

Written Language Skills in Children with Dyslexia

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ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTTHRI

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May 2010




Amma and Dad....
I love you....
This is dedicated to you.

Certificate

This is to certify that this dissertation entitled "**Written language skills in children with dyslexia**" is a bonafide work in part fulfillment for the degree of Master of Science (Speech- Language Pathology) of the student (Registration No. 08SLP028). This has been carried out under the guidance of a faculty of this Institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

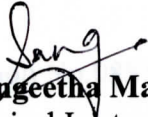
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Declaration

This dissertation entitled "**Written language skills in children with dyslexia**" is the result of my own study under the guidance of Mrs. Sangeetha Mahesh, Clinical Lecturer, Department of Clinical Services, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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CHAPTER 1

INTRODUCTION

Writing is an essential means of communication and helps children to organize their thoughts in a structured way. Writing is one form of verbal behaviour and it is the most complex of all the verbal behaviours and students of all ages have difficulties becoming proficient in writing. Some children with writing difficulties have language or learning disabilities, whereas others do not. Whatever may be the underlying difficulties for some children, writing is not easy.

Writing is a cognitive activity. It involves use of executive process and self regulation all throughout the writing activity which includes four stages: planning, organizing, generating and revising. Planning and organizing stages are internal processes which cannot be measured explicitly. Generating stage is where text is generated where the writer translates his or her planned ideas into meaningful chunks of sentences, phrases, words into written symbols and includes spelling, handwriting and punctuation (Scott, 2005). In proficient writers these stages follow one another smoothly and quickly and easily.

In the early primary grades text generation and writing quality are most constrained by a child's handwriting fluency (Berninger & Swanson, 1994). Because children who have not yet mastered handwriting must direct attention to letter formation, they do not generate much text. By the intermediate grades, when handwriting is automatised for most children, its constraint on text generation is minimized and texts

become longer. With age, text length and quality become increasingly related (Berninger & Swanson, 1994; Shanbal & Prema, 2003; Yeshoda , 1994; Kiran , 1994).

Numerous prerequisites are present in order to become efficient in writing. These prerequisites include auditory processes, visual processes, motor processes and inner language processes. All these processes are very important for all kinds of verbal behaviour and these are the stepping stones or foundations for the prospective writers. Any difficulty in even one among these processes would lead to written language difficulties.

Writing is a multifaceted activity ranging from the production of legible handwriting to the production of organized discourse. The components of writing are interwoven, and difficulty in one aspect of writing, such as spelling, often contributes to difficulty in another aspect of writing, such as talking notes or expressing ideas. It is important to know the components of written language in order to plan appropriate instructional interventions for children with writing difficulties. The components of written language are handwriting, spelling, usage, vocabulary and text structure. These skills are interlinked to one another and thus help in forming a structured and organized written text (Mather, Wendling & Roberts, 2009).

The term dyslexia is often misunderstood to mean a reading difficulty where an individual reverses letters or reads words backwards. In fact, *dys-* means impaired and *-lexia* means words, reading or language. Thus dyslexia means impaired language or

reading (Hudson, High & Al Otaiba, 2007). The definition of dyslexia also includes difficulty in fluent word recognition, poor spelling and decoding abilities. Hence, children with dyslexia may also have problems in written language. The international dyslexia association (2002) defines dyslexia as follows:

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.

A disorder of written language is termed as dysgraphia by Johnson and Myklebust (1967). As we know that writing is a multifaceted activity, it calls for a classification of written language disorders. Written language can be due to inappropriate visuo motor integration, due to deficits in revisualization and can be due to formulation difficulties in syntax. Consequently the clinical manifestations of these varied types of difficulties will be different from one another and this requires a comprehensive assessment of written language skills.

There are numerous tests available for spoken form verbal language abilities. From past few decades research is gradually gearing up on reading and writing aspects of

verbal language particularly research on writing is a recent research interest for most of the speech pathologists, psychologists and educators. Written language can be assessed using standardized instruments which test the basic skills like spelling, handwriting, vocabulary, syntax quantitatively. These standardized measures do not follow the classroom curriculum. Hence, these tests should be used in conjunction with an informal assessment by doing curriculum based measurement which allows the speech language pathologists to quantify the writing samples and measure in the way the children are taught in school by testing their basic skills. This would be a more comprehensive way of assessing the written language skills.

NEED FOR THE STUDY

Testing a wide variety of written language skills at various levels of language development has important implications for assessment, diagnosis and therapy. Research indicates that children with language difficulties have problems in several aspects of written language. But, we do not have readily available data on typically developing primary children that can be used to compare the clinical samples of children's writing.

Most of the standardized tests check narrative style of writing. Although this is appropriate in the primary grades, children are expected to create expositions as they move on to higher classes. Expository writing requires children to employ skills that can be particularly challenging for language disorders. For example they need to demonstrate familiarity with complex rhetorical structures, facility with general and technical vocabulary that they can use with precision around specific topics, a solid working

knowledge of how to apply grammatical rules and writing conventions in simple and complex sentences and correct spelling of morphologically complex words. Commercial test seldom cover these areas neither in any depth nor with resources adequate to scaffold them.

Also, studies on written language and difficulties associated with written language have been very few in the Indian context. India is a multilingual country and majority of the children are exposed to their mother tongue and have English as their medium of instruction in school. Thus, there is a need to study the language aspects of writing in typically developing children (TDC) and also to derive normative for different grades in TDC in English. The development of norms can be used as an index for comparing writing samples of TDC and the clinical groups particularly in children with Dyslexia. Clinically, this study will help Speech Language Pathologists (SLP) to screen and to identify their difficulties and design appropriate management procedures relevant to linguistic aspects of writing. Frequent assessment and progress monitoring make it possible for SLPs to document the results of the efforts of therapy and the impact on the child's learning. Further, the results can be compared and differentially diagnosed with other types of dyslexia. Hence, the present study has been planned to meet the following objectives.

OBJECTIVES OF THE STUDY

The present study was conducted to determine the written language skills in TDC and in children with dyslexia. Following were the objectives considered for the study.

1. To derive a normative data for the written language skills using expository style of writing.
2. To study the pattern of written language skills in children with dyslexia.
3. To perform quantitative analysis of written language skills in both the groups.
4. To compare and analyse the written language skills in TDC and children with dyslexia.

CHAPTER 2

REVIEW OF LITERATURE

Verbal language is of two types, spoken and written (auditory and visual). Man acquires auditory language before he begins to read and write. Man's language systems, the auditory and the written, develop sequentially according to a pattern determined phylogenetically and ontogenetically, neurologically and psychologically. After auditory language has been achieved and after the required additional maturity has been attained neurologically and psychologically, the normal child acquires the visual language forms; he learns to read and write. The written form assumes that the read form has been achieved. The relationship between the auditory and visual language forms is hierarchical in nature, meaning that to develop normally, the read form is dependent on the auditory or spoken form and the written is dependent on the integrity of both the auditory and the read.

Writing is a challenging activity for most of the primary school going children. Writing a text demands more proficiency in a language as "writing is a complex process which requires the activation and co-ordination of orthographic, graphomotor and several linguistic skills, including, but not limited to, semantics, syntax, spelling and writing conventions" (Scott, 2005; Singer & Bashir, 2004). Literature on written language skills has been reviewed and is presented in the following headings.

- Models of written language
- Developmental prerequisites of written language
- Components of written language
- Learning Disability and Dyslexia

- Disorders of written language
- Assessment of written language
- Tests of assessing writing skills
- Research on written language in TDC
- Research on written language in children with Dyslexia

Models of written language

Writing is a deliberate, generative task that requires the recruitment and integration of a range of different neurodevelopment abilities. Because writing is intentional action, it is under the control of executive and self regulatory processes.

A few models of written language have been proposed. One of the models of written language explains the variations and difficulties seen in the production of written language in children (Bereiter & Scaradmalia, 1987; Berninger & Swanson, 1994; Hayes, 2000; Hayes & Flower, 1980).

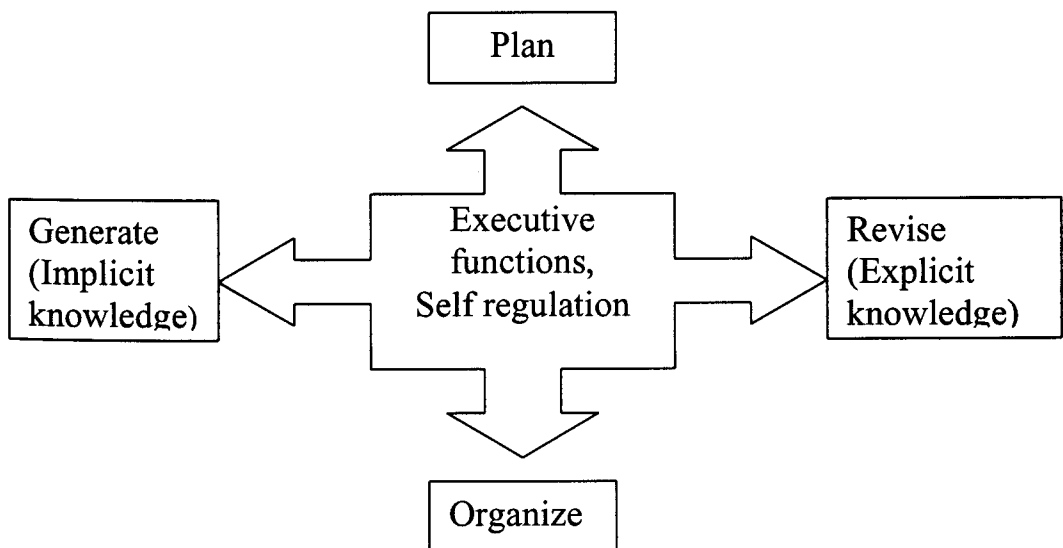


Figure 1: A model of written language production (Singer & Bashir, 1999)

Figure 1 shows a model of written language production which has four writing processes. They are planning, organizing, generating and revising. As writing is a deliberate self regulated task, it is controlled by executive functions. The first step in writing a text is idea generation and retrieval (plan), second step is how to structure those ideas so as to convey their meaning (organize); third step is to encode such ideas into linear strings of words, phrases and clauses to express those meanings (generate); and the final step is to reconsider and recast those linguistic structures so that they convey what the writer intended according to the writing conventions of the culture (revise). Hence, these four processes are central to the composing process itself.

a. Planning

For something to be written, writers must have something they want to communicate. In this model, the process of planning is considered to involve the retrieval of preverbal representations (Collins & Gentner, 1980) i.e., conceptual information that is represented in nonlinguistic form). In other words planning involves idea generation and retrieval. Having an idea of what to convey in writing, the writer then engages the generating processes to transcribe this onto a page. Planning is an internal process that is distinct from generating. As a result, it is difficult to isolate and to examine empirically.

Children with Language Learning Disability (LLD) fail to engage in advanced planning processes when they write both narrative and expository text. They use an average less than 1 minute of time planning prior to writing, unless they are explicitly taught how to plan.

b. Organizing

Organization processes are engaged when writer decides how to structure and sequence the ideational content of a text. Children enlist organizing processes when they implicitly and/or explicitly plan how to attain their goals for a text and generate language reflecting what they know about.

Children with LLD struggle with organizing ideas for writing. Children write whatever comes to mind in whatever order it comes to mind. Thus, they string ideas together associatively instead of actively shaping them according to the text structure dictated by the genre and/or writing task. Even when they have brainstormed ideas prior to writing, children with LLD do not apply logical and well defined schemas for organizing the information when composing. As a result their writing is often poorly organized and incoherent.

c. Generating

The generating process encompasses two general functions. The first is text generation, which involves turning ideas that are generated in the planning process into language representations with working memory so that they can be expressed in writing. It involves implicit representation and encoding of ideas into written language. In the representational process, the writer draws on knowledge of language meaning, structure, spelling, writing mechanics and text structure.

The second aspect of generating a text is transcription, which involves encoding verbal mental representations into written symbols (Berninger & Swanson, 1994).

Recruiting knowledge of spelling, writing mechanics and writing conventions, writers transcribe formulated ideas onto paper (by handwriting or typing).

d. Revising

The notion of implicit (automatic) versus explicit (reflective) encoding of language distinguishes the generating process from revising process. Revising taps explicit linguistic knowledge. Changes to word choice, sentence structure, spelling, punctuation, and so on are brought about by one's explicit (or metalinguistic) knowledge of language meaning, form and use. During online production of text, writers recruit both implicit and explicit linguistic knowledge. They encode ideas implicitly, then reflect on the degree to which they have accurately represented their intentions and when necessary, explicitly use their knowledge of language to reformulate, clarify or elaborate.

Children with LLD often present with concomitant reading disabilities. As a result, they struggle with the foundation skill of revision: reading comprehension. Children with LLD struggle not only to decode and to comprehend their own writing but also to comprehend and evaluate what they read in terms of its meaning, form, style, clarity, organization and effect on the reader. As well, many have limited working memory capacity, which impedes their ability to hold global goals and subgoals for their text in mind, while they read to evaluate whether they achieved these goals (Swanson & Berninger, 1994).

