METALINGUISTIC ABILITIES IN CHILDREN WITH DEVELOPMENTAL DYSLEXIA: IMPLICATIONS FOR READING AND WRITING

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The dream began with my guide who
believed in me, who tugged and pushed
and lead me to the next plateau,
sometimes poking me with a sharp stick
called "precision".
Thank you ma'am.

CERTIFICATE

This is to certify that this dissertation entitled '*Metalinguistic abilities in children with developmental dyslexia: Implications for reading and writing*' is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech - Language Pathology) of the student with Register No. 07SLP015. 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.

Mysore

May, 2009.

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CERTIFICATE

This is to certify that this dissertation entitled '*Metalinguistic abilities in children with developmental dyslexia: Implications for reading and writing*' has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier to any other University for the award of Diploma or Degree.

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May, 2009.

DECLARATION

I hereby declare that this dissertation entitled **'***Metalinguistic abilities in children with developmental dyslexia: Implications for reading and writing*' is the result of my own study under the guidance of Dr. R. Manjula, Professor of Speech Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier to any other University for the award of Diploma or Degree.

Mysore

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

"Language is the armory of the human mind, and at once contains the trophies of its past and the weapons of its future conquests"

- Samuel Taylor Coleridge

Metalinguistic ability is said to be a "developmentally distinct kind of linguistic functioning that develops separately from and later than basic speaking and listening skills" (Tunmer, 1991). It is the ability to reflect upon and manipulate the structural features of spoken language, treating language itself as an object of thought (Tunmer, Pratt & Herriman, 1984). Children at the age of 2 years are able to produce simple two-word utterances and understand complex sentences. This kind of understanding is "implicit" in children as children do not consciously focus on the various rules of a given language that they are learning to speak. However, at around 6-8 years of age children begin to acquire a more "explicit" kind of language. Such an understanding in children was theoretically interpreted way back in the 1960's and 1970's as a natural consequence of language learning (Karmiloff-Smith, 1992) due to the development of metalinguistic knowledge from the implicit to the explicit forms.

Olson (1994) proposed a novel hypothesis known as the 'script- as- model' hypothesis. According to this hypothesis, metalinguistic awareness is postulated as a by-product of literacy. It is postulated that children use script to reflect on language

consciously. Studies that have examined children's metalinguistic awareness have commonly focused on tasks of phonemic awareness and grammatical judgement tasks. Another important aspect which has gained attention is the understanding of the concept of word by children.

Metalinguistic awareness in bilingual learners is the ability to objectively function outside one language system and to objectify languages' rules, structures and functions. Code-switching and translation are examples of bilinguals' metalinguistic awareness. Research has shown that metalinguistic awareness in bilinguals is a crucial component because of its documented relationship and positive effects on language ability, symbolic development and literacy skills. The focus shifted in the mid 1990's to a greater emphasis on phonological aspects of language and knowledge of phoneme-grapheme relationships (the alphabetic principle and phonics) as the central abilities in literacy learning. However, the construct of metalinguistic awareness is more expansive and inclusive than theories and constructs in literacy because the abilities referred to and studied include all aspects and components of language and its purposeful, functional uses. The most commonly studied phenomenon in biliteracy learning that transfers across languages and enhances literacy learning among bilingual learners is the "metalinguistic awareness" (Koda, 2008).

Reading is a complex process involving many skills, amongst which language is the core skill (Catts & Kamhi, 1999). A logical consequence of the language basis of reading is that children who have deficiencies in one or more aspects of language will

experience difficulty learning to read (Catts & Kamhi, 1999). Metalinguistic abilities play a crucial role in different stages of reading acquisition.

Phonological awareness (alternatively called as metaphonological skills) is the ability to gain access to and intentionally manipulate the phonemes within a word (Gonzalez, Espinel & Rosquete, 2002). Operationally, skills that represent children's phonological awareness lie on a continuum of complexity. Complex phonological skills are reported to emerge only after 5 to 6 years of age (Liberman, Shankweiler, Fischer & Carter, 1974). Research has shown that phonemic awareness, a crucial part of phonological awareness is both a prerequisite and a consequence of learning to read. Grammatical awareness has also been reported to influence reading comprehension (Bentin, Deutsch, & Liberman, 1990; Cairns, Schlisselberg, Waltzman & McDaniel, 2006).

Most of the research findings agree that metalinguistic abilities are developed gradually around mid-childhood (Glietman & Glietman, 1979; Hakes, 1980; Scholl & Ryan, 1980; Van Kleeck, 1982, 1984; Pratt, Tunmer & Bowey, 1984). However, each of these researchers has given different explanations for the causes and the factors affecting metalinguistic skills.

The major view points expressed by various researchers can be grouped under three main categories:

1. The view that metalinguistic awareness is incidental to language.

2. That it is a consequence of decentration of cognitive processes.
3. That it is directly related to the experience of learning to read.

1. Metalinguistic skills developing parallel to language acquisition

The major supporters of this view were Clark (1978) and Karmiloff-Smith (1986) who believed that extralinguistic to intralinguistic shift in metalinguistic awareness occurred around the age of 5 years. New and refined skills as a result of internal reorganization of linguistic categories were another phase which was attained around the age of 8 years. This level was marked by an ability to comprehend at the abstract level without depending on functional, syntactic, semantic and pragmatic cues.

2. Metalinguistic awareness as a result of the decentration process at the cognitive level

The main proponents of this view are Lundberg (1978), Hakes (1980), Tunmer, Herriman and Nesdale (1988) who believed in the Piagetian process of decentration. 'Decentration' is the ability of a person to shift ones attention from the immediate concrete message content to the properties of language used to convey this content. This ability is thought of as forming the core of metalinguistic development. Reading process is said to begin only after the child attains a specific level in decentration.

3. Metalinguistic awareness as a result of reading instruction

This is a view that emerged in the early 1970's which suggests that reading and writing give messages a static nature which can be written and reflected upon by the child. Thus, school literacy and extensive reading and writing instruction are suggested to be the propelling factor for metalinguistic awareness (Donaldson, 1976; Flavell, 1985). Ehri (1978) on the other hand lays greater emphasis on written symbols alone and believes that print which makes speech visible is readily available to the child for any further analysis.

Literacy, as is widely known, provides a new form of word representation; it means adding orthographic representations to the pre-existing phonological and semantic representations of the word. Success in the acquisition of reading and writing gives the child a very powerful way of processing information and thus, acquiring knowledge, together with developing sophisticated linguistic and metalinguistic skills (Morais, 1991b).

The World Federation of Neurology defines developmental dyslexia as a "learning disability which initially shows itself by difficulty in learning to read and later by erratic spelling and lack of facility in manipulating written as opposed to spoken words. The condition is cognitive in essence and usually genetically determined. It is not due to intellectual inadequacy, or to lack of socio-cultural opportunity, or to emotional

factors, or to any known structural brain defect. It probably represents a specific maturational defect, which tends to lessen as child gets older and is capable of considerable improvement, especially when appropriate remedial help is afforded at the earliest opportunity" (Cited in Critchley, 1970).

Research in the area of metalinguistics in learning disability has reported deficits which hampers their reading abilities. Hence, assessment and remediation of metalinguistic skills becomes an essential component in the diagnosis and management of children with developmental dyslexia.

In the Indian Scenario, research on reading is still at its infancy. Metalinguistic and reading abilities are language and script specific in nature and hence investigations in the respective language and scripts are called for. Indian scripts developed from Brahmi that are semi-syllabic in nature, is said to have highly transparent orthographies. Kannada, a language spoken in Karnataka has the basic letter symbols that are arranged in phonetic manner. Studies in Kannada language on metaphonology and reading abilities contradicted the hitherto accepted notion that metaphonological abilities are prerequisites for the acquisition of reading (Rekha, 1987, 1996). Prema (1997) has profiled the reading acquisition of children from grade III to grade VII and reported that the hierarchy of predictors of reading disability in Kannada are metasemantic, metasyntactic and metaphonological skills.

Need for the study

It has been well documented that children with developmental dyslexia have reading as one of their core deficits and various components that are necessary for the acquisition of reading are affected. Studies in the area of metalinguistic abilities in bilingual-biliterate (Kannada-English) children with developmental dyslexia are limited. Further, the relationship between different metalinguistic skills (metasemantics, metasyntax, metaphonology) and literacy have not been addressed in this population.

Thus, it is of interest to study the hierarchy of skills that contribute to the acquisition of reading and writing in Kannada-English bilingual-biliterate typically developing children and children with developmental dyslexia, which will have implications in the management of these children.

Aims of the study

The study was undertaken with the following aims:

I. To compare the performance of bilingual-biliterate (Kannada-English) typically developing children and children with developmental dyslexia across the major domains of Metalinguistics, Reading and Writing.

II. To compare the performance of bilingual-biliterate typically developing children and children with developmental dyslexia across the sub-domains of Metalinguistic components, Reading and Writing.

III. To study the correlation of Reading and Writing with the Components of Metalinguistic Skills.

IV. To determine the Metalinguistic Skills that contributes significantly to the acquisition of Reading and Writing Abilities in bilingual-biliterate typically developing children and children with developmental dyslexia.

V. To compare the pattern of errors on Metalinguistic, Reading and Writing tasks based on Qualitative Analysis in the two groups of children.

Method

Twenty bilingual-biliterate typically developing children and twenty children with developmental dyslexia were assessed on a wide range of metalinguistic tasks which included metaphonology, metasemantics, metasyntax and, reading and writing tasks in order to compare the metalinguistic skills between the two groups. Linguistic Profile Test in Kannada (Karanth, 1980) and sections on metaphonology, reading and writing from Reading Acquisition Profile in Kannada (Prema, 1997) were administered. The correlation of reading abilities and different metalinguistic skills (metaphonology, metasemantics & metasyntax) was also studied in order to understand the metalinguistic skills that significantly contribute to reading and writing in the two subject groups. The patterns of errors were also analysed qualitatively in both the groups of children.

Implications

The implications of the study are as follows:

1. The results of the study will provide an insight into the metalinguistic skills in Kannada in both typically developing children and children with developmental dyslexia in the age range of 8-13 years.
2. The relationship between metalinguistic abilities and reading and writing skills in the native language for bilingual-biliterate children is delineated.
3. The metalinguistic skills that contribute to reading and writing in bilingual-biliterate (Kannada-English) typically developing children and children with developmental dyslexia is detailed which may aid in choosing the effective hierarchy of skills for management of children with developmental dyslexia.

Limitations

The limitations of the study are as follows:

1. The design of the present study was cross-sectional and hence the skills that were found to contribute to reading and writing may not hold good at all stages of literacy development. A longitudinal study would help establish the predictors of reading and writing abilities in the long term and also the changing patterns, if any.

2. The tasks employed to tap the metalinguistic abilities have not included the entire range of skills under the realm of metaphonology, metasemantics and metasyntax and hence, generalization of the results is cautioned.

REVIEW OF LITERATURE

Metalinguistic ability is the ability to reflect consciously upon the nature and properties of language (Van Kleeck, 1982). This reflective capacity is necessary not only for the mastery of phonological information but for semantic and syntactic competence as well. Metalinguistics is a cognitive skill that can be described as “the ability to think and talk about language” (Bernstein & Tiegerman-Farber, 2002).

The term 'metalinguistic awareness' was first used by Cazden (1972). Ehri (1978) differentiated between implicit and explicit knowledge and further stated that metalinguistic knowledge is explicit. Ehri (1978) defined metalinguistic awareness as the ability to focus, think or make judgements about the structures comprising language. According to Sinclair (1981), metalinguistic awareness includes all the capacities and activities concerning language and language judgement which are not themselves a part of (or very closely related to) production and comprehension processes. In general, any reflections, ideas, knowledge or explicit formulations of underlying principles, rules, etc., concerning language structure, functions or the rules for its use have been classified under the label ‘Linguistic awareness’ or ‘Metalinguistic awareness’.

Components of Metalinguistics

There are four types of metalinguistic awareness which include - phonological (metaphonological), lexical/semantic (metalexical/metasemantic), syntactic/structural

(metasyntactic) and pragmatic (metapragmatic) awareness. Tunmer and Bowey (1984) identified four levels of metalinguistic awareness: word awareness, phonological awareness, form awareness and pragmatic awareness. They hypothesized that these levels play a vital role at different stages of reading acquisition. Gombert (1992) categorized metalinguistic awareness into six groups: metaphonological, metasyntactic, metalexical, metasemantic, metapragmatic, and metatextual.

Metaphonological Awareness

Phonological awareness usually refers to the ability to conceive of spoken words as sequences of smaller units of sound segments (syllables, onsets, rimes, or phonemes) (Liberman, Shankweiler, Liberman, Fowler, & Fischer, 1977; Goswami, 1999). It is a kind of metalinguistic ability that requires the explicit knowledge of the phonological structure of speech, as opposed to normal conversation that is interpreted and produced largely automatically (Tunmer et al., 1988). This skill is related to learning the letters of the alphabetic system as the latter are symbols for sounds. Metaphonological awareness includes awareness of phonological strings (awareness of phonological length, sound similarity etc), awareness of syllables, awareness of phonemes and awareness of phonetic features (Morais, Alegria & Content, 1987).

The tasks used to assess metaphonological awareness generally include the following:

- Phoneme Deletion – E.g. *What word is left is we remove the /k/ from 'car'?*
- Word to Word Matching – E.g. *Do 'pen' and 'pipe' begin with the same sound?*

- Blending – E.g. *What word would we have if we put these sounds together/s/ /a/ /t/?*
- Sound Isolation – E.g. *What is the first sound in 'rose'?*
- Phoneme Segmentation – E.g. *What sounds do you hear in the word 'hot'?*
- Phoneme Counting – E.g. *How many sounds do you hear in the word 'cake'?*
- Deleted Phoneme- E.g. *What sound do you hear in 'meat' that is missing from 'eat'?*
- Odd Word Out- E.g. *What word starts with a different sound? Bag, nine, beach, bike*
- Sound to Sound Matching- E.g. *Is there a /k/ in 'bike'?*

Many studies have shown that good phonological awareness skill is characteristic of good readers, and poor phonological awareness skill is characteristic of poor readers (Wagner & Torgesen, 1987; Adams, 1990; Goswami & Bryant, 1990; Brady & Shankweiler, 1991; Scarborough, 1998).

Morphological awareness

Morphological awareness is the explicit understanding of word structure. In contrast to phonological awareness, the units of analysis in morphological awareness are affixes and root words rather than phonemes.

Metalexical/Metasemantic Awareness

Meta-semantics is the ability to analyze words, to look at synonyms, antonyms, homonyms, multiple definitions. It is the ability to abstract and play with words. Word awareness is the understanding of a word as a constituent part of speech. It includes the ability to segment sentences and phrases into words, separation of words from their referent, ability to substitute words, and the recognition of synonyms and antonyms (Tunmer & Cole, 1985).

Nippold and Rudzinski (1993) proposed the "metasemantic hypothesis" to account for the discrepancy in difficulty between transparent and opaque idioms. The view in this hypothesis is that idioms are learned, in part, by analyzing the words composing them—a strategy that is potentially more profitable with transparent expressions.

The tasks used to assess metasemantic awareness generally include assessing whether the individual can

- Analyze a sentence into lexical units or words
- Categorize a word according to its superordinate
- Give examples of subordinate category members
- Provide the definition for a word including superordinate information and specific differentiating features

- Provide a synonym for a word
- Provide an antonym for a word
- Provide multiple meanings for homonyms or lexically ambiguous words
- Identify the grammatical category for a word

Metasyntactic Awareness

Syntactic awareness is the ability to reason consciously about the syntactic aspects of language, and to exercise intentional control over the application of grammatical rules (Gombert, 1992). Previous studies on syntactic awareness focused on children's awareness of sentence-grammaticality, structural synonymy and structural ambiguity. More studies have been done to tap young children's abilities to reflect on syntactic forms using grammaticality judgement tasks. Most of the reported studies on metasyntactic ability (which are mainly English studies) used either a grammaticality judgement task or a revision task or both tasks to assess children's awareness of different syntactic constructions. In a judgement task, the subject is presented with both grammatical and ungrammatical sentences. He/she is required to indicate which are grammatical and which are ungrammatical. In a revision task, the subject is presented with only ungrammatical sentences and is required to correct them. Despite the large variability across studies, most findings reveal that syntactic awareness improves with age and all tasks are effective in assessing metasyntactic awareness. Furthermore, it

appears that children perform better on the judgement task than on the revision task. Owing to the possibility of a response bias in judgement tasks, a revision task is thought to be a more sensitive measure of syntactic awareness (Pratt, Tunmer, & Bowey, 1984; Blackmore, Pratt, & Dewsbury, 1995).

The tasks used to assess metasyntactic awareness generally include assessing whether the individual can

- Unscramble a jumbled sentence
- Fill-in missing words in sentences or phrases
- Determine if two sentences have the same or different meanings
- Determine if a sentence is grammatical or not
- Correct grammatical errors
- Recognize or produce a paraphrase of a sentence
- Recognize or detect a lexically or structurally ambiguous sentence i.e. determine if the sentence in question can have more than interpretation.

Metapragmatic Awareness

Metapragmatic awareness includes an awareness of the relationship between language and the social context in which it is being used (Hickmann, 1985; Ninio & Snow, 1996). Common examples of metapragmatic awareness include the ability to judge referential adequacy, the ability to determine comprehensibility, and the ability to describe explicitly the social rules (e.g., politeness rules) governing language use.

Metalinguistic Development in Typically Developing Children

The development of metalinguistic ability in children is a metacognitive skill that emerges towards the end of preschool period and is characterized by a cognitive shift in intellectual functioning when a child can begin to treat language as an object of thought. This ability to reflect on language has been attributed to emergence of the Piagetian stage of concrete operations that begins to develop between 5 and 7 years of age (Fowler, 1991; Van Kleeck, 1984). Metalinguistic development is not considered as a simple epiphenomenon. Its significance lies in facilitating later linguistic development such as literacy development. The underlying assumptions are:

1. Acquisition of basic language skills does not require awareness and
2. Skills in using spoken language and skills in making judgement about language do not develop concurrently.

Supporters of the second view have suggested that verbal language comprehension and production skills develop in the preschool years while the ability to make metalinguistic judgements occurs in middle childhood (Gleitman & Gleitman, 1979; Hakes, 1980).

Valtin (1984) suggests three stages of developmental sequence of language awareness: unconscious awareness of automatic use of language, actual but not deliberate awareness (e.g. can play rhyme game but cannot perform rhyme production), and

conscious awareness (which needs some formal instructions). Analogous to the above, there are three major views on the development of metalinguistic awareness:

1. Metalinguistic awareness develops concomitantly with language acquisition.
2. Metalinguistic awareness develops in middle childhood and is related to a more general change in information processing capabilities that occur during this period; and
3. Metalinguistic awareness develops after the child begins formal schooling and is largely the result of learning to read.

Investigators have often addressed metalinguistic skills as the ability to reflect upon language, to attend to form as distinct from content, and to evaluate two aspects of a linguistic array simultaneously. This remains a perfectly valid way to view metalinguistic development, but recent work suggests that what experts have thought of as metalinguistic skills are not merely metalinguistic. Instead, they reflect the developing nature of how language is represented and processed. Metsala and Walley (1997) suggested that the ability to segment phonemes rests on the increasingly segmental representation of lexical items in the child's lexicon. Cairns et al. (2006) suggested that the traditional metalinguistic skill of grammaticality judgment and correction rests on developing psycholinguistic processing operations and the ability to consciously access the internalized grammar.

Metalinguistic skills need some primary language competence because the child must have something to reflect upon (Van Kleeck, 1982). Nevertheless, the development

of metalinguistic skill is distinguished from the acquisition of linguistic skills for ordinary verbal communication: once the basic linguistic skills are mastered, metalinguistic skills drift away from it. Older preschoolers may possess some metasyntactic/metalinguistic ability which is incidental to task demands. Children do not develop true metasyntactic/metalinguistic abilities until middle childhood (Sheung, 1998).

Middle elementary school seems to be a pivotal period in both learning to read and developing metalinguistic skill. Jarmulowicz, Hay, Taran and Ethington (2008) proposed a developmental sequence beginning with receptive language followed by phonological awareness, morphological awareness, and a new metalinguistic task measuring oral morphophonological accuracy, followed by decoding and culminating in reading comprehension.

Development of Phonological Awareness

Developmental changes in the acquisition of phonological awareness skills regardless of the kind of task employed are well documented in literature. Chard and Dickson (1999) have suggested a hierarchy of phonological skill development from less complex activities to more complex ones. Activities such as initial rhyming and rhyming songs are considered to be less complex and blending and segmenting individual phonemes to be the most complex ones.

According to Byrne (2001), acquisition of phonological awareness takes place at two levels. Level 1 is indexed by the ability to identify and produce rhymes and to segment words by syllables, separate initial sounds, or segment syllables into onset-rime segments (Stahl & Murray, 1998; Wagner, Torgesen & Rashotte, 1999). Level 2 is more sophisticated in which phonological awareness often does not appear until a child can read to some extent and involves representation of and operation on individual phonemes occurring at various positions in a word (Stahl & Murray, 1998; Wagner et al., 1999).

Ehri et al. (2001) described various stages of phonological development moving towards deep phonemic awareness as follows:

1. Recognition that sentences are made up of words.
2. Recognition that words can rhyme.
3. Recognition that words can be broken down into syllables.
4. Recognition that words can be broken down into onset and rimes.
5. Recognition that words can begin with the same sound.
6. Recognition that words can end with the same sound.
7. Recognition that words can have the same medial sound.
8. Recognition that words can be broken down into individual phonemes.
9. Recognition that sounds can be deleted from words to make new words.
10. Ability to blend sounds to make words.
11. Ability to segment words into constituent sounds.

Complex phonological skills are reported to emerge only after 5 to 6 years of age (Liberman et al., 1974). Liberman, Mattingly and Shankweiler (1980) reported that segmentation of words into syllables is achieved at the age of four, five and six years. A supporting study by Liberman and Shankweiler (1985) revealed that in the group of four year old children, none could segment by phoneme whereas about 50% could segment by syllables; in the group of five year olds, 17% could segment by phonemes and about 50% would do so by syllable and in the six year old children, 70% would segment by phoneme and 90% by syllable. Thus, there is a continuum from simple to complex in the development of phonological skills.

Development of Semantic Awareness

Metasemantic knowledge evolves slowly over the school years. Children come to understand that words are basic units of the language system and that the relationship between the phonological constituents of words and their referents are arbitrary (Bowey & Tunmer, 1984; Homer & Olson, 1999). By age ten, children acquire a clear understanding of the use of the term word. At this age, children are able to provide formal definitions of words through the use of the copula and a superordinate relative clause (e.g., “a bird is a kind of animal that likes to fly”) (Snow, Cancini, Gonzales, & Shriberg, 1989; Snow, 1990; Kurland & Snow, 1997). Defining words in this manner is a regular part of classroom discourse, and the skill in producing formal definitions is positively correlated with overall language and reading ability (Snow et al., 1989; Tabors, Snow, & Dickinson, 2001).

Development of Syntactic Awareness

Syntactic awareness refers to the ability to understand the grammatical structures of language within sentences (Tunmer & Hoover, 1992) as well as the ability to "reflect on the syntactic structure of language and regard it objectively and separately from the meaning conveyed by language" (Blackmore et al., 1995). Based on the "Cognitive Phase Model" proposed by Karmiloff-Smith (1986), Gombert (1992) postulates a model with four successive phases to explain children's metalinguistic development. The first level involves the acquisition of tacit knowledge of syntactic and grammatical rules related to word strings or sentences. Level 2 refers to the ability to manipulate the internal grammatical structure of sentences. Level 3 is determined by the ability to formulate the rules of syntax and to identify what the rules are. Level 4 involves the ability to intentionally control and reflect upon one's knowledge of syntactic rules or one's performance on tasks testing syntactic knowledge (Layton, Robinson & Lawson, 1998).

The following is a summary of the four phases proposed by Gombert (1992):

The acquisition of the first linguistic skills: The first phase is obligatory in character. A child's earliest linguistic skills are fundamentally established on the adults' model. A particular linguistic form and the pragmatic context in which the form has been positively reinforced will be stored in memory. The child's use of a linguistic form is similar to that of the adults at the end of this phase. This is the beginning level of automation of

linguistic behaviour. The increased length and complexity of the adult models and the length of the child's own productions will trigger the next phase.

The acquisition of epilinguistic (episyntactic) control: The second phase is also obligatory and involves an organization of the implicit knowledge accumulated in the first phase. In this phase, there is not just an internal organization of the acquired knowledge but also the creation of links. These links are associations of previous knowledge with new knowledge regarding the same linguistic forms or forms that are related to those in the course of being organized. The new knowledge acquired is attributed to the enrichment of the adults' models and the child's active linguistic processing. Thus, the general process at work is an internal linking of the implicit knowledge that leads to an unreflected awareness of a system. As a system of rules governing the use of linguistic forms is established, the child gradually masters the skills to refer implicitly to a prototypical context as this phase develops. The context associated with each linguistic form can serve as a pragmatic reference point when an unfamiliar context is introduced. Nevertheless, the consciousness of the system of rules has not developed. Fresh external stimuli are necessary to have the consciousness gained.

The acquisition of metalinguistic (metasyntactic) awareness: The third phase is non-obligatory in nature as it is not decided by maturational factors but external factors, such as reading and writing (that necessitates the conscious control of many aspects of language), to bring the stable epilinguistic (episyntactic) control to consciousness.

The automation of the metaprocesses: Metaprocesses are cognitive processes which are accessible to the consciousness (Gombert, 1992). Those metalinguistic (metasyntactic) functions whose use has been frequently effective become automated.

According to Van Kleeck (1994), being conscious of the rule-governed nature of language, can make communication more effective. It is reasoned that a child with enhanced knowledge of language structure is likely to be more capable of detecting and repairing errors made in conversation. With this awareness, the child is able to monitor not only his/her own speech but also others'. The ability to self-monitor and adjust to the listener will probably make the child's communication more effective (Van Kleeck, 1994).

The ability to make grammaticality judgments is of particular interest because it seems to develop well after children have internalized basic grammatical information and is one of an ensemble of metalinguistic skills required for early reading acquisition. Some investigators generally believe that the ability to make grammaticality judgments is a measure of syntactic awareness, which aids in reading comprehension for the young reader. Bowey (1994) recommended that the best way to assess grammatical awareness is when “the intended meaning of the sentence is obvious but where the grammatical means used to express that meaning is deviant. In such cases, error correction reflects children’s capacity to reflect on and manipulate grammatical well-formedness”.

Metasyntactic awareness is sometimes assumed to underlie children’s ability to correct syntactic errors. Five-year-old children can correct ungrammatical sentences, but

often their corrections reflect their propensity to correct the deviant semantic meaning created by the syntactic errors. When young children are asked to correct the syntax, but not the semantic meaning, of sentences that are both syntactically and semantically deviant (e.g., the baby eated the typewriter), their rates of failure are relatively high (Bialystok, 1986). Metasyntactic awareness also includes an understanding of syntactic structure. In reviewing the evidence on metasyntactic development, including a classic cross-cultural study by Scribner and Cole (1981), Gombert (1992) argued that explicit syntactic awareness comes only through formal education in literacy skills.

Many investigators have commented on the pros and cons of judgement and revision tasks while addressing children's syntactic awareness (Pratt et al., 1984; Gombert, 1992; Blackmore et at., 1995). There is a likelihood of a response bias in a judgement task and it is often difficult to justify the basis on which children make judgements. Conversely, a correction task requires a higher level of processing capacity than judgement tasks (as it requires the subject to hold the sentence in working memory and articulate the response) and a failure to revise ungrammatical sentences does not necessarily mean a lack of syntactic awareness (Blackmore et al., 1995). The findings in this study clearly support that a judgement task is easier than a revision task due to the differences in task demands. Both tasks, however, are equally good at unveiling patterns of metasyntactic development as the scores in both tasks are positively correlated. Some three years old scored higher in the judgement than the revision task. Thus, the judgement task, with less task demands, seemed more appealing to tap the syntactic awareness of very young children. In this study, a word order revision task was able to capture the

partially-developing nature of metasyntactic growth of the five years old. Consequently, it was recommended that both tasks should be included experimentally to trace the pattern of metasyntactic development provided that instructions, practice trials and the type of response sets are carefully planned.

Cairns, Waltzman and Schlisselberg (2004) argued that the ability to detect the ambiguity of sentences (which develops at later ages than the judgment/correction skill) reflects the child's ability to recruit psycholinguistic processes to both initially process and reprocess sentences. Thus, the three metalinguistic abilities of grammatical judgment, correction and ambiguity detection are arguably ramifications of children's maturing linguistic representations and the psycholinguistic abilities that are required for the children to manipulate those representations and to verbalize their psycholinguistic intuitions (Cairns et al., 2006).

Cairns et al. (2006) hypothesized a developmental progression in psycholinguistic processing operations, beginning with those required to correctly judge well-formed and ill-formed sentences, going on to those involved in correcting ungrammatical sentences, and, finally, to those required for the detection of structural ambiguity. They believe that these metalinguistic skills are predictors of early reading ability because the same psycholinguistic processing operations are recruited for both. The results of their study revealed that 5-year-olds begin to make the discriminations that reflect their developing psycholinguistic abilities (judgement tasks) while the sophisticated ability to correct ungrammatical sentences develops by 6 years.

Metalinguistic Abilities in Children with Language Impairments

There have been several studies documenting the metalinguistic abilities in children with various language impairments. Mattingly (1972), Tunmer and Bowey (1980), Hodgson (1992) and others emphasize that the metalinguistic processes, specially the metaphonological skills need to be paid more attention to in the identification and management of reading disabled children. Children with language impairments have been reported to show deficits in phonological awareness beginning in preschool (Kamhi, Lee & Nelson, 1985; Boudreau & Hedberg, 1999).

Menyuk (1993) reported that a group of children with specific language impairment (SLI) who presented both metalinguistic difficulties and general metaprocessing difficulties which retarded their development. On the other hand, another group of children with SLI showed differences in the patterns of development and language behavior, and their difficulties were mostly metalinguistic, not general metaprocessing difficulties.

Menyuk, Chesnick, Liebergott, Korngold, D'Agostino and Belanger (1991) compared the metalinguistic abilities in children labelled as SLI and those of normally developing and at risk children. They reported that some SLI and some at risk children clustered together in these abilities but that, although some at risk children performed significantly more poorly than their normally developing age peers, they did significantly

better than did the SLI children. A comparison of the metalinguistic skills of the three language ability groups in all the areas showed that the SLI group was most different in pattern of development of semantax and phonology (Chesnick, Menyuk, D'Agostino & Belanger, 1992).

Lewis, Murdoch and Woodyatt (2007) studied the communicative competence and metalinguistic abilities in children and adults with autism spectrum disorder using The Test of Language Competence-Expanded Edition (TLC-E) (Wiig & Secord, 1989). The findings revealed that children with ASD were less skilled on tasks of resolving ambiguity, understanding inferential language, and using linguistic flexibility to produce speech acts constrained by a communicative situation while adults with the same diagnosis presented with difficulties in interpreting figurative language and producing relevant speech acts.

'Dyslexia' is a generic term that has come to refer to an extraordinary difficulty experienced by otherwise normal children in learning to identify printed words, presumably as a result of constitutional deficiencies (Vellutino, 1979). Developmental dyslexia is a term used to define individuals with lower reading ability than their developmental peers despite normal intelligence and adequate educational provision (Rutter & Yule, 1975). Developmental dyslexia is a specific disability in reading that is neurobiological in origin (Lyon, Shaywitz & Shaywitz, 2003), has a high rate of inheritability (Pennington & Olson, 2005) and is not related to overall cognitive ability,

lack of exposure to reading, or other extraneous factors such as sensory acuity deficits or emotional disturbance (Vellutino, Fletcher, Snowling & Scanlon, 2004).

It has been reported that dyslexics appeared to be primarily impaired in phonological and orthographic processing, rapid automatized naming, and executive functions but to have intact oral language skills for morphology and syntax, that is, good metalinguistic awareness at those levels of language (Berninger, 2006). However, the language learning disabled (Wallach & Butler, 1994; Butler & Silliman, 2002) children appeared to be impaired in oral language skills, phonological skills and reading comprehension than the dyslexics. Their impaired metalinguistic awareness of morphology and syntax was accounted for the lower verbal IQs. Siegel and Ryan (1988) reported that reading disabled children scored lower on measures of syntactic awareness than age-matched normal readers.

Kamhi at al. (1985) examined metalinguistic awareness of words, syllables and sounds in fifteen language disordered children, fifteen typically developing children matched for mental age, and fifteen chronologically age-matched children. Results indicated that 5- and 6- year-old children with language disorders lacked metalinguistic awareness of words, syllables and sounds and did not perform as well as younger mental age-matched children, placing them at risk for difficulty in learning to read, write and spell.

Poor metalinguistic awareness has also been demonstrated in other aspects of language. Children with language disorders have shown a lack of syntactic awareness (Nation & Snowling, 2000) and morphological awareness (Carlisle, 1987; Rubin, Patterson & Kantor, 1991). Carlisle (1987) demonstrated that students in the ninth grade diagnosed with a specific learning disability in reading and spelling had difficulty completing an orally presented metalinguistic task that involved producing a derived form and performed like typically developing younger students (e.g., "Warm. He chose the jacket for its _____").

Metalinguistics and Literacy Skills

Oral language is the foundation on which literary skