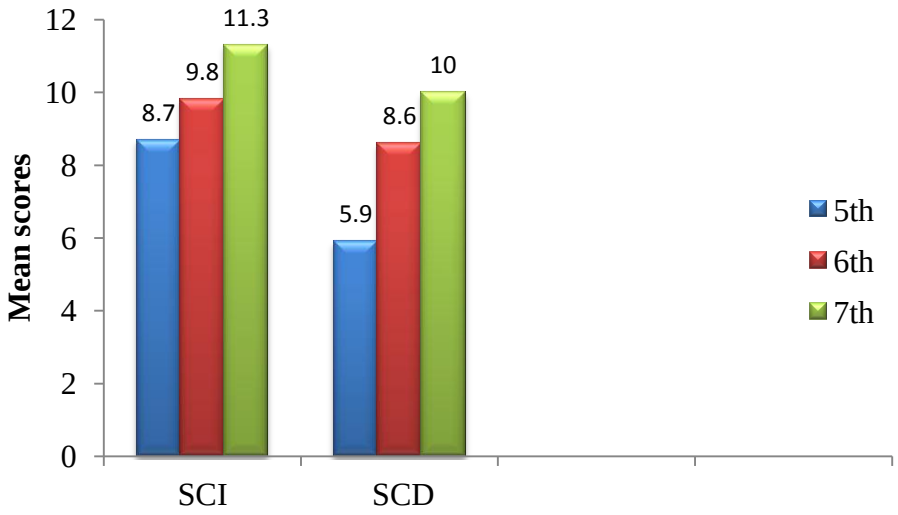

Figure 4.2. Mean scores of sentence completion task measures across all the grades for two experiments

Note: SCT-I= Sentence Completion task by inflectional morphemes, SCT-D= Sentence Completion Task by Derivational morphemes.

Multivariate analysis of variance (MANOVA) was computed to check the performance of the children in sentence completion tasks which showed significant difference in both usage if inflectional and derivational morphemes for sentence completion tasks respectively [$F(2,27=6.23.p<0.05)$ & $F(2,27=7.34.p<0.05)$] .

Multiple comparisons of the tasks were made by using Post Hoc test, Least Significant Difference (LSD) for sentence completion task with inflectional morphemes (SCI) and results were depicted in the table 4.4

Table 4.4 *Comparison of the performance of the children in sentence completion tasks using inflection across all three grades.*

Tasks	Compared grades	Mean difference	SD	p value
SCT-I	5 v/s 6	-1.10	0.73	0.15
SCT-I	6 v/s 7	1.10	0.73	0.16
SCT-I	5 v/s 7	2.60	0.73	**0.02**

***p<0.05-Significant difference **p<0.01-Highly significant difference**

Note: SCT-I= Sentence Completion Task using Inflectional morphemes, SD= Standard Deviation

Findings of the study revealed that there was significant difference seen between children of between 5th and 7th grade, where as there was no significant difference seen between 5th and 6th grade and between 6th and 7th. This implies that the performance of the children across consecutive grades were same for usage of inflectional morphemes, whereas difference were prominently noticed across two grade difference.

The current findings are in consonance with the study carried out by Kuppuraj, Abhishek & Prema(2012) considering 4th , 5th and 6th .found similar results were noticed in performance of children and they found that prominent difference between all three grades and increment were increases from one grade to another in their study too. The enhanced performance on morphemes at all these grade levels is also reported by McCutchen, Green, and Abbott (2008). The growths of the morphological knowledge were incremented from one grade to another which helps children in acquisition of language (Morin, 2003; McBride-Chang, Cho, Liu, Shu and Zhou et al, 2005; Nagy, Berninger, and Abbott, 2006). In the same lines, performance of

children of grade V, VI and VII on sentence completion was studied for derivation task also.

Multiple comparisons of the tasks were made by using Post Hoc test, Least Significant Difference (LSD) for sentence completion task with Derivational morphemes (SCD) and results were depicted in the table 4.5

Table 4.5 C*ompare the performance of the children in sentence completion task using derivational morphemes across all three grades.*

Tasks	Compared grades	Mean difference	SD	p value
SCT-D	5 v/s 6	-2.7	1.06	**0.01**
SCT-D	6 v/s 7	-1.4	1.01	0.20
SCT-D	5 v/s 7	-4.1	1.14	**0.07**

***p<0.05-Significant difference **p<0.01-Highly significant difference**

Note: SCT-I= Sentence Completion Task using Derivational morphemes, SD= Standard Deviation

Findings of the study revealed that there was significant difference seen between children of 5^{th} and 6^{th} grade and between 5^{th} and 7^{th} grade, where as there was no significant difference seen between 6^{th} and 7^{th}. This implies that there was a plateau achieved by children at 7^{th} grade in the usage of derivational morphemes which tell us that by 7^{th} grade children tend to acquire derivational morphemes (Morin, 2003; McBride-Chang, Cho, Liu, Shu and Zhou et al, 2005; Nagy, Berninger, and Abbott, 2006). Similarly Kuppuraj, Abhishek & Prema(2012) considered 4^{th} , 5^{th} and 6^{th} grades and found similar results and they found prominent difference between all three grades and increment increased from one grade to another in their study too.

Comparatively, inflection morphemes were acquired and achieved plateau early than derivational morphemes. Hence development of morphology can be explained by concluding that inflections are emerging prior to derivational morphemes developmentally.

4.2 Comparison of overall performance on two sub tasks of sentence completion task within grades i.e. on inflection versus derivational morphemes

The total mean values for the sentence completion task obtained in the two tasks for all three groups was subjected to repeated measure ANOVA which revealed a significant difference in sentence completion task between inflection and derivation morphemes [F(1,27=18.96.p<0.05)]. F and p values were depicted in the below table.

Table 4.6 *Total mean, standard deviation (SD) for the sentence completion task in the two conditions across all grades*

Tasks	Total mean	SD	F value	p value
SCT-I	9.93	1.9		
			18.9	0.00
STC-D	8.16	2.8		

***p<0.05-Significant difference **p<0.01-Highly significant difference**

Note: SCT-I= Sentence Completion task by inflectional morphemes, SCT-D= Sentence Completion Task by Derivational morphemes and SD= Standard Deviation

Overall results showed highly significant difference in performance of the children for sentence completion task for both inflection and

derivational morphemes. Total mean scores depicted in table 4.2 showed that the children performed better for inflection morphemes than derivation morphemes for completion of sentences.

The performances of the children in sentence completion task by using inflection and derivation were analysed. Findings of the study revealed that all the children performed well for completing the sentence using inflectional morphemes than derivational morphemes. On similar lines, a study done by Kuppuraj, Abhishek & Prema(2012) for the same tasks across 4^{th}, 5^{th} and 6^{th} grades also revealed that usage of inflectional morpheme in completing sentence was observed better than usage of derivational morphemes in completing sentence. The findings of the current study revealed that children acquire inflection morphemes prior to derivational morphemes which shows that awareness and use of inflectional forms will be achieved prior than to derivational forms (Carlisle & Stone, 2003; Ku & Anderson (2003). Similarly Michael and Nonie. K. (2007) study results showed that there was increase in performance for inflection morphemes than derivational morphemes by the children from 4^{th} to 6^{th} grades. This implies that there was significant association between knowledge of morphological units and reading comprehension between fourth and sixth grade. Morphological awareness had significant contribution to reading comprehension at all the 3 groups. Authors also stated that morphological awareness was a very important predictor of reading comprehension. (Kuo and Anderson, 2006; McBride- Chang, 2005; Singson , 2000; John R. Kirby (2011).

In the present study it was found that inflectional morphemes developed earlier compared to derivational morphemes.

4.3(a) Comparison of reaction time in morphological judgment task across grades i.e. 5^{th}, 6^{th} and 7^{th}.

The mean, median and standard deviation values for the reaction time for morphological Judgment Task (MJT) for the inflectional and derivational morphemes were computed using descriptive statistics and these values are represented in Table 4.7

Table 4.7 *Comparison of reaction time in morphological judgment task across grades*

Grade	Task	Mean	Median	SD
5^{th}	RT-I	2770.60	2746.65	227.34
	RT-D	2930.5	2910.92	216.14
6^{th}	RT-I	2516.76	2449.05	397.56
	RT-D	2836.94	2943.20	330.00
7^{th}	RT-I	2404.67	2397.70	296.09
	RT-D	2483.09	2401.60	268.73

***p<0.05-Significant difference **p<0.01-Highly significant difference**

Note: RT-D= Reaction time taken for derivational morpheme, RT-I= Reaction time for Inflectional morphemes & SD= Standard Deviation.

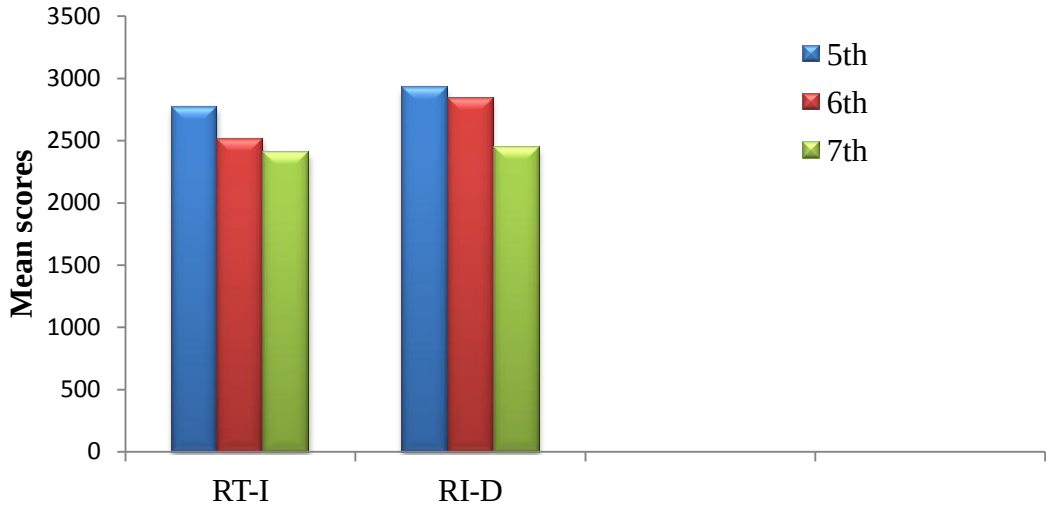

Figure4.3*:* represents mean scores of Reaction time for both inflectional and derivational task.
Note: RT-D=Reaction time taken for derivational morpheme, RT-I= Reaction time for Inflectional morphemes.

Kruskal-Wallis test was computed in order to check the overall scores of the reaction time for all grades across in two tasks. The results were put up in the table 4.8

Table 4.8 O*verall scores of the reaction time for all grades across two tasks*

	Tasks	**Grade**	**Chi-square**	**p value**
MJT	RTI	Overall grade	5.4	0.067
	RTD		9.4	**0.09**

***p<0.05-Significant difference** ****p<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, RT-D=Reaction time taken for derivational morpheme, RT-I= Reaction time for Inflectional morphemes.

The result of Kruskal-Wallis revealed that there is no significant difference in reaction time for inflectional morphemes [H(2)= 5.4, p<0.05] whereas

there was significant difference in reaction time for derivational morphemes[$H(2)= 9.4$, $p<0.05$].

Findings of tests revealed that overall mean reaction time scores in identifying the proper bound morphemes was less for inflection morphemes compared to derivational morphemes. This implies that children were able to identify correct inflection morphemes attached to root word than word with derivational morphemes. Similarly Results by Casalis, Severine et,al (2009) showed that both morphologically and orthographically related primes are facilitated by priming effects at the shortest prime duration. Even the study conducted by Kuppuraj, Abhishek & Prema(2012) revealed that mean reaction time scores in identifying the proper bound morphemes was less for inflectional morphemes compared to derivational morphemes across 4^{th}, 5^{th} and 6^{th} grade. This implies that children were able to identify inflectional morphemes earlier than derivational morphemes and this can be linked to the sentence completion task where children performed better for inflection compared to derivational morphemes.

There was no significant difference across the different grades for reaction time scores in identifying inflectional morphemes, whereas there was a prominent difference seen in identifying derivational morphemes. Since there was a significant difference noticed, Mann-Whitney test was computed to check for significant difference between grades and Wilcoxon-Signed rank test was carried out to check significant difference within each grades for both tasks across all grades.

Mann-Whitney test was computed to compare the performance of Morphological judgment task between all three grades for reaction time in

identifying both inflectional and derivational morphemes. Results were depicted in the table 4.9

Table 4.9 C*omparison of the performance of Morphological judgment task between all three grades for reaction time in Inflectional Morphemes*

Tasks	**Compared Grades**	***p* value**
MJT- RTI	5 v/s 6	0.226
	6 v/s 7	0.650
	5 v/s 7	0.10

***p*<0.05Significant difference ***p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, RT-I= Reaction time for Inflectional morphemes.

Results revealed that there was no significant difference between 5^{th} & 6^{th} grade (u=16, p <0.05), 6^{th} &7^{th} (u=44, p <0.05) and 5^{th} & 7^{th} (u=16, p<0.05) for reaction time in morphological judgment task using inflectional morphemes.

Table 4.10 *Comparison of performance of children reaction time for derivational morphemes across the three grades.*

Tasks	**Grades**	***p* value**
MJT-RTD	5 v/s 6	0.705
	6 v/s 7	0.23
	5 v/s 7	**0.03**

***p*<0.05-Significant difference ***p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, RT-D=Reaction time taken for derivational morpheme

Results revealed that there was no significant difference between 5th & 6th grade (u=45, $p<0.05$) and 6th &7th (u=20, $p<0.05$). Whereas, 5th & 7th (u=11, $p<0.05$) showed significant difference for reaction time in morphological judgment task using inflectional morphemes.

Findings from Mann-Whitney test revealed that there was no significant difference seen between any of the grades. This implies that the performances of the children across consecutive grades were same for usage of inflectional morphemes and even there was no differences were prominently noticed across two grade difference which suggests that there were no noticeable increases in increment. The children were able to identify inflection morphemes irrespective of the grade.

While there was significant difference observed between 5th and 7th grade children in identifying the derivation morphemes in priming task, there was no significant difference observed between 5th and 6th or between 6th and 7th grades. This implies that there were noticeable increases in increment for derivation morphemes from 5th to 7th grade and comparatively, derivational morphemes were difficult to be identified for lower grade children compared to identifying inflectional morphemes.

4.3(b) Comparison of reaction time between inflectional and derivational morphemes within each grade.

Wilcoxon Signed-Rank test was used to compare the differences within the group of pairs. Here reaction time for both inflectional and derivational

morphemes was calculated within each grade. The results were tabulated in table 4.11

Table 4.11 *Comparison of reaction time between inflection and derivational morphemes across each Grades*

Tasks	Grade	Z	*p* value
MJT-RT	5th	-1.07	0.285
	6th	-2.80	0.053
	7th	-1.171	0.241

***p*<0.05-Significant difference ***p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, RT-I= Reaction time for Inflectional morphemes.

Test results revealed that there was no significant difference between inflectional and derivational morphemes usage across fifth grade [z= (-1.07), $p<0.05$] and seventh grade [z= (-1.17), $p<0.05$] whereas there was significant difference seen in sixth grade children [z= (-2.80), $p<0.05$].

Findings of Wilcoxon signed-rank test revealed that there was no significant difference between the tasks across each grades. The children across each grade were not differing by time in identifying inflection and derivational morphemes. This implies that the children were used to identifying both inflectional and derivational morpheme around the same time in each grade.

4.4 (a) Comparison of accuracy of response in morphological judgment task across grades

The mean, median and standard deviation values for the accuracy of response for morphological Judgment Task (MJT) for both inflectional and derivational morphemes were computed using descriptive statistics and these values are represented in table.

Table 4.12 *Comparison of accuracy of response in morphological judgment task across grades*

Grade	Task	Mean	Median	SD
5th	AR-I	72.7	71.4	14.2
	AR-D	54.2	57	11.2
6th	AR-I	79.9	85.6	13.8
	AR-D	62.7	57	12.06
7th	AR-I	81.3	85.4	13.5
	AR-D	72.8	71.4	8.10

Note: AR-I= Accuracy of response for inflectional morphemes, AR-D= Accuracy of response for Derivational morphemes

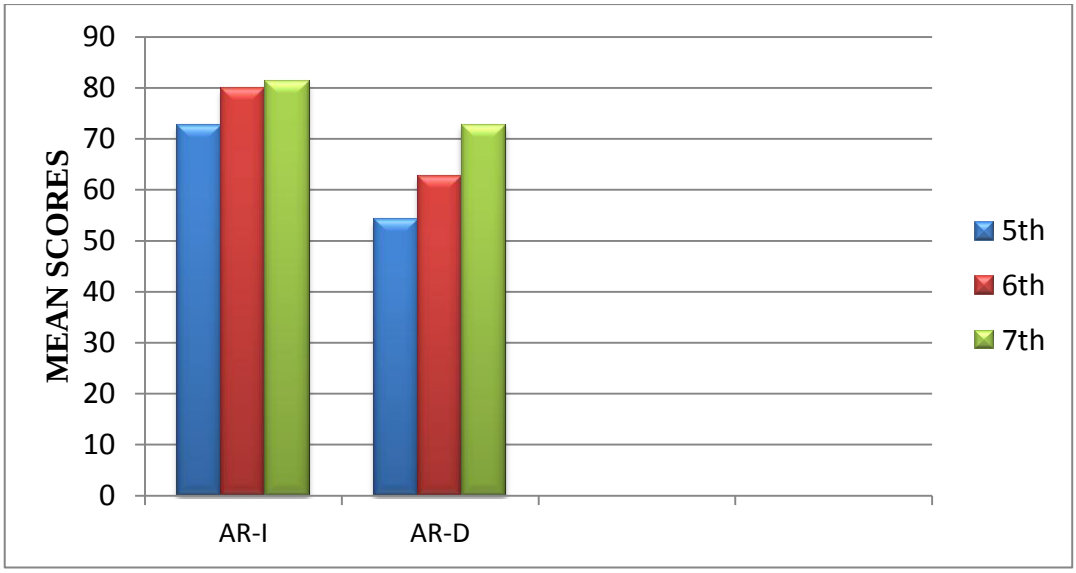

Figure4.4 : Represents the mean scores of the Accuracy of the response across all grades.

Kruskal-Wallis test was computed in order to check the overall scores of the accuracy of the response for all the three grades across two tasks. The results were put up in the table4.13

Table 4.13 O*verall scores of the Accuracy of the response for all grades across two tasks*

Tasks		Grade	Chi-square	*p* value
MJT	AR-I	Overall grade	2.15	0.341
	ARD		10.8	**0.04**

***p*<0.05-Significant difference** *******p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, AR-I=Accuracy of the Response for inflection morphemes, AR-D= Accuracy of the Response for derivational morphemes.

The result of Kruskal-Wallis test revealed that there is no significant difference in accuracy of the response for inflectional morphemes [H(2)=

2.15, $p<0.05$] whereas there was significant difference in the accuracy of the response for derivational morphemes[H(2)= 10.8, $p<0.05$].

Findings of tests revealed that overall mean percentage of accuracy scores in identifying the proper bound morphemes was more for inflection morphemes compared to derivational morphemes. This implies that children were able to identify correct inflection morphemes attached to root word than word with derivational morphemes. Even in the study conducted by Kuppuraj, et,al (2012) mean percentage of accuracy scores in identifying the proper bound morphemes was more for inflectional morphemes compared to derivational morphemes across 4^{th}, 5^{th} and 6^{th} grade. This implies that children were able to identify inflectional morphemes than derivational morphemes and this can be linked to the sentence completion task where children performed better for inflection compared to derivational morphemes.

There was no significant difference across all the three grades for accuracy scores in identifying inflectional morphemes, whereas there was prominent difference seen in identifying derivational morphemes. This implies that children find it easy in identifying inflectional morphemes across the three grades, whereas there was significant change of scores from each grade for identifying derivational morphemes.

Comparisons of accuracy of response in morphological judgment task across grades were tested by using Mann-whitney test and results were depicted in the table 4.14.

Table 4.14 *Comparison of performance of children in accuracy of response using inflection Morphemes between all grades*.

Task	Grades	*p* value
MJT- ARI	5 v/s 6	0.218
	6 v/s 7	0.905
	5 v/s 7	0.196

***p*<0.05-Significant difference ***p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task, AR-I=Accuracy of the Response for inflection morphemes

Results revealed that there was no significant difference between 5^{th} & 6^{th} grade (u=34.5, $p<0.05$) or 6^{th} &7^{th} (u=48.5, $p<0.05$). Whereas, 5^{th} & 7^{th} (u=33.5, $p<0.05$) showed significant difference for accuracy of response in morphological judgment task using inflectional morphemes

Comparisons of accuracy of response in morphological judgment task across grades were tested by using Mann-whitney test and results were depicted in the table 4.15.

Table 4.15 *Comparison of performance of children in accuracy of response using derivation Morphemes between all grades*.

Task	Grades	*p* value
MJT- ARD	5 v/s 6	0.126
	6 v/s 7	**0.04**
	5 v/s 7	**0.002**

***p*<0.05-Significant difference ***p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task,

Results revealed that there was no significant difference between 5^{th} & 6^{th} grade ($u=31$, $p<0.05$), while there was significant difference between 6^{th} &7^{th} ($u=25$, $p<0.05$) and 5^{th} & 7^{th} ($u=11$, $p<0.05$) for accuracy of the response in morphological judgment task using derivational morphemes.

Findings from mann-Whitney test revealed that there was no significant difference seen between any of the grades in inflectional morpheme identification. This implies that the performances of the children across consecutive grades were same for usage of inflectional morphemes and even across two grades no differences were prominently noticed across two grade difference which suggests that there were no noticeable increases in increment. The children were able to identify inflection morphemes irrespective of the grade.

While there was significant difference observed between 6^{th} and 7^{th} and between 5^{th} and 7^{th} grade children in identifying the derivational morphemes, there was no significant difference observed between 5^{th} and 6^{th} grade children. This implies that children from 5^{th} and 6^{th} grade find difficulty in identifying derivational tasks where as when they were compared with 7^{th} graders, scores were significantly low. This shows spurt of development for derivational morphemes at higher grade.

4.4 (b) Comparison of accuracy of the response between inflectional and derivational morphemes within each grades.

Wilcoxon Signed-Rank test was used to compare the differences within the group of pairs. Here accuracy of the response for both inflectional and

derivational morphemes was calculated within each grade. The results were tabulated in table 4.16.

Table 4.16. *Comparison of accuracy of response between inflection and derivational morphemes across each grades*

Tasks	Grade	Z	*p* value
MJT-AR-D	5th	-2.53	**0.011**
	6th	-1.99	**0.046**
	7th	-1.364	0.172

***p*<0.05-Significant difference ****p*<0.01-Highly significant difference**

Note: MJT= Morphological Judgment Task.

Test results revealed that there was significant difference between inflectional and derivational morphemes usage across fifth grade [z= (-2.53), p<0.05] and sixth grade [z= (-1.99), p<0.05]. While there was no significant difference seen in seventh grade children [z= (-1.36), p<0.05].

Findings of Wilcoxon signed-rank test revealed that there was a significant difference between 5th and 6th graders for the tasks. The children of 5th and 6th grade showed accuracy of the response for inflectional morphemes which differed from derivational morphemes, whereas children of 7th grade did not show a difference for the two task. This implies that responding to the inflectional and derivational morphemes was differing at lower grades. But, saturation or plateau is achieved at the 7th grade. so it may be concluded that development of many morphemes may take place by 7th grade.

CHAPTER-5

SUMMARY AND CONCLUSION

The study aimed at investigating the relationship of awareness of morphological complexity on reading comprehension for children across grade V, VI and VII in Kannada. Specifically, the study aimed at investigating the usage of inflectional and derivational morphemes in both sentence completion task and morphological judgment task between and within the grades among children. A total of 30 typically developing children were included in the study. Based on their grade, children were divided into three groups. The native language of speakers as well as medium of instruction at school was Kannada. The two tasks selected were Sentence Completion Task and Morphological Judgement Tasks. Sentence Completion Task (SCT) was an open ended task, where totally 30 sentences were considered, whole Morphological judgement task was a priming task, where 14 stimuli were considered.

In Sentence Completion Task**,** the children were supposed to complete the sentences with the appropriate bound morphemes. Under Morphological Judgement Task, 14 stimuli were used. Seven each were derivational and inflectional morphemes that were presented and children were asked to identify if the bound morphemes matched the target root word. The performance of all the participants were tabulated and subjected for statistical analysis. The analysis was performed with respect to grades and tasks. Statistical analysis was done by using SPSS software 18.0 version. MANOVA and repeated measure ANOVA were used to compare and

contrast between grades for sentence completion tasks. Mann-Whitney, Kruskal-Wills test, Wilcoxon Sign-rank test were applied to compare and contrast between grades for Morphological Judgment task.

The results revealed that all the children performed better in usage of inflectional morphemes than derivational morphemes. 5^{th} and 6^{th} grades children performed poorer compared to 7^{th} grade children. As the grade increased, performance was better for both tasks.

The following conclusions were drawn from findings of the current study.

1. The results of the performance of the children showed significant difference in both usages of inflectional and derivational morphemes for sentence completion tasks respectively. Here children performed better for inflection morphemes in completing sentences than derivational morphemes.

2. The result of comparison between grades showed that there was no significant difference for consecutive grades on sentence completion tasks using inflection morphemes, whereas there was a significant difference between 5 and 7^{th} grade.

3. There was no significant difference between 6^{th} and 7th grades on sentence completion tasks using derivation morphemes, while there was significant difference between 5 and 7^{th} grade and 5^{th} and 6^{th} grade.

4. The result of comparison of reaction time in morphological judgment task across grades revealed that overall mean reaction time scores in identifying the appropriate bound morphemes was less for inflectional morphemes compared to derivational morphemes. This implies that children were able to

identify correct inflection morphemes attached to root word than word with derivational morphemes.

5. Overall scores of the reaction time for identifying inflectional morphemes did not show any significant difference, whereas overall scores of the reaction time for derivational morphemes showed significant difference across all the grades.
6. The results of comparison of the performance of Morphological Judgment Task revealed that there was no significant difference between the three grades for reaction time in identifying both inflectional and derivational morphemes.
7. Comparison of within the group of children across grades revealed that no significant difference for 5^{th} and 7^{th} grade, while 6^{th} grade children showed significant difference for reaction time.
8. Overall scores of the accuracy of the response for identifying inflectional morphemes did not show any significant difference, whereas overall scores of the accuracy of the response for derivational morphemes showed significant difference across all the grades.
9. The results of comparison of the performance of Morphological judgment task revealed that that there was no significant difference across all grades for accuracy of response in morphological judgment task using inflectional morphemes
10. The results of comparison of the performance of Morphological judgment task revealed that that there was no significant difference between 5^{th} & 6^{th} grade Whereas, 6^{th} &7^{th} and 5^{th} & 7^{th} showed significant difference for

accuracy of response in morphological judgment task using derivational morphemes.

11. Comparison of within the group of children across grades revealed that there was significant difference between inflectional and derivational morphemes usage across fifth and sixth grade. Whereas, there was significant difference seen in seventh grade children.

Clinical implications

- The results of the present study suggests that facilitating morphological awareness may also facilitate word reading
- This may lead to an alternative view to intervention of children with Reading difficulty in Kannada language.

Limitations of the study

- Sample size used for the study was small suggesting caution in generalizing the findings.
- Since the sample size was less, comparison between males and females could not to be done.
- Stimulus taken for Morphological judgment tasks was less. i.e. 14 only in number.

Future Directions

- The future studies can be focus on wide range considering lowest grade and highest school grade.
- Gender contingent variations if any, may also be explored by including a larger sample.

- More stimuli can be considered for Morphological Judgment Task in order to tap the children morphological awareness
- Since it is a preliminary study, more studies has to be carry out in this field

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