Developmental prerequisites for written language

We know that writing is a complex verbal behaviour and thus is the last to be achieved in the developmental process. There are certain prerequisites which should be met for the writing process to become efficient and they can be divided under following headings:

- Auditory processes
- Visual processes
- Motor processes
- Inner language processes

Auditory processes

Gates (1947) report that the typically developing children learn one language first, the auditory, and then a second language, the visual. He learns the second by translating it into its auditory equivalents. Gradually, as the visual is acquired he has less and less need to translate. So long as the words are familiar he can read by using the visual form alone. But when he encounters unfamiliar words again, he translates from the auditory by sounding out the word. Any sort of disturbances and deprivation of auditory sensation results in a variety of behavioural modifications, including a profound alteration of learning itself (Mykelbust & Neyhus, 1970; Hughes, 1971). Certain of these processes that are prerequisites to development of this language system are as follows.

a. *Memory*

Auditory memory often has been viewed as ability to reproduce sequences of words and sentences. According to the researchers Baker and Leland, 1959; Spencer, 1958, up to adulthood the average length of sentences repeated is greater than the number of words written per sentence. This relation discloses the greater maturity required for written language. Moreover, it is logical that by adulthood the number of words recallable by sentence in the spoken form is equivalent to the average number of words written per sentence.

b. *Syllable sequence and Recall of Nonsense Syllables*

Ability to repeat words that have an increasing number of syllables is an important function which provides evidence of auditory maturation and psycho neurological integrity. Recall of nonsense syllables also has proved useful in evaluating auditory perceptual and memory capacities. McGrady (1964) has demonstrated its usefulness in showing differences among speech-defective, aphasic and normal children. In a study of written language checking developmentally and diagnostically, it is included as an indication of the level of auditory function attained. Ability to repeat nonsense syllables is related to the auditory processes necessary for acquisition of written language.

c. *Syllable blending*

Studies of the disorders of the written language suggest that a child who cannot retain syllables sequentially and blend them into words cannot use the written word normally, even though he has average ability to read. Children are unable to learn to read unless they are able to re-auditorize and re-visualise letters simultaneously. Spencer (1958) suggests that unless the child can synthesize at least three syllables to form a word, he lacks the necessary prerequisite for writing words. Myklebust (1971b) reported that auditory cognitive disturbances of this type predominate in children with LD.

d. *Discrimination*

Auditory discrimination is the ability to distinguish among sounds that are alike and also those that are widely different. If a child's auditory discrimination is poor, he or she may confuse similar words in both speech and reading without recognizing the error. Spencer (1958) reported that the average child achieves the adult level of discrimination of auditory functioning before 6 years of age. If auditory functioning is grossly deficient in early life, all language behaviour, including the written is affected. Discrimination is one of the most basic and consequential processes.

e. *Oral commissions: Following directions*

This is the ability to follow directions in the order given which is an important aspect of auditory processes. Baker and Leland (1959) found that by the age of 4 years the average child is capable of following directions such as *put the book on the table*,

then get your pencil and bring your chair over here. Many children having disorders in written language show deficits in this ability.

Visual processes

Visual processes are one of the most important and most related aspects to the acquisition of written language. The following visual processes are the prerequisites for the written language development:

a. Orientation: scanning

Studies of children with disorders of written language often detect those who are deficient in ability to scan and to focus. They can see but cannot look. Cattell (1940) has found that at 2 months of age the average infants begin to visually inspect and scan the environment. Such basic aspects as scanning and focusing are essential to the development of other visual processes. When these abilities do not ensue normally, a gross deficiency, often of the neurogenic type is suspected. Reading and writing assume that these visual functions have been established developmentally.

b. Discrimination

What cannot be discriminated cannot be perceived. Unless the discriminatory process is present, the behaviour is below the level of perception, presumably at the level of sensation. If what is seen is to be recognized and identified, it must be distinguished as distinct from the other aspects of the visual world. Writing is not possible until letters can be discriminated; words cannot be written until letters can be distinguished one from the

other (Gibson, 1969). Some children substitute incorrect for correct letters especially those that look alike; presumably these are the most difficult to discriminate.

c. Recognition

Recognition and discrimination are not identical processes. Some children can identify likeness and differences; they can match forms, even letters, but are unable to recognize them; they can discriminate between M and W but do not recognize them as letters. As a process, recognition assumes integration and memory.

d. Meaning

Although, certain perceptual skills, such as discrimination, are excellent the child may be unable to associate meaning with what he discriminates. The equivalent condition is seen in use of written word when the child successfully writes words, or even sentences, but has no knowledge of what he has written; this may be referred to as word-writing. One of the consequential considerations in relation to perception is that development of meaning is assumed.

e. Visual memory

Memory is viewed as comprising of distinct aspects: recording, storing and retrieving. Memory is involved in many aspects of acquiring or writing a word. The words must have been recorded and stored auditorily and visually, then must be retrievable auditorily, visually and motorically. Only when all these processes function normally can the child produce the written word. It is critical, however, to be aware that

both auditory and visual memory may be adequate intrasensorially but deficient intersensorially; the child may not be able to learn and remember the auditory equivalents of letters as seen or the visual equivalents of the letters heard. It is in these that developmental prerequisites must be ascertained. Minimal integrity and attainment are essential before written language can be mastered.

f. Imagery

There is a relation between imagery and memory which, perhaps, is best described by the statement that there can be no imagery without memory. Imagery, as a cognitive function, usually refers to ability to recall experience auditorily or visually; it is defined as ability to recall all or parts of an actual experience, picturing it in the mind. This process has been referred to as revisualization (Johnson & Myklebust, 1967). Studies show that much learning is dependent on the processes of reauditorization and revisualization.

Motor Processes

Motor ability and facility with writing are related is apparent from observation. Rarick and Harris (1963) found correlations between legibility and the rate of development and on differences by sex. They report that females show greater and more rapid progress in legibility from the sixth to the tenth grades. Fine motor control stands out as an important factor in legibility.

Various conditions interfere with development of the motor ability prerequisite for writing. The most disturbances are those that impose limitations on fine motor co-ordination of the hands and fingers, though use of the arm also is critical. It is necessary to ascertain the integrity of the motor system when determining prerequisites for writing. Writing is a motor act accomplished through use of the preferred hand. Though the association between handedness and development of writing is complex, it can be viewed in terms of motor behaviour. So appraisal of laterality is an important aspect of motor maturity for writing.

Acquisition of the needed motor ability follows a sequential pattern. Gesell and Amatruda (1947) and Doll (1953) report that by the age of

- 1 year - The child grasps a crayon.
- 18 months - Picks up & grasps the crayon with a palmar grip.
- 2 years- Uses the thumb more effectively.
- 4 years- Approximates holding the pencil like an adult
- 5 to 6 years- Continues to improve in both grasp and co-ordination and at this time the child can use writing tools to print simple words and at 6 years- he copies capital letters.
- 7 years- Writes, but the script is large, awkward, uneven and irregular in size and position.
- 9 years - Penmanship becomes smaller and more uniform.
- 10 years - Begins to write occasional short letters and writing finally becomes a fundamental means of communication.

Motor ability, however, presents no further obstacle to writing after 10-12 years of age. They also report that facility with the written output continues to mature for 7 years more.

Inner Language Processes

One of the most critical and least understood prerequisites for use of written language, as well as for use of the spoken and read forms, is the manner in which words become associated with the meaning which is referred to as the inner language process by Myklebust (1954). The inner language disturbance is called *word-writing* where the words are written but has no meaning to the writer. This word-writing must be differentiated from inability to read what one has written as seen in children with dyslexia.

Learning Disability and Dyslexia

Learning Disability is not a specific term; it is a category containing many specific disabilities, all of which cause learning to be difficult. The term 'learning disability' means a disorder in one or more of the basic processes involved in understanding spoken or written language. It may show up as a problem in listening, thinking, speaking, reading, writing, or spelling or in a person's ability to do math, despite at least average intelligence. The term does not include children who have learning problems which are primarily the result of visual, hearing, or physical handicaps, or mental retardation, or emotional disturbance, or of environmental, cultural, or economic disadvantage.

The historical perspective of dyslexia was that if a child's difficulty with reading could not be explained by low intelligence, poor eye sight, poor hearing, inadequate educational opportunities, or any other problem, then the child must be dyslexic. This explanation was not satisfactory to parents, teachers, or researchers. So simply to put, it is neurologically-based, often familial, disorder which interferes with the acquisition and processing of language. Varying in degrees of severity, it is manifested by difficulties in receptive and expressive language, including phonological processing, in reading, writing, spelling, handwriting, and sometimes in arithmetic. It is not the result of lack of motivation, sensory impairment, inadequate instructional or environmental opportunities, or other limiting conditions, but may occur together with these conditions. Although dyslexia is life long, individuals with dyslexia frequently respond successfully to timely and appropriate intervention. Thus dyslexia is a specific learning disability.

The international dyslexia association (2002) defines dyslexia as follows:

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition, and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.

Components of written language

Throughout the grades, skill levels in children vary, as do the aspects of writing. When learning to write, children may have trouble generating the content, organizing structures, formulating goals, executing the mechanical aspects of writing and revising texts and reformulating goals (Harris, Graham, Mason & Friedlander, 2008). Some children may have problem with spelling and some in formulating ideas into coherent messages. Thus, there is a need for a basic understanding of the major components of written language which includes (a) handwriting, (b) spelling, (c) usage, (d) vocabulary, and (e) text structure.

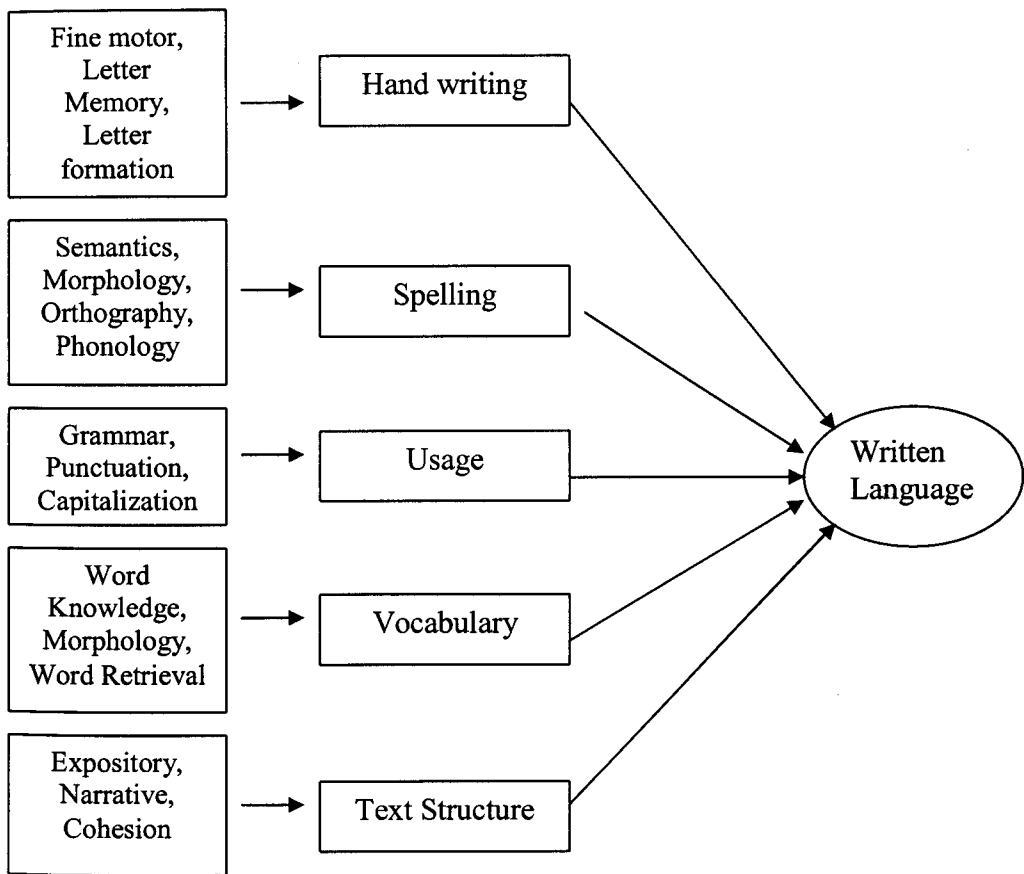


Figure 2: Various Components of Writing Skill

a. Handwriting

Handwriting is a fine motor skill that enables children to record their thoughts. Rapid, legible and comfortable handwriting facilitates writing productions. Children who can write easily tend to write more. A child who cannot produce legible script or write quickly and easily is restricted in the ability to communicate ideas. In addition, legible handwriting supports the development of other writing skills.

Handwriting requires numerous skills. Effective handwriting requires legibility and fluency. Legibility refers to the clarity and accuracy of the letter forms, whereas fluency refers to the ease and quickness of formation.

Legible handwriting involves six interrelated characteristics as reported by Barbe, Wasyluk, Hackney and Braun (1984) which are as given below.

1. *Letter formation* or the composition of the stroke.
2. *Size and proportion* or the proportional size between the uppercase and the lowercase letters.
3. *Spacing* or the amount of spacing between the letters and words.
4. *Slant* or the consistency in the direction of the writing.
5. *Alignment* or the uniformity of size and consistency on the writing line.
6. *Line quality* or the steadiness and thickness of the line.

Children who have the most severe problems with handwriting may be diagnosed as having dysgraphia or what is referred to as disturbance in visual motor integration. Children may have trouble executing the motor movements needed to write or copy letters or have trouble recalling the letter forms or letter sequences. Memory for letter forms and letter sequences is commonly referred to as orthographic memory.

For many children with poor handwriting, the quality of their handwriting decreases as they attempt to compose. Composing requires the writer to attend to all of the different simultaneous demands, such as paying attention to spelling, punctuation and ideation which results in an overwhelming task.

b. Spelling

Spelling is one of the most difficult basic skills for children. When compared to the TD peers, children with LD perform significantly poor in most areas of written expression particularly in spelling. Spelling is much more difficult than reading because the child has to recall and reproduce the entire word correctly, not just recognize it. So, even as their reading skill improves, the spelling difficulties still persist. A characteristic of many children with LD is good written expression but poor spelling. Thus, in order to answer all these aspects, it is important to know the components that are involved in generating a spelling for a word. Four aspects of oral language have particular relevance to spelling: Phonology, Orthography, Morphology and Semantics.

1. Phonology

Phonology refers to the sounds of a language. Individual units of speech sounds are called phonemes. When first learning to spell, children acquire knowledge of the sound to letter principles that is known as alphabetic principle, the knowledge that speech sounds are represented with letters. Although phonemes have no meanings in and of themselves, spelling requires the accurate sequencing of these phonemes to spell meaningful words.

2. Orthography

Orthography refers to the writing system of a language, including the spelling patterns, punctuation marks and numbers. The writing system represents the phonemes through graphemes or written letters and letter patterns.

English is described as having deep orthography because the correspondences between the words and letters are more complex. Although many English words can be either following the same phonetic pattern (e.g., hat), not phonetic but regular (e.g., ight), or irregular words (e.g., once) which are called ‘exception’ words or ‘sight’ words because the irregular elements have to be memorized.

3. Morphology

In addition to learning the spelling of phonemes and specific letter combinations and patterns, children must also learn how to spell morphemes. Morphemes are the smallest meaningful units of a language. Although the spellings of some English words do not adhere to regular phoneme- grapheme correspondence patterns, regularity is often apparent at a deeper level, morphological level. Knowledge of morphological principles of English makes it possible to spell thousands of additional words. Many children with learning and language problems are not as proficient as their peers in using morphological knowledge to help with spelling. Children may have difficulty forming plurals, possessives and verb tenses. They often omit word endings even though they say these when speaking.

4. Semantics

Semantics or vocabulary knowledge helps a writer in word choice and in the spelling of homophones or words that differ in meaning but sound alike. Typically, the content of the sentence especially the words preceding or following the target helps the writer to determine the correct spelling. Children with LD often have difficulties producing the correct spellings of homophones and require a considerable amount of practice to master these words.

c. Usage

The rules governing a written language are more involved than those of spoken language. To communicate in writing with clarity, children must master rules involving capitalization, punctuation and syntax. Application of these rules requires knowledge of the language structure and mastery of these written language conventions. Knowledge of these rules becomes particularly important when children attempt to edit their own writings.

Syntax, frequently referred to as a component of grammar, represents a structure of a language and includes the rules for combining words into sentences and identifying the relationships among the various words. Syntax includes knowledge of (a) clause structure or noun phrases and verb phrases within clauses and (b) the rules for forming negatives, questions and complex sentences through embedding and conjoining (James, 1989). The selection and use of sentence structures are essential for clarity. Understanding of the sentence syntax enables one to construct a variety of sentence

patterns that make one's writing more interesting. Knowledge of morphology is also important for understanding the sentence structure. As morphological knowledge increases, a child's ability to produce more complex language structures evolves.

Struggling writers often have problems in using correct word order and applying capitalization and punctuation rules. Children who struggle with writing tend to write short sentences that lack complexity and variety. Also they tend to write run-on sentences and sentences with too many clauses that are joined using words such as and, but or then. They may have trouble identifying where the main sentence ends and a clause begins. Some children experience delays in their ability to generate and use a variety of sentence patterns require intervention in oral language. Other children have adequate oral syntactic development, but have trouble formulating written sentences.

d. Vocabulary

Another critical aspect of effective writing is selecting descriptive words. For children with language impairments, their written language mirrors the spoken language. For children with LD, however, a discrepancy often exists between their oral and written vocabularies with their oral vocabulary being far superior to the vocabulary words that they use while writing. The number of different words available to writers is determined by their breadth and depth of word knowledge and their ability to retrieve words as and when needed. Children with limited vocabulary may have difficulty with (a) word-retrieval ability, (b) knowledge of morphology or (c) breadth and depth of word knowledge.

1. Word retrieval

Word retrieval involves the ability to rapidly access the individual words that are stored in memory. When children have difficulty with word retrieval, the problem is not lack of intact word knowledge, but rather quick and efficient access to these words. Gerber (1993) report the characteristics of children with word retrieval which include,

- (a) A delay in producing words, including common objects, letters, colours or numbers,
- (b) Omission or substitution of words,
- (c) Circumlocutions and
- (d) Use of gesture, pantomime or nonverbal vocalization.

These problems may be apparent in both spoken and written language and can persist in adulthood.

2. Morphology

Children's knowledge of morphology helps them to gain meaning by recognizing how prefixes, suffixes and roots contribute to and alter word meaning. Understanding both the meaning of root words and affixes can help increase vocabulary knowledge. For most children, knowledge of the meanings of common English suffixes undergoes significant development between fourth grade and high school. In general, derivational suffixes are the most abstract and difficult concept of morphology that children are asked to learn; this may be because derivational suffixes are used more frequently in the

complex syntax of written language rather than within common everyday speaking situations.

3. Breadth and Depth of Word Knowledge

Word knowledge, or semantics, includes both knowledge of word meanings and the various shades of meaning a word may have. Semantic knowledge helps one to differentiate between words that have shared yet different meanings such as *dusk* and *night*. Children with limited word knowledge often have difficulty expressing themselves because they have trouble selecting the right words to use. Some children overuse general, non descriptive words such as the word *nice*, and their writing lacks specificity and elaboration.

Weaknesses in vocabulary can hinder the educational performance at all levels. Children may experience difficulty using homophones, selecting vocabulary, generalizing word meanings across contexts and forming associations among words.

e. Text structure

Written texts are designed and organized to convey and represent ideas for a particular purpose. The genres, or text structures, selected by writers enhance organization and the presentation of information in different ways. Organization of text requires the abilities to plan, translate and review what has been written. In considering a writer's ability to organize and structure the text, firstly the cohesiveness and coherence of the child's writing should be examined. Next, the child's knowledge of narrative and expository writing should be examined.

Cohesion and coherence

It is the writer's job to present information in a connected, meaningful manner. A writer must attend to the transitions from one sentence to the next, as well as to logical sequencing of ideas. Text organization requires attention to both cohesion and coherence. Cohesion involves the specific ways sentences are integrated and linked together and the transitions within and between sentences. Coherence refers to the overall form and organization of the ideas in a text.

Relationships between and among sentences are often established through the addition of cohesive ties. Two examples of types of cohesive types are transitional and lexical ties. Transitional ties are words or phrases that illustrate the relationships between sentences such as for *example* or *consequently*. Lexical ties are established through the selection of vocabulary, such as repeating a word more than once within a text or using a synonym. These cohesive devices help in the interaction of the content and structure of writing to create meaning. Text coherence relies on both topic maintenance and the careful sequencing of ideas. Two major types of text structure are *narrative* and *expository* writing.

1. Narrative

Knowledge and understanding of the underlying framework or set of rules associated with narrative structure have been referred to as story schema and story grammar. Story schema refers to the mental representations an individual has of story parts and their relationships whereas story grammar describes the organizational rules,

relationships and regularities found in text. Story grammar provides children with a framework that can help them produce narrative text.

The basic story grammar elements include setting or place, description of the main characters, beginning or what starts the story, reaction, or how the main characters respond, outcome or the results of the attempt to reach the goal and ending or the consequences and final responses of the main characters. A more simplified story grammar can include four major story parts that are setting, problem, action and ending.

2. Expository

Expository text explains or provides information about a topic to the reader. Expository writing is more complex than story writing because children must research the topic, determine ways to organize their findings and consider the reader's prior knowledge. A number of different expository text structures exist that can be applied to answer different text structure questions. Each structure is characterized by various semantic and syntactic techniques. Examples of text structure include descriptive, sequential, temporal, compare-contrast, explanation, problem-solution and opinion. Failure to attend to text structure can result in writing that has irrelevancies, redundancies and poor organization. Children differ in their abilities to produce expository text. Some compositions contain unclear introductions, few details and inadequate summaries or conclusions. In addition, some writers do not understand how to organize, monitor and revise their texts on the basis of text structure. The sentences that are written may be unrelated rather than being combined into organized sections of related information in which main ideas are stated first followed by supporting facts and details.

Disorders of written language

In the typically developing child, the processes required for writing develop in an orderly manner. By the time the child is approximately 6 years of age, he is ready to write when he has developed skills for visual and auditory discrimination required for reading and visuo-motor integration for forming a stage where he learns to organize words into simple sentences. However, problems in the above mentioned skills may lead to difficulties in the writing process and may lead to varied forms of disorders of written expression (Spagna, Dennis, Cantwell & Baker, 2000). Hence, disorders of written expression may be defined as a significant impairment in written communication that fall substantially below those expected given the individual age, measured intelligence, age appropriate education that significantly interferes with academic achievement (Spagna, Dennis, Cantwell & Baker, 2000).

Johnson & Myklebust (1967) termed the inability to learn the appropriate motor behaviour for writing as dysgraphia. Severe deficits in handwriting may include inappropriate pencil grip and less severe problems may result in handwriting which is poorly spaced, awkward and immature.

Handwriting difficulties may also occur due to the rate of performance, in order for the writing to be efficient; it must be performed at a rate appropriate for the task. Although a child's writing may appear adequate, it may have been produced slowly and with difficulty. Such problems result from slowness in processing and organizing information for the writing task.

Another skill which is very important for writing is the ability to recall the spelling of words. Researchers have given an outline for the abilities required to spell words in children. The ability to articulate the word correctly, to recall the spoken pattern (i.e., the auditory sequence of the phonemes or syllables) and to recall the visual letter sequences are necessary for learning to spell. Also, children must be able to recall the motor pattern for writing a word and to execute the plan for the motor act. Because of the complex nature of the writing task which requires simultaneous use semantic, syntactic and grapho-phonetic information, trying to satisfy all these constraints makes it difficult.

As writing involves the use of multiple processes, deficits in any one of these processes may lead to the disorders of writing. Consequently, the clinical manifestations of disorders of written expression also vary depending on the underlying deficits, thus forming subgroups of disorders of writing.

Classification of disorders of written language

The focus of research on written language is gradually been paid more attention in recent years. Initially the focus was on spelling and handwriting difficulties of written language. The earliest view was that the written language is always associated with reading difficulties. With time, more studies were done and reported about learning disorders that only occur in written form, with other forms of verbal language being intact. These findings were reviewed and the difficulties in written expression were grouped into three primary categories:

1. Disorders of visual-motor integration: person could speak and read but could not correctly execute the motor operations necessary to print symbols such as letters and numbers.
2. Deficits in revisualization: Individuals could recognize and read words but not revisualise letters and words and thus could not write words from dictation or spontaneously.
3. Deficiencies in formulation and syntax: individuals could copy printed symbols accurately, could revisualise words, but could not organize thoughts into meaningful written communication (Spagna et al., 2000).

Disorders of written expression can also occur as a consequence of the following motor deficits:

1. Grapho-motor dysfunction, which may result in writing problems if there is excessive muscle movement and too little stabilization or if too many stabilizing muscles present then the pencil grip is unstable with great pressure and constantly changing.
2. Finger agnosia, which is a condition where a person is unable to recognize one's fingers or fingers of others. This is seen due to lack or deficient motor feedback.
3. Fine motor dysfunction, which is often considered to be at the root of any writing problems.
4. Writer's cramp, which is an action induced or task specific dystonia where the act of writing is painful in most case with illegible, sloppy handwriting and jerky

writing motion. Writer's cramp can be associated with essential tremors and may be related to a syndrome as 'primary writing errors' (Weiner & Goetz, 1987).

Firth (1973) described two groups of children between 11-13 years old who were poor spellers. One group made errors that were phonologically correct and did well in spelling non-words, while the other group made errors that were not phonologically correct and had difficulty spelling non-words. In addition, Firth reported that the first group read well while the second one did not. Also, described were children who had more trouble spelling irregular than regular words and made errors that were phonologically correct, resembling the patterns of patients with acquired lexical agraphia as studied by Baron (1980).

Assessment of written language

The multifaceted nature of written expression makes objective and valid measurement a difficult task. The writing process may break down at the level of individual sub-skills, such as handwriting, punctuation, spelling and grammar usage. On the other hand, for some individuals, the breakdown occurs only when all these sub-skills must be integrated automatically within the broad process of composing. The first goal of diagnosis, is to identify the most basic level at which a writing breakdown occurs, followed by identification of intervention strategies that facilitates more effective written communication.

There is abundance of literature that exists on the assessment of spoken language and reading disability, but the literature on the assessment of written language skills is scanty. The standardized tests are one among the measurement options for speech language pathologists. Most of these tests measure the basic writing skills like punctuation, spelling, vocabulary etc. Although these standardization measures are useful as screening measures, additional information is needed to provide a comprehensive picture of writing skill. At present, well named and reliable standardized tests are available that quantify handwriting legibility, dictation spelling skills, spontaneous spelling skills, vocabulary usage, syntactic accuracy, sentence combining ability, punctuation, capitalization usage and conceptual maturity. But, whether measurement of these skills relates meaningfully to performance of typical classroom writing assignments is less certain (Bain, 1988; Hammill & Larsen, 1988). However, numerous attempts have been made in the past to develop a comprehensive test for assessing written language skills in children. There have been a number of tests developed, revised in the past two decades providing SLPs, psychologists and educators a broad range of writing assessment instruments for identifying children in need of special education.

Tests of assessing writing skills

Woodcock and Johnson (1977) developed the Woodcock - Johnson Psycho educational battery, Tests of Achievement (Written Language cluster). This test consists of a spelling dictation subtest and a proofreading sub-test. The dictation sub-test includes items requiring the subject to write letters, words, abbreviations and punctuation marks from dictation. Several items assess knowledge of regular and irregular plural forms. The

proofreading sub-test requires the subject to read sentences and identify errors in word usage, spelling, punctuation and capitalization. However, the Woodcock- Johnson written language cluster provides only a preliminary screen of writing ability and should therefore prefer to be used in conjunction with the other writing tasks during the diagnostic process.

Jastak and Wilkinson (1984) developed and revised the Wide Range Achievement Test (WRAT- R). It includes measures of spelling, reading and mathematics for individual ages five to seventy five. It consists of two levels; level one for children in the age range five to eleven years, and level 2 for ages twelve through seventy five years. For both levels, the spelling sub-test follows a single-word dictation format requiring written responses. Overall, the WRAT-R spelling sub-test can be used for screening, educational placement, research and program evaluation.

Larsen and Hammill (1986) developed the test of written spelling -2 (TWS-2), which is a revision of the Test of Written Spelling. It is a single word dictation test for individuals in the age range 6years 6 months to 18 years 5 months. TWS-2 consists of two spelling subtests, on measuring 'predictable' words and the other 'unpredictable' words and they are scored as correct or incorrect.

Hammill, Brown, Larsen and Wiederholt (1987) revised the Test of Adolescent Language (TOAL) as TOAL-2. It is a measure of receptive and expressive oral and written language skills for ages eleven years through eighteen years five months. Eight

subtests are included that measure vocabulary and grammar skills across the domains of listening, speaking, reading and writing. The two writing subtests include measures of the child's ability to use given vocabulary words in sentences and of the ability to combine two given sentences into one complex sentence. This test is considered to provide important quantitative as well as qualitative data about written language abilities. Thus, this test considers only the linguistic aspects of writing and does not assess the non-linguistic aspects of writing.

Hresko (1988) developed the Test of Early Written Language (TEWL), which was designed to measure prewriting and writing skills of children of ages three through seven years. This test intended to include identification of children with significant writing difficulty, identification of a child's writing strengths and weaknesses, documentation of progress in written language, and use as a research tool. It proposes to measure discrimination of verbal versus non-verbal visual representational forms, understanding of linguistic terms and ability to write words, sentences and stories.

Kiran (1994) developed the Test of writing for children in Hindi (TOWCH) to assess writing skills in children in the range of 4-9 years of age. The test consisted of eight sections that are simple alphabets, syllabary, words non-words, sentences, sentence completion, questions and answers and lastly the written test which comprises of picture description and spontaneous writing. The results indicated that all the writing tasks other than copying are developing with age and age of acquisitions vary for different tasks depending on whether the task is copying, dictation and spontaneous writing tasks.

In another similar study Yeshoda (1994) developed the Test of writing for children in Kannada (TOWCK) as a tool to assess the acquisition of writing in children in the age range of 3-8 years. This test also consisted of the same tasks as that of the TOWCH divided into eight sections. It was found that writing skills for copying begin to emerge at around 3-4 years of age. Later on the other skills like writing to dictation, sentence completion etc is gradually acquired with increasing age. The study also showed that writing is not fully developed even at around 7-8 years of age.

Shanbal (2003) developed a test named A Tool for Screening Children with Writing Difficulties (ToSC-WD). This test can be used as a screening tool for linguistic and non linguistic domains of writing. The non-linguistic domain included mechanics of writing like abnormal pen grip, loose pencil grip, excessive pencil pressure, tremors while writing, poor spacing etc. The linguistic parameters included spelling, punctuation and capitalization, vocabulary and syntax. Error analysis was done and they were scored as 1 for definite errors, 2 for occasional errors and 3 for no errors. This test was developed for the 3rd grade to 7th grade children. The results of this suggest that the acquisition of writing skills has already begun by Grade III, it continues and shows a developmental progression from Grade III to Grade VII. The results also suggest that the developmental progression for linguistic and non-linguistic skills are almost overlapping in the lower grades and become more distinct in the higher grades.

The assessment of written language can also be done informally using curriculum based measurement (CBM). Ideally, both standardized and CBM should be incorporated into a comprehensive evaluation of written language. Standardized commercial achievement tests measure broad curriculum areas and/or skills which restrict their application for instructional program planning whereas; CBM measures specific skills that are taught in the classroom, usually the basic skills. Several positive features of CBMs are worth noting. CBM is a simple and time efficient way to gather important instructional information. CBM involves brief timed tests called probes, and covers material from the curriculum. Typically, it involves brief, timed tests called probes and covers material from the curriculum. These are not norm-referenced unless a district has gathered norms for each grade. They are quick and easy to administer. They can be given multiple times without invalidating the test. They are more sensitive to small changes than most of the norm-based tests. The measurement procedures assess children directly using the materials in which they are being instructed. This involves sampling items from the curriculum. CBM is also an attractive option for monitoring progress in written expression. The children can be given the writing probes to group of children or individual child. A common method is to provide a grade appropriate story starter sentence printed at the top of a lined composition sheet of paper. These types of probes may be scored on the basis of several different criteria: (a) the total number of words written (TWW); (b) the words spelled correctly (WSC); (c) the total number of letters written (TLW); or (d) the number of writing units in correct sequence (CWS).

Informal assessment is essential for monitoring the progress in written language aspects in children. Frequent assessment and progress monitoring make it possible for

speech language pathologists to document the results of the efforts of therapy and the impact on the child's learning. It also helps the child to develop awareness of their own performance by which they can get a clear picture of what is expected of them and how they are progressing towards that goal. Such a test was developed by Myklebust (1965). He has done an extensive research on written language skills in TDC and in children with dysgraphia. He has also developed a test named Picture Story Language Test (PSLT) for quantifying one's facility with the written word and to furnish a scale for children. This test consists of a picture about which a story is written. It comprises of 3 scales – one devised to measure length (Productivity scale), another to measure corrections (Syntax scale) and third to measure context or meaning (Abstract- Concrete scale). Productivity is the amount of language expressed under a given circumstance or it is that aspect commonly referred to as length. In PSLT, the productivity has been ascertained by the number of words (total words), the number of sentences and the number of words per sentence. The Syntax scale mainly evaluates the extent to which verbal expressions are used correctly. This correctness is measured in terms of the accuracy of word usage of word endings and of punctuation. The Abstract-Concrete scale was devised to study the effectiveness with which the ideas are conveyed.

Research on written language in typically developing children

Puranik, lombardino and Altmann (2008) conducted a study to document the progression of the microstructural elements of written language in children at 4 grade levels. The secondary purpose was to ascertain whether the variables selected for examination could be classified into valid categories that reflect the multidimensional

nature of writing. Written language samples were collected and transcribed from 120 children in Grades 3 through 6 using an expository text retelling paradigm. Nine variables at various levels of language were analysed. They were Total number of words (TNW), Total number of ideas expressed (IDEAS), Number of T-units, Mean length of T-unit (MLT-UNIT), Number of clauses (CLAUSES), Clause density(C-DENSITY), Percentage of Grammatical T-units (GRAM T-UNIT), Percentage of spelling errors (SPELL) and Writing conventions (CONVEN). Exploratory factor analysis suggested that writing can be represented by 3 factors: Productivity, Complexity and Accuracy. The results indicated that the measure of productivity (e.g., TNW, IDEAS) improved steadily with age, whereas measures of complexity (e.g., MLT- UNIT) did not. Results for measures of accuracy (e.g., SPELL & CONVEN) were mixed with some showing improvement across grades. Grade 3 children showed consistently poorer performance than children in Grades 4, 5 and 6. Grade 4 children showed poorer performance than children in Grades 5 and 6. They concluded that this empirically based framework for measuring microstructural variables of writing provides clinicians with a 3 prong conceptual framework for determining children's strengths and weaknesses within the translational stage of writing.

Earlier research on written language in children includes studies which have compared typical and atypical language learners and have concluded that children with language based disabilities show reduced *written productivity* as measured by total number of words, total number of utterances or total number of ideas (Barenbaum, Newcomer & Nodine, 1987; Houck & Billingsley, 1989; Laughton & Morris, 1989;

Puranik, Lombardino & Altmann, 2007; Scott and Windsor, 2000), difficulties in *writing complexity* as measured by average length of T-units, number of different words, and percentage of complex sentences(Fey, Catts, Proctor-Williams, Tombling & Zhang, 2004; Gillam & Johnston, 1992; Houck & Billingsley, 1989; Mackey & Dockrell, 2004; Morris & Crump, 1982; Puranik et al., 2007; Scott & Windsor, 2000), and *accuracy* as measured by number of spelling or mechanical errors and number of syntax errors (e.g., Altmann, Lombardino & Puranik, 2008; McArthur & Graham, 1987; Nelson & Van Meter, 2003; Puranik et al., 2007).

Research on written language in Children with Dyslexia

In the past, many studies have compared written expression of children with dyslexia with the typically developing children. They report that in the area of syntactic maturity, children with Dyslexia are less proficient than their normally achieving peers (Myklebust, 1973; Poteet, 1978). They produce less mature compositions in several task conditions (Barenbaum et al., 1987; Nodine, Barenbaum & Newcomer, 1985) and display less sensitivity to text structure (Englert & Thomas, 1987). However, Barenbaum et al. (1987) and Nodine et al. (1985) failed to find differences in the number of words per T-unit across ability groups. The lower productivity displayed by children with Dyslexia is also a recurring finding (Barenbaum et al., 1987; Myklebust, 1973, Nodine et al., 1985; Poteet, 1978), as are significant spelling problems (Moran, 1981; Poplin, Gray, Larsen & Banikowski., 1980). However, the results related to vocabulary are mixed. Poplin et al. (1980) reported no differences for Grades 3 through 6, although significant differences were found for the subjects on other tasks. Barenbaum et al. (1987) failed to find a

difference in the number of words used with seven letters or more. Capitalization and punctuation were found to be a discriminating factor in some studies (Poteet, 1978), but differences were restricted to specific grade levels in other studies (Poplin et al., 1980). Moran (1981) reported no significant difference between children with Dyslexia and typically developing children on mechanics of writing.

Hauck and Billingsley (1989) examined the written expression of children with LD and typically developing children (TDC) at three grade levels. Specifically, the investigation addressed the following research question as to how do the written samples of children with LD and the TDC compare at Grades 4, 8 and 11 using measures of (a) productivity, (b) syntactic maturity, (c) vocabulary, (d) mechanics, and (e) use of conventions. Results indicated that, compared to the TDC, children with LD write fewer words and sentences, write more words per sentence, produce fewer words with seven letters or more and fewer sentence fragments, and have a higher percentage of capitalization and spelling errors. No group differences were found for the number of T-units produced or the number of morphemes per T-unit. Comparison of group differences at each grade level and differences by groups across the grades reveals persistent written expression difficulties in children with LD.

These above mentioned studies give a clear picture of how the written language skills shape with increasing age thus suggesting a developmental trend in written language acquisition. Such studies are lacking in Indian population and India being a country with numerous languages and many cultures, studies are required in every

district. Development of normatives for written language skills is the need of the day for assessing the written language skills clinically in children with dyslexia in a comprehensive way. This can be later used for differentially diagnosing different types of dyslexia. Thus, the present study was planned.

CHAPTER 3

METHOD

The current study was taken up to investigate the written language skills in children with dyslexia. The study was conducted in two phases. First phase aimed at developing a normative data. In second phase, a comparison of written language skills in TDC and in children with dyslexia was taken up. It is essential as norms with reference to the topic 'My School' have not been established in Indian children.

Participants: The study included two groups of participants.

- Group 1 included TDC.
- Group 2 included children with dyslexia.
- These children had English as their medium of instruction.
- All children selected had Kannada as their native language background.
- All children were right handed.
- The participants were children studying in first grade to fifth grade.

Group 1: Inclusionary criteria for TDC

- They were selected from different schools in Mysore City.
- All the children in the group were screened for having any history of in (a) spoken language (b) sensory, motor or other neurological functions and (c) behavior including attentional deficits. All the participants were screened using WHO Ten disability checklist (Singhi, Kumar, Malhi, & Kumar, 2007).

- This group comprised of 27 children from first grade, 30 from second grade, 28 from third grade, 30 from fourth grade and 29 from fifth grade.

Group 2: Inclusionary criteria for children with Dyslexia

- For the second phase of the study, participants were children who have reported to AIISH and are diagnosed as having Dyslexia according to evaluation reports.
- Participants were diagnosed as dyslexia considering the definition given by International dyslexia association (2002) which defines dyslexia as a specific learning disability which is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities.
- 8 children with dyslexia participated for the study.
- It comprised of 1 child from first grade, 2 from third grade, 2 from fourth grade and 3 from fifth grade.

Task and procedure

Participants were instructed to produce a text on 'My school' in English. This topic was selected as it is familiar and easy for all children across grades. Initially a picture prompt was used for duration of approximately 1 minute (appendix 1). The expository style of writing was chosen as it provides information about the knowledge and organizational skills about the topic in a child. The participants were given around twenty minutes to produce the text.

The written sample was collected. The author read the participant's sample to clarify any words that are unclear due to poor penmanship or incorrect spelling (the original and transcribed written sample of a TD child and a child with dyslexia is attached with the appendix 2). All the testing was conducted in a quiet room in groups.

All the written samples were transcribed by an experienced Speech-Language Pathologist and coded according to the computerized language analyzer, the Systematic Analysis of Language Transcript conventions (SALT; Miller & Chapman, 2001). After practicing and establishing coding guidelines, the written samples were coded. T-units were used as the unit of segmentation, as suggested by Scott and Stokes (1995) and Scott and Windsor (2000). Written samples were analyzed using a modification of Nelson, Bahr and Van Meter's (2004) protocol for analyzing written language. A total of 8 variables were analyzed quantitatively using SALT software.

Scoring

The written sample of TDC and children with dyslexia were analysed quantitatively using these following 8 variables.

1. *Total number of words (TNW)*: it is the total number of words written in the text which will be automatically calculated by SALT. It was used to measure the productivity and written fluency.
2. *Number of T-units (T-UNIT)*: A T-unit is a sentence. It is considered to be one main clause with all subordinate clauses embedded in it as defined by Hunt (1965). This was used to measure syntactic complexity. Once the written sample

was transcribed into SALT in T- units, the total number of T-units was calculated automatically by the program.

3. *Mean length of T-unit (MLT-UNIT)*: This is a measure of syntactic complexity. This was calculated by dividing TNW by T-UNIT.

$$\text{MLT-UNIT} = \frac{\text{TNW}}{\text{T-UNIT}}$$

T-UNIT

4. *Number of clauses (CLAUSES)*: A clause is a group of words containing a subject and a predicate. Clauses in each sentence was coded into SALT. The program automatically calculates the total number of clauses in the text. This is a measure of productivity.

5. *Clause density (C-DENSITY)*: This was calculated by the ratio of CLAUSES to T-UNITS. This is another measure of syntactic complexity.

$$\text{C-DENSITY} = \frac{\text{CLAUSES}}{\text{T-UNIT}}$$

T-UNIT

6. *Percentage of grammatical T-units (GRAM T-UNIT)*: This was calculated by using the ratio of number of T-units without errors divided by the total number of T-units in the sample. Grammaticality of sentences was based on the standard academic English. A T-unit containing more than one error was given an error

code only once because this measures the percentage of grammatically correct T-units and not the number of errors. This is a measure of accuracy.

$$\text{GRAM T- UNIT} = \frac{\text{Number of T-units without errors}}{\text{Total number of T-units}}$$

7. *Percentage of spelling errors (SPELL)*: SPELL is calculated by dividing the number of spelling errors by TNW. A word was counted as a spelling error only once if the same spelling is used every time. However, if the word is spelt differently every time then each incorrect spelling was considered as an error. This is a measure of accuracy.

$$\text{SPELL} = \frac{\text{Number of spelling errors}}{\text{TNW}}$$

8. Errors in writing conventions (CONVEN): This was a measure to check the appropriate use of punctuation marks like initial capital letters and end periods, apostrophes, comma etc written by the participants in the text. The total number of these errors was calculated. This is a measure of accuracy.

Inter Rater Reliability

20% of the total written samples were used for inter rater reliability. All the samples were transcribed into SALT by another SLP. Every transcript was checked by the author to ensure that all writing samples are correctly transcribed. Scoring differences were settled by consensus following discussion. Interrater reliability ranged from 90% to

100%. Followin are the reliability scores for each of the writing variables: TNW, 100%; T-UNIT, 92%; MLT-UNIT, 90%; CLAUSES, 90%; C-DENSITY, 92% GRAM T-UNIT, 95%, SPELL 100%; and CONVEN, 90%.

Statistical Analysis

The numerical obtained after quantitative analysis done using SALT was subjected to statistical analysis using SPSS software (version 10). The tabulated scores were used to obtain the mean, standard deviation (SD) and confidence interval (CI) using MANOVA on TDC with grade as the between subject factor. Post hoc analysis was also carried out to get pair wise comparison across the grades to obtain significant difference measures using Duncan's Test.

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CHAPTER 4

RESULTS AND DISCUSSION

The objective of the present study was to analyse the written language skills in TDC and children with dyslexia. Eight variables were included to analyse the written language samples. They are Total number of words, Total number of T-units, Mean Length of T-units, Number of clauses, Clause Density, Percentage of grammatical T-units, Percentage of spelling errors and Errors in Writing conventions. The results of the present study with respect to 8 variables are discussed as follows. In the first phase normatives were derived for TDC. In the second phase the same norms were compared with that of the scores of children with dyslexia.

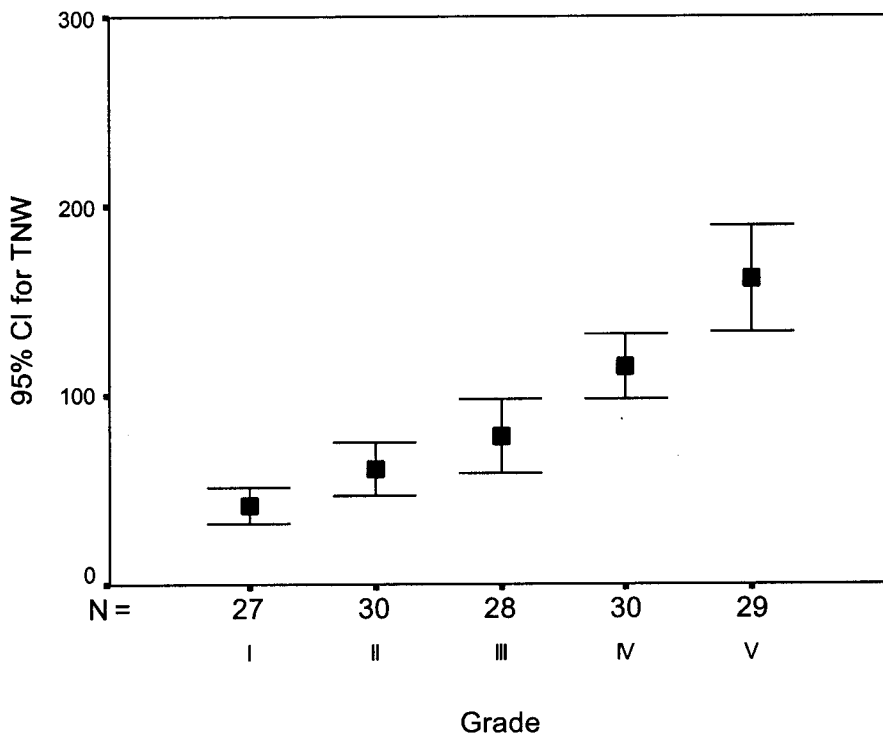
A) Written language skills in TDC across grades

1. Total Number of Words (TNW)

Table 1: Mean and SD for TNW across grades for TDC.

Grade	Mean	SD
I	42.33	24.76
II	61.51	37.28
III	78.25	50.66
IV	115.07	47.10
V	161.52	73.90

Examination of the descriptive statistics for TNW showed a significant main effect for grade, $F(4, 139) = 25.928, p < 0.0001$. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. The results revealed that there is a clear-cut increasing trend in the TNW from grade 1 through grade 5 as depicted in graph 1. Pair wise comparison showed that 5th graders differed significantly from that of children in all the other grades. 4th graders showed significantly higher scores from 3rd, 2nd and 1st graders. 3rd grader showed significantly higher scores than 1st graders. Results showed that there is no significant difference between 3rd and 2nd grade children; and between 2nd and 1st grade children. 5th graders showed the greatest variability.



Graph 1: Mean and distribution of scores for TNW in TDC

These results are in agreement with previous studies of written language (Puranik et al., 2008; Nelson & Van Meter, 2003, 2007). There is an increase in number of words used with an increase in the grade indicating that there is an increase in productivity aspect of written language. The possible reason could be that the oral vocabulary shows a mark increment with increase in age which is reflected even in the written language abilities. Greater variability was noted in 5th grade indicating that most of the children show better performance but few are still in the process of improvement.

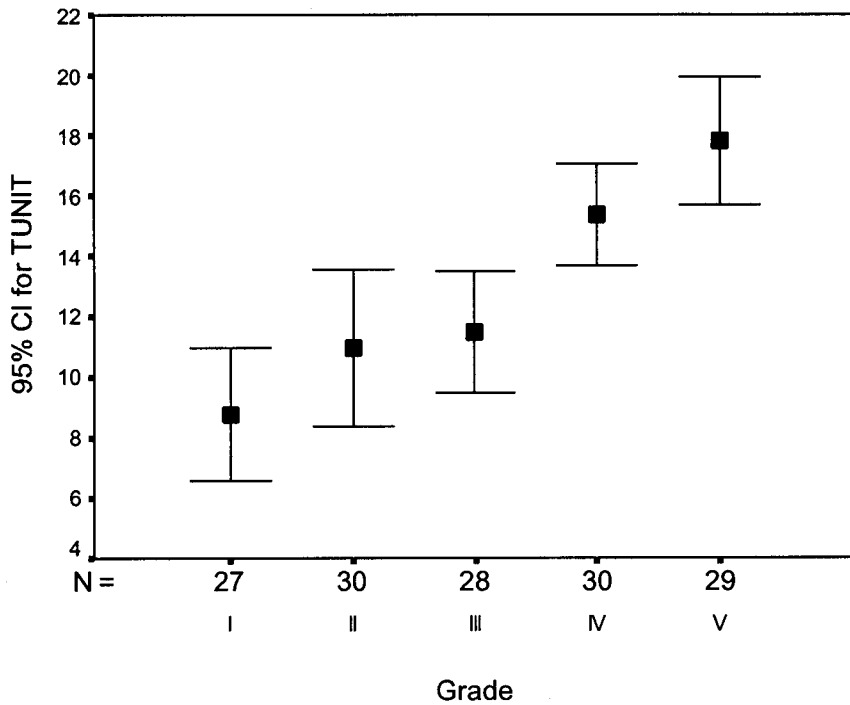
2. Total Number of T-units (T-UNIT)

Table 2: Mean and SD for T-UNIT across grades for TDC.

Grade	Mean	SD
I	8.78	5.50
II	10.97	6.83
III	11.50	5.15
IV	15.33	4.51
V	17.79	5.58

Examination of the descriptive statistics for T-UNIT showed a significant main effect for grade, $F(4, 139) = 12.051, p < 0.0001$. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. From Graph 2, it is evident that there is an increasing trend in the T-UNIT from grade 1 through grade 5. Pair wise comparison showed that children in grade 5 and grade 4 differed significantly from that of children in grade 3, grade 2 and grade 1. Results

showed that there is no significant difference between 1st, 2nd and 3rd grade children and between 4th and 5th grade children. Grade showed the greatest variability in the results compared to the other graders.



Graph 2: Mean and distribution for T-UNIT in TDC

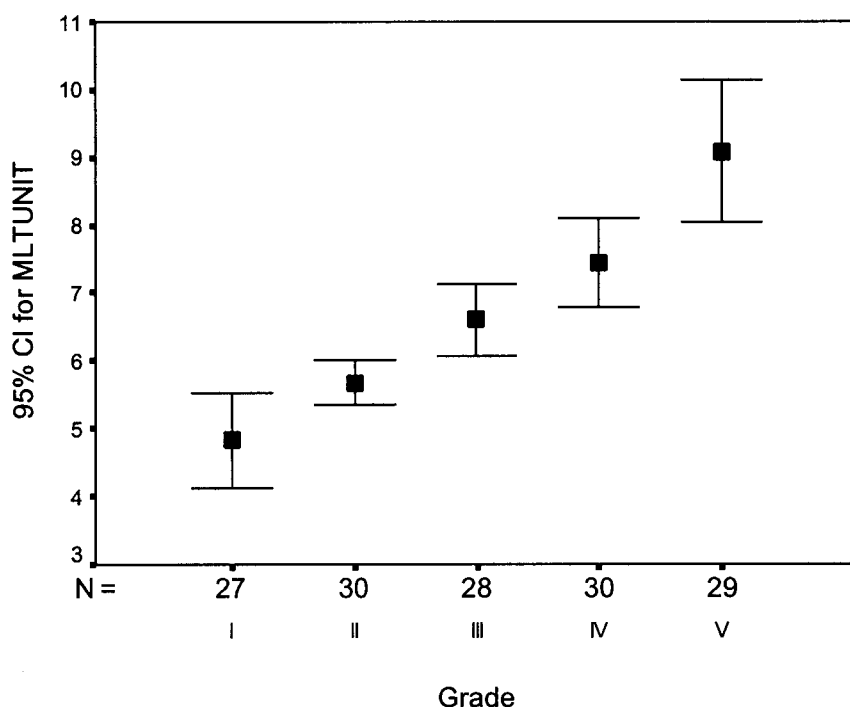
These results are consistent with the findings of previous studies (Puranik et al., 2008; Nelson & Van Meter, 2003, 2007) indicating that there is an increase in the productivity of written language with increase in grade. From Graph 2, it is evident that there is a marked increment from 3rd grade to 4th grade because a marked shift in literacy skills occurs at Grade 3 and children would have mastered the basic reading skills and begin to read for meaning (Chall, 1983).

3. Mean Length of T-unit (MLT-UNIT)

Table 3: Mean and SD for MLT-UNIT across grades for TDC.

Grade	Mean	SD
I	4.8215	1.7601
II	5.6793	0.9009
III	6.6029	1.3915
IV	7.4550	1.7671
V	9.0931	2.7205

Examination of the descriptive statistics for MLT-UNIT showed a significant main effect for grade, $F(4, 139) = 23.684, p < 0.0001$. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. From the Graph 3, it is evident that there is a clear cut increasing trend in the MLT-UNIT from grade 1 through grade 5. Pair wise comparison showed that children in grade 5 differed significantly from that of children in all the other grades. 4th graders showed significantly higher scores from 2nd and 1st graders. Children in 3rd grade showed significantly higher scores than children in 1st grade. Results showed that there is no significant difference between 4th graders and 3rd graders, between 3rd and 2nd grade children; and between 2nd and 1st grade children. 5th graders showed the greatest variability in the results than the other grades.



Graph 5: Mean and distribution of scores for MLT-UNIT in TDC

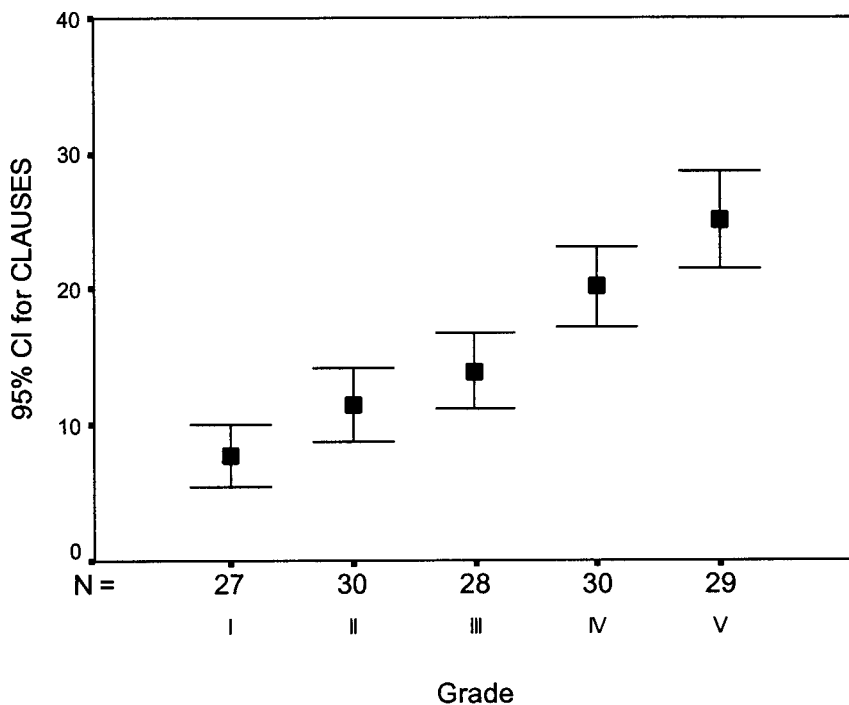
The results are not in agreement with the previous studies (Hunt, 1965; Puranik et al., 2008; Scott, 1988). There is an increment in the mean length of T- unit with increase in the grade which is contradicting the previous studies. However, the results suggest that there is no significant difference between adjacent grades till 4th grade which is in partial agreement with the previous studies. This suggests that mean length of T-unit is a measure of complexity and children acquire competence in syntactic complexity slowly and steadily as a function of age and grade.

4. Total number of Clauses (CLAUSES)

Table 4: Mean and SD for CLAUSES across grades for TDC.

Grade	Mean	SD
I	7.70	5.83
II	11.53	7.31
III	13.93	7.25
IV	20.17	7.97
V	25.14	9.39

Examination of the descriptive statistics for CLAUSES showed a significant main effect for grades, $F(4, 139) = 23.472$, $p < 0.0001$. From Graph 4, it is evident that there is a clear cut increasing trend in the total number of clauses from grade 1 through grade 5. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. Pairwise comparison showed that children in grade 5 differed significantly from that of children in all the other grades. 4th graders showed significantly higher scores from 3rd, 2nd and 1st graders. Children in 3rd grade showed significantly higher scores than children in 1st grade. Results showed that there is no significant difference between 3rd and 2nd grade children and between 2nd and 1st grade children. 5th graders showed the greatest variability among all the grades.



Graph 6: Mean and distribution of scores for CLAUSES in TDC

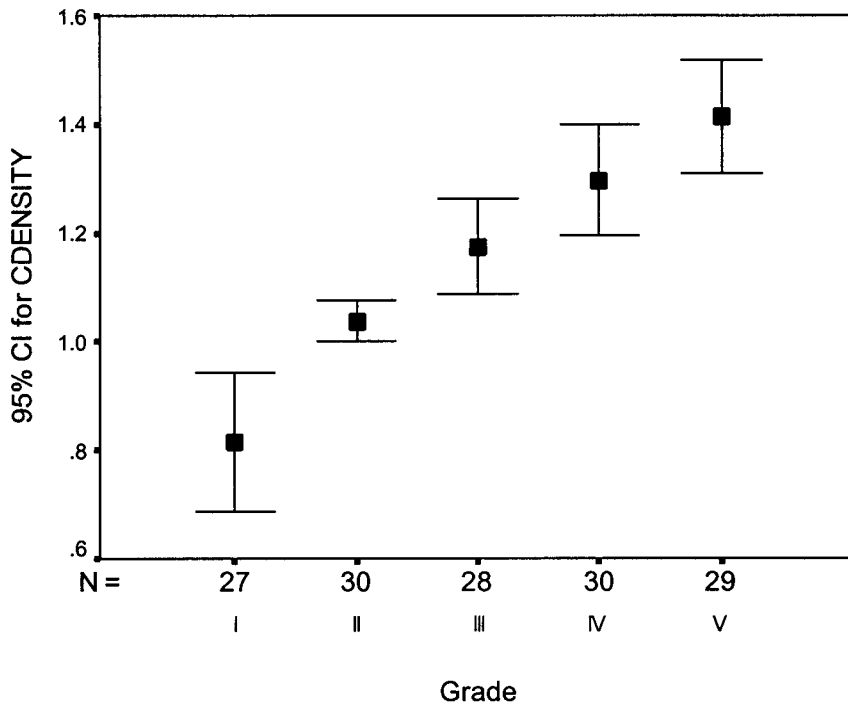
These results are in agreement with previous studies of written language (Puranik et al., 2008; Nelson & Van Meter, 2003, 2007). There is an increase in number of clauses used with an increase in the grade indicating that there is an increase in productivity aspect of written language. The possible reason could be that with the increase in age, there is an increment in the spoken language structure in children. Children tend to use more complex and long sentences as they grow older. A similar developmental process takes place also in written language skills.

5. Clause Density (C-DENSITY)

Table 5: Mean and SD for C-DENSITY across grades for TDC.

Grade	Mean	SD
I	0.8137	0.3258
II	1.0373	0.1007
III	1.1736	0.2262
IV	1.2957	0.2730
V	1.4141	0.2711

Examination of the descriptive statistics for C-DENSITY showed a significant main effect for grades, $F(4, 139) = 24.528, p < 0.0001$. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. From Graph 5, it is evident that there is a clear cut increasing trend in the C-DENSITY from grade 1 through grade 5. . Pair wise comparison showed that children in grade 5 differed significantly from that of children in grades 3, 2 and 1. 4th graders showed significantly higher scores from 2nd and 1st graders. Children in 3rd grade showed significantly higher scores than children in 1st grade and 2nd graders showed significantly higher scores from 1st graders. Results showed that there is no significant difference between 5th and 4th grade children; and between 4th and 3rd grade children. 1st graders showed the greatest variability in this variable of written language skills.



Graph 5: Mean and distribution of scores for C-DENSITY in TDC

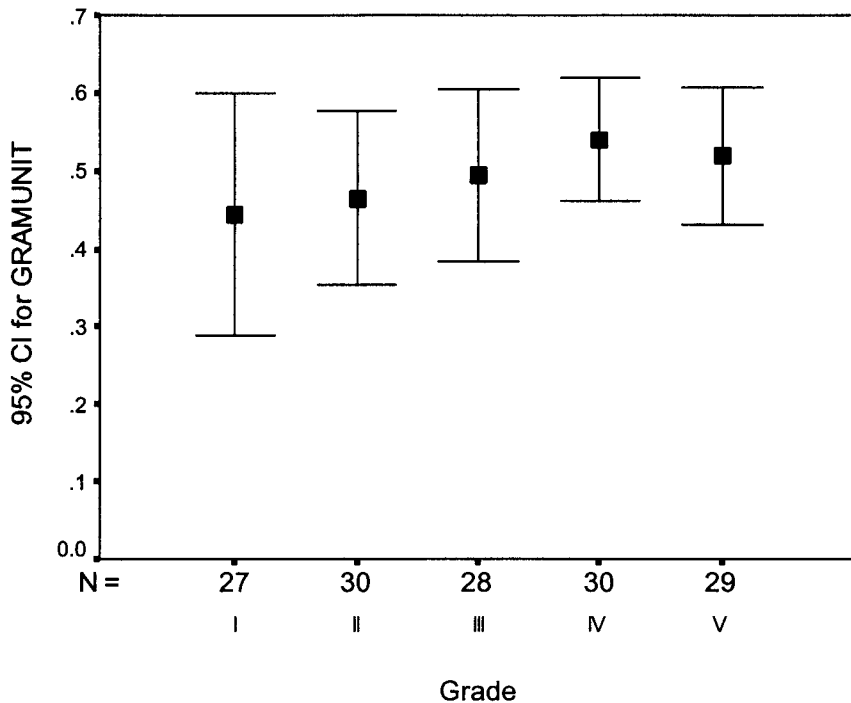
The results are not in agreement with the previous studies (Ioban, 1976). The results of the current study show a significant increase in the clause density with the increase in grade level. The reason could be because the other studies used retelling or narrative texts and hence the scope for them to use complex sentences would have been limited. This study employed expository style of writing where the child had to give information regarding the topic 'My School' which is so familiar and easy for them to formulate complex sentence structure.

6. Percentage of grammatical T-units (GRAM T-UNIT)

Table 6: Mean and SD for GRAM T-UNIT across grades for TDC.

Grade	Mean	SD
I	0.4439	0.3947
II	0.4652	0.2980
III	0.4946	0.2853
IV	0.5402	0.2107
V	0.5198	0.2322

There was no significant difference seen in percentage of grammatically correct t units across the grades, $F(4, 139) = 0.526$, $p = 0.717$. Although, the Graph 6 shows an increasing trend from 1st grade to 4th grade, it is not statistically significant. But, from the Graph 6, it is clear that variability is greatest in 1st graders compared to all the other grades. With the increase in the grade, variability is decreasing as depicted in Graph 6.



Graph 6: Mean and distribution of scores for GRAM T-UNIT in TDC

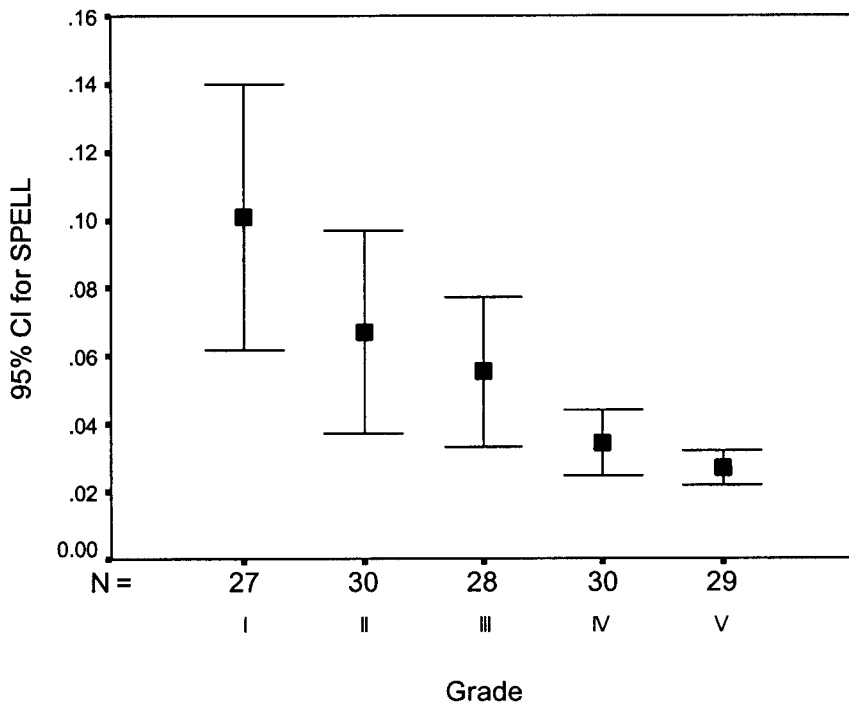
The results are in agreement with the previous study done by Puranik et al., 2008. One possible explanation could be that children in higher grades attempted to write more complex sentences which is very well evident from the results on C-DENSITY. This attempt would have led to produce more errors than might be expected. Also, this study did not count the number of errors per T-unit; a T-unit was scored as error only once irrespective of whether it had one or more errors. It is highly possible that children in lower grades would have had more errors per T-unit than children in higher grades. This should be considered in the future research.

7. Percentage of Spelling Errors (SPELL)

Table 7: Mean and SD for SPELL across grades for TDC.

Grade	Mean	SD
I	0.101	0.098
II	0.067	0.080
III	0.055	0.056
IV	0.034	0.026
V	0.027	0.013

Examination of the descriptive statistics for SPELL showed a significant main effect for grades, $F(4, 139) = 6.115, p < 0.0001$. The Duncun's post hoc analysis was done at $p < 0.05$ level of significance which gave the pair wise comparison between the grades. From Graph 7, it is evident that there is a clear cut decreasing trend in the percentage of spelling errors from grade 1 through grade 5. Pair wise comparison showed that children in grade 5 differed significantly from that of children in grades 2 and 1. 4th graders showed significantly lower scores from 1st graders. Children in 3rd grade showed significantly lower scores than 1st graders and 2nd graders showed significantly lower scores from 1st graders. Results showed that there is no significant difference between 5th, 4th and 3rd grade children; and between 4th, 3rd and 2nd grade children.



Graph 9: Mean and distribution of scores for SPELL in TDC

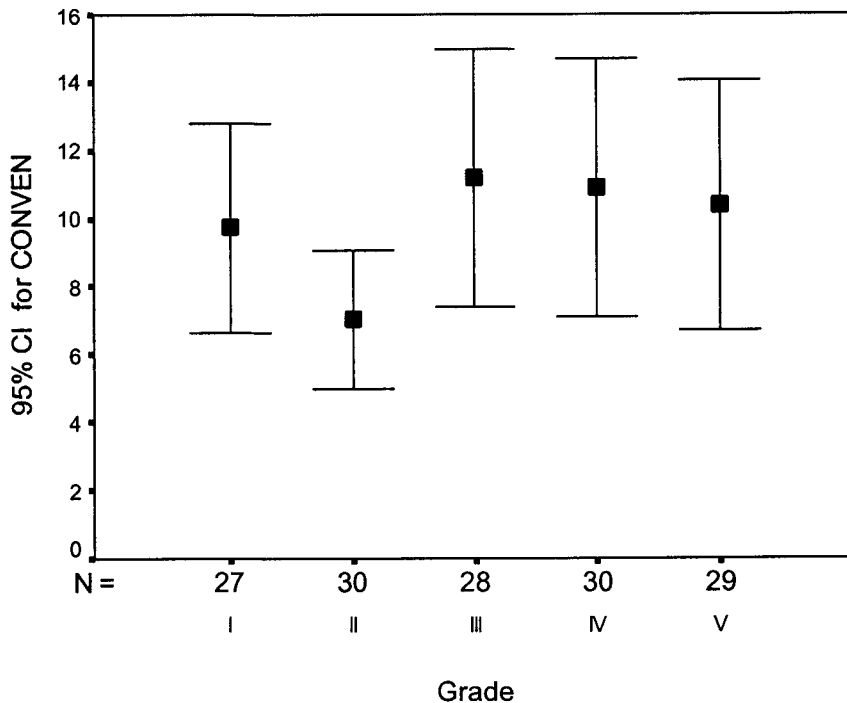
The results of the present study indicated an improved spelling accuracy with an increase in age which is in consonance with the previous studies done by Moran, 1981; Puranik et al., 2008; Nelson & Van Meter, 2003. Although there was a decrease in spelling errors, the errors still persisted in higher grades. The possible reason could be because spelling is the most difficult aspect of basic skills because the child has to recall and produce the entire word correctly. Even as their reading skill improves the spelling difficulties still persist. Particularly in English, as it has a deep orthography. The variability in the performance of spelling decreased with increase in grade. This is an indication that with the increase in grade, spelling errors are seen mostly on ‘exception’ words only which do not have a regular pattern and these have to be memorized (Mather et al., 2009).

8. Errors in Writing Conventions (CONVEN)

Table 8: Mean and SD for CONVEN across grades for TDC.

Grade	Mean	SD
I	9.74	7.77
II	7.03	5.40
III	11.18	9.72
IV	10.90	10.10
V	10.38	9.72

There was no significant difference seen in writing grades across the grades, $F(4, 139) = 1.081, p = 0.398$. From Graph 8, it is evident that there is no trend seen across the grades and has high variability in all the grades.



Graph 8: Mean and distribution of scores for CONVEN in TDC

The children at different age levels did not differ significantly on writing conventions which is in agreement with the previous study done by Puranik et al., 2008. Researchers have suggested that children at this grade level are less sensitive to the use of punctuations and they typically confine their writing to the most basic writing conventions (Simone, 1996). The variability was higher in all the grades as reflected from the SD values from Graph 8. The variability in higher grades was unexpected but, it is likely that children in higher grades would have concentrated more on the productivity and complexity of language than on the accuracy. Also, children in an attempt to write complex sentences tend to write run- on sentences without using any punctuations and connecting the clauses by conjunctions like and, or etc.

The findings from this study indicate that children demonstrate knowledge about the writing from Grade 1 itself but to lesser extent compared to other grades. The probable reason for knowledge at such a young age in TDC is that, they start receiving formal instructions before beginning school. As age increases, there was improvement noticed in terms of productivity, complexity and accuracy.

B) Written language skills in children with Dyslexia.

Here we discuss about the second phase of the method where quantitative scores of children with dyslexia are compared within the group and between the groups with that of TDC. The Group 2 comprised of 8 children with dyslexia named as subject 1 to subject 8 from Grade 1 through Grade 5. Subjects 4, 5, 6 and 8 had undergone therapy

from an SLP. Subject 4 had attended around 10 sessions of therapy, subject 5 had attended therapy for more than a year, subject 6 had taken therapy for 20 sessions and subject 8 had taken therapy for about 5 sessions.

1. *Total Number of Words (TNW)*

Table 9: Comparison of TDC and children with dyslexia across grades for TNW

Grade	Mean of TDC group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	42.33	32.54	52.13	Subject 1	5
II	61.51	47.65	75.59	-	-
III	78.25	58.61	97.89	Subject 2	2
				Subject 3	3
IV	115.07	97.48	132.65	Subject 4	62
				Subject 5	62
V	161.52	133.51	189.63	Subject 6	47
				Subject 7	86
				Subject 8	33

Table 9 gives a clear picture that children with dyslexia have scored lesser than their TD peers across the grades. Subject 7 had the highest TNW and subject 2 has the least TNW among children with dyslexia. From table 9, it is also evident that higher grade children with dyslexia have higher scores compared to children in lower grades. When each of their scores are compared to the statistical data of TDC; Subjects 1, 2 and 3

fall below grade 1 in their productivity of TNW. Subject 4, 5 and 6 have productivity score which falls within 2nd grade level. Subject 7 has productivity of a 3rd grader and subject 8 has that of a 1st grader.

The children with dyslexia have written fewer words compared to TDC of the same grade. This is in agreement with the study done by Hauck & Bellingsley, 1989; Barenbaum et al., 1987. The possible reason could be because of word retrieval problems which is present in children with dyslexia (Mather et al., 2009)

2. Total Number of T-units (T-UNIT)

Table 10: Comparison of TDC and children with dyslexia across grades for T-UNIT

Grade	Mean of TDC Group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	8.78	6.60	40.95	Subject 1	1
II	10.97	8.42	13.52	-	-
III	11.50	9.50	13.50	Subject 2	1
				Subject 3	0
IV	15.33	13.65	17.02	Subject 4	8
				Subject 5	8
V	17.79	15.67	19.92	Subject 6	7
				Subject 7	13
				Subject 8	5

Table 10 gives a clear picture that children with dyslexia have scored lesser than their TD peers across the grades. Subject 7 has the highest T-UNIT and subject 3 has zero score among children with dyslexia. From table 10, it is also evident that higher grade children with dyslexia have higher scores compared to children in lower grades. When each of their scores are compared to the statistical data of TDC; Subjects 1, 2, 3 and 8 fall below grade 1 in their productivity of T-UNIT. Subject 4, 5 and 6 have productivity score which falls within 1st grade level. Subject 7 has productivity of a 3rd grader.

The number of T-units was fewer in children with dyslexia compared to TDC. This is in agreement with the study done by Nodine et al., 1985; Hauck and Bellingsley, 1989. The possible reason could be that as there can be a delay in word retrieval problem there will be a delay in producing words which is a limits them to produce lesser number of T-units thereby reducing the overall productivity.

3. Mean length of T-units (MLT-UNIT)

Table 11: Comparison of TDC and children with dyslexia across grades for MLT-UNIT

Grade	Mean of TDC group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	4.8215	4.1252	5.5178	Subject 1	5
II	5.6793	5.3429	6.0158	-	-
III	6.6029	6.0633	7.1424	Subject 2	2
				Subject 3	0
IV	7.4550	6.7952	8.1148	Subject 4	7.75
				Subject 5	7.75
V	9.0931	8.0583	10.1259	Subject 6	6.71
				Subject 7	6.62
				Subject 8	6.60

From table 11, it is evident that fourth grade children with dyslexia have higher scores compared to children in fifth grade, third grade and first grades. Subject 4 and 5 have the highest MLT-UNIT and subject 3 has zero score among children with dyslexia. When each of their scores are compared to the statistical data of TDC; Subjects 1, 4 and 5 fall within their grade level. Subject 7 and 8 have scores which fall in third grade level. Subject 6 has a score of a 4th grader. Subject 2 and 3 have the least scores of lesser than first graders.

There is an increasing trend in the MLT-UNIT in children with dyslexia and most of them have a score similar to that of their TDC. This is in agreement with a study done by Nodine et al., 1985 which report that the author failed to find any difference in mean length of utterance between the TDC and children with dyslexia. In fact, Hauck and Bellingsley, 1989 reported that children with dyslexia wrote more words per sentence. This could be because they would be lacking in their ability to use age appropriate vocabulary and tend to explain the meaning more elaborately.

4. Total number of clauses (CLAUSES)

Table 12: Comparison of TDC and children with dyslexia across grades for CLAUSES

Grade	Mean of TDC group	95% Confidence interval for mean of TDC group		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	7.70	5.40	10.01	Subject 1	1
II	11.53	8.80	14.26	-	-
III	13.93	11.12	16.74	Subject 2	0
				Subject 3	0
IV	20.17	17.19	23.14	Subject 4	10
				Subject 5	10
V	25.14	21.57	28.71	Subject 6	8
				Subject 7	16
				Subject 8	4

The results from table 12 show that children with dyslexia have lesser number of clauses compared to their typically developing peers across the grades. Higher grade children have higher scores compared to lower grade children. When each of their scores are compared to the statistical data of TDC; Subjects 1, 2, 3 and 8 fall below grade 1 in their productivity of CLAUSES. Subject 4, 5 and 6 have productivity score which falls within first grade or second grade level. Subject 7 has a productivity of that of a 3rd grader.

The total number of clauses is also a measure of productivity. There is an overall decrease in the measure of productivity as seen earlier in TNW and T-UNIT which is reflected in CLAUSES also.

5. Clause Density (C-DENSITY)

Table 13: Comparison of TDC and children with dyslexia across grades for C-DENSITY

Grade	Mean of TDC group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	0.8137	0.6848	0.9426	Subject 1	1
II	1.0373	0.9997	1.0749	-	-
III	1.1736	1.0858	1.2613	Subject 2	0
				Subject 3	0
IV	1.2957	1.1937	1.3976	Subject 4	1.25
				Subject 5	1.25
V	1.4141	1.3110	1.5172	Subject 6	1.14
				Subject 7	1.23
				Subject 8	0.80

From table 13, it is evident that fourth grade children with dyslexia have higher scores compared to children in fifth grade and children in third and first grades. Subject 4 and 5 have the highest C-DENSITY and subjects 2 and 3 have zero score among children with dyslexia. When each of their scores is compared to the statistical data of TDC; Subjects 4 and 5 fall within their grade level. Subject 6 and 7 have scores which fall in third grade level. Subject 8 has a score of a first grader.

The results state that children with dyslexia are not that deviant from that of TDC in C-DENSITY particularly in higher grades. Taking support from the results obtained

for MLT-UNIT, children with dyslexia may tend to write longer sentences involving more number of clauses per sentence compromising for their inability in using an appropriate vocabulary accordingly. Another reason could be that children lack the use of appropriate punctuations and write run on sentences with more and more clauses embedded in the same T-unit.

6. Percentage of grammatical T-units (GRAM T-UNIT)

Table 14: Comparison of TDC and children with dyslexia across grades for GRAM T-UNIT

Grade	Mean of TDC group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	0.4439	0.2878	0.6000	Subject 1	0
II	0.4652	0.3539	0.5765	-	-
III	0.4946	0.3840	0.6053	Subject 2	0
				Subject 3	0
IV	0.5402	0.4615	0.6188	Subject 4	0.38
				Subject 5	0.25
V	0.5198	0.4315	0.6082	Subject 6	0
				Subject 7	0.61
				Subject 8	0.50

From table 14, it is evident that higher grade children have higher number of grammatical T-units compared to children in lower grades in children with dyslexia.

Subjects 1, 2, 3 and 6 have got zero score and subject 7 has highest score and is similar to that of the TD peers of his grade. Subjects 4 and 8 have scores that of a first grader. Subject 5 falls below first grade level.

The results suggest that children with dyslexia produce less correct grammatically correct sentences when compared to TDC. But, there is an increasing trend seen from grade 1 through 5 in children with dyslexia. Higher graders have less erred sentences compared to low graders. This could be because of limited productivity seen in children in lower grades. Another reason is that, children in higher grades could have made more grammatical errors in an attempt to produce longer sentences. Third reason could be because grammaticality includes morphological and syntactical abilities which involve use of suffixes that typically undergoes significant development between fourth grade and high school in TDC.

7. Percentage of spelling errors (SPELL)

Table 15: Comparison of TDC and children with dyslexia across grades for SPELL

Grade	Mean of TDC group	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	0.101	0.062	0.139	Subject 1	.200
II	0.067	0.037	0.096	-	-
III	0.055	0.033	0.077	Subject 2	0.500
				Subject 3	1.000
IV	0.034	0.024	0.044	Subject 4	0.225
				Subject 5	0.225
V	0.027	0.021	0.032	Subject 6	0.063
				Subject 7	0.139
				Subject 8	0.272

Spelling errors have a lot of variability in children with dyslexia. There is no increasing or decreasing trend seen across the grades. Subject 3 has all the spellings written wrong. Subject 6 has the least number of errors in spelling than other subjects. Most of them have spelling errors greater than the TDC of grade 1.

The result of the present study is in agreement with the previous studies done by Moran, 1981; Poplin et al., 1980. Spelling is the most basic and most difficult skill of all. Spelling is a sensitive index of phonological processing (Bishop & Clarkson, 2003). To spell the words correctly, children should have good knowledge in phonology,

orthography, morphology and semantics of a language. Children with dyslexia have impaired phonological abilities and thus can have poor spelling abilities. A low quality phonological representation can result in less clearly defined, less explicit word representations and can result in pervasive effects on many aspects of language use (Perfetti & Hart, 2001).

8. Errors of Writing Conventions (CONVEN)

Table 16: Comparison of TDC and children with dyslexia across grades for CONVEN

Grade	Mean of TDC	95% Confidence interval for mean of TDC		Quantitative data of children with dyslexia	
		Lower bound	Upper bound	Sl no.	Score
I	9.74	6.67	12.81	Subject 1	1
II	7.03	5.02	9.05	-	-
III	11.18	7.41	14.95	Subject 2	1
				Subject 3	3
IV	10.90	7.13	14.67	Subject 4	15
				Subject 5	17
V	10.38	6.68	14.08	Subject 6	8
				Subject 7	15
				Subject 8	9

CONVEN has a lot of variability in TDC across the grades and there is no significant difference across groups. The same trend is also seen in children with dyslexia. Subject 5 has more number of errors compared to other children with dyslexia.

The result of the present study is not in agreement with the previous studies done by Hauck and Bellingsley (1989). Conventional errors were almost equal to that of the TDC. But, this result is not sensitive as there is a lot of variability within each grade in all the grades. A review of research reports that struggling writers have problems in using correct capitalization and punctuation rules. Children who struggle to write tend to write run-on sentences and sentences with too many clauses that are joined using conjunctions like 'and'. The same could be the reason in children with dyslexia as well.

Thus, children with dyslexia show poorer scores compared to TDC in almost all the aspects of productivity, complexity and accuracy except for MLT-UNIT. These children exhibited lesser TNW, less number of T-units but the number of words per T-unit was more. Though, these T-units had incorrect grammar and spelling errors. However, the high variability within children of the same grade could be attributed to the severity and type of dyslexia and to the treatment effects.

Overall, writing is a complex process that requires generation and integration of many levels of linguistic material. There might be difficulty at one or more levels of processing in persons with dyslexia. Children with Dyslexia fail to engage in advanced planning processes when they write expository text. They use an average less than 1 minute of time planning prior to writing, unless they are explicitly taught how to plan. Children with dyslexia struggle with organizing ideas for writing. Children write whatever comes to mind in whatever order it comes to mind. Thus, they string ideas

together associatively instead of actively shaping them according to the text structure dictated by the genre and/or writing task. Even when they have brainstormed ideas prior to writing, children with dyslexia do not apply logical and well defined schemas for organizing the information when composing. As a result their writing is often poorly organized and incoherent. Children with dyslexia struggle with the foundation skill of revision and reading comprehension. They struggle not only to decode and to comprehend their own writing but also to comprehend and evaluate what they read in terms of its meaning, form, style, clarity, organization and effect on the reader. As well, many have limited working memory capacity, which impedes their ability to hold global goals and subgoals for their text in mind, while they read to evaluate whether they achieved these goals (Swanson & Berninger, 1994).

This study provides preliminary data for establishing grade level guidelines of performance on several writing variables. It provides pattern of written language development in children with dyslexia. It also provides comparison and differences found between children with dyslexia and TDC. Given the importance of writing, combined with results of research, showing that a number of children struggle with writing, this study provides an efficient system for evaluating written language behaviours in children with dyslexia from first to fifth grade. A multidimensional database of variables that contribute to overall writing proficiency across grades is needed to provide assessment and remediation in school age children. This study is merely a first step toward this end.

CHAPTER 5

SUMMARY AND CONCLUSION

The present study was conducted to determine the written language skills in TDC and in children with dyslexia. Following were the objectives considered for the study.

1. To derive a normative data for the written language skills using expository style of writing.
2. To study the pattern of written language skills in children with dyslexia.
3. To perform quantitative analysis of written language skills in both the groups.
4. To compare and analyze the written language skills in TDC and children with dyslexia.

Writing is a complex skill and a form of verbal behaviour which is achieved late than all the other verbal skills and hence is the most difficult skill of all verbal behaviours. It involves a lot of cognitive processes like planning, organizing, generating and revising abilities. However, only transcription sub stage of generating stage can be explicitly tapped to know about development of the written language skills in TDC and pattern of written language skills in children with dyslexia. This can be done by quantitatively measuring an exposition written language sample on a particular topic using various variables. These measured norms can then be used to compare the clinical samples especially in cases of children with dyslexia. However, such studies are lacking in Indian population and hence there was a need to carry out this study.

The present study included two groups of participants. The first group included TDC from grade 1 to grade 5 and second group included 8 children with dyslexia. The study was carried out in two phases. The first phase included developing norms for TDC across grades for the written language variables. The second phase included comparing within the group of children with dyslexia and between the groups of children with dyslexia and TDC. 8 variables considered for the study included Total number of words, Total number of T-units, Mean Length of T-units, Number of clauses, Clause Density, Percentage of grammatical T-units, Percentage of spelling errors and Errors in Writing conventions. Using SALT software, quantitative analysis of the data was done by an experienced speech language pathologist.

The results of phase 1 of the present study showed that in TDC

- There is a significant increase in the TNW, T-UNIT, MLT-UNIT, CLAUSES and C-DENSITY with increase in the grade.
- SPELL decreased with increase in grade.
- There was no significant difference in GRAM-T UNIT and CONVEN across the grades.

The results of phase 2 of the present study showed that

- Children with dyslexia showed poorer score in all the variables when compared to the TDC except in MLT-UNIT.
- Children with dyslexia studying in higher grades (4th and 5th grades) performed better than the children with dyslexia in lower grades.

To conclude, children with dyslexia showed poorer scores compared to TDC in almost all the aspects of productivity, complexity and accuracy except for MLT-UNIT. These children exhibited lesser TNW, less number of T-units but the number of words per T-unit was more. Though, these T-units had incorrect grammar and spelling errors. However, the high variability within children of the same grade could be attributed to the severity and type of dyslexia and to the treatment effects. Writing is a complex process that requires generation and integration of many levels of linguistic material. There might be difficulty at one or more levels of processing in children with dyslexia

IMPLICATIONS OF THE STUDY

- The norms developed can be used for the assessment of written language skills in children with dyslexia across grade 1 to 5.
- The topic ‘My School’ used in the present study had increasing trend on productivity, complexity and accuracy starting from first grade to fifth grade. Hence, this topic can be used as standard stimuli as its easy, familiar and no ceiling effect noticed across the grades.
- Writing is a language based activity. So, SLPs can make valuable contributions to improving the writing of the children. This can be used for preparing appropriate management procedures to improve the linguistics aspects of writing.
- The measures discussed in the study can be evaluated at multiple points in time during the course of written language intervention and to assess the progress during and after intervention.

- Writing is a multifaceted activity. The variables included for the study helps the SLP to get a multidimensional view of the children's written language skills. Most importantly, these are depicted quantitatively, which helps the child and his/her caregiver to know more about the areas of difficulty in written language and also to monitor progress throughout the treatment phase.

Future implications:

- To study the gender variations in the written language development in TDC and in children with dyslexia.
- To determine the written language skills in children studying in greater than fifth grade. This will provide relevant information on the ceiling effect in the studied variables.
- To include different types of dyslexia to differentially diagnose between them.
- To study the written language development in Indian languages.

LIMITATIONS OF THE STUDY

- A larger database with a wider geographical distribution is needed to create a robust normative sample that can be used with greater confidence for all school aged children.
- Number of participants in group 2 comprising of children with dyslexia is less. Including more number of samples would give better results.
- Qualitative analysis of the written language samples was not carried out to test for the non linguistic aspects of writing.

- All the writing conventions were added and then tabulated to get a normative value. The capitalization errors and full stop errors could have separately calculated as most of the other writing conventions are acquired late in the TDC.
- The grammatical errors in a T-unit were measured but, number of grammatical errors per T-unit was not looked into in the present study. This would have given a better result for the GRAM T-UNIT variable in TDC across different grades.
- Educational background of the parents was not considered in the study. This would have been a much more controlled study.
- The participants in the group 2 were not controlled for treatment effects.

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APPENDIX I



APPENDIX II

Original written sample of a typically developing child of fourth grade

Topic - my school

- 1) My school name is vefaya vrttala vidya Sahala.
- 2) My class teacher name is dufatha miss
- 3) our school is very good school
- 4) I like my school. and it is Big
- 5) In our school we have play ground and school bus we have.
- 6) ~~am~~ and we do assembly in the morning. and ~~the~~ our teachers teach us.
- 7) In our school we have many class rooms like library, computer room, physical lab and multimedia room etc
- 8) In our school we have collage, we have stage know school and also we have uniforms to wear. and also we have colour dress on wednesday ^{many}
- 9) we have sections like A' B' C.
- 10) I love my school and I am very ~~happy~~ Proud of my school.

Thankyou

Sample of written Language Analysis of SALT produced by a typically developing fourth grader.

\$ Child, Examiner
+ Language: English
+ Subject Id: 36
+ Grade: 4
+ Context: Exposition

Codes

+ [1cl]: 1 clause
+ [2cl]: 2 clauses
+ [3cl]: 3 clauses
+ [4cl]: 4 clauses
+ [E]: Error
+ [spelerr]: spelling error
+ [.err]: missing end error
+ [i-caperr]: Initial Capitalization error
+ [0-conven]: Other conventional errors.

c My school[0-conven] name is vijaya vittala vidya sahala[0-conven] [1cl].
c My class teacher[0-conven] name is Sujatha miss[1cl][.err].
c our[i-caperr] school is very good school [1cl][.err].
c i[i-caperr] like my school and it is Big[0-conven] [2cl][.err].
c In our school we have play ground and scholl[spelerr] bus we have [2cl][E].
c and we do Assembly[0-conven] in the morning and our tachers[spelerr] teach us [2cl][E].
c In our school we have many class rooms like library, computer room, Physical[0-conven] lab and multiedia[spelerr] room etc [2cl][E].
c In our school we have collage[spelerr], we have stage in our school and also we have uniforms to wear and also we have colour dress on wednesday [4cl][.err][E].
c We have many sections like A, B,C[0-conven] [2cl].
c I love my school and I am very Proud[0-conven] of my school [2cl].

Standard measures

Total Utterances (T-unit)	10
MLU in Words (MLT-UNIT)	11.6
Total Main Body Words (TNW)	116
Number of Clauses (3x1+6x2+4x1)	19
Clause Density (Clauses/ T-unit)	1.9
Percentage of Grammatical T-units (GRAM T-UNIT)	0.6
Percentage of spelling errors	0.034
Errors of writing conventions	14

Original written sample of a child with dyslexia studying in fourth grade

my school name is excel
ridge school I am from
five states and some
going nu school and
new play ground
but it is a big new
school
and my key butted
and the ticki name
is grassmary.
and ~~my~~ school bidden
is new but I like
to stowdy and my
school let as punch
is mainy on Tom
I samas Kemp.

Sample of written Language Analysis of SALT produced by a child with dyslexia studying in fourth grade.

\$ Child, Examiner
 + Language: English
 + Grade: 4
 + Context: Exposition

c my[i-caperr] school[0-conven] name is excel[0-conven] pluge[spelerr] school
 [1cl][.err].
 c I am from five stady[spelerr] [1cl][E][.err].
 c and[i-caperr] ame[spelerr] going niu[spelerr] school and neu[spelerr] play
 groung[spelerr] but it is a big neu school [2cl][E][.err].
 c and[i-caperr] my very butiful [1cl][E].
 c and[i-caperr] the teacher[0-conven] name is grusmary[0-conven][spelerr][E][1cl].
 c and[i-caperr] my school bilden[spelerr] is new [1cl][.err][E].
 c but[i-caperr] I have to stoundy[spelerr] [1cl][.err].
 c and[i-caperr] my school let is princle[spelerr] is maing[spelerr] on Joon[spelerr] 1
 sumar[spelerr] kamp[spelerr] [2cl][E][.err].

Standard measures

Total Utterances (T-unit)	8
MLU in Words (MLT-UNIT)	7.75
Total Main Body Words (TNW)	62
Number of Clauses	10
Clause Density (Clauses/ T-unit)	1.25
Percentage of Grammatical T-units (GRAM T-UNIT)	0.25
Percentage of spelling errors	0.225
Errors of writing conventions	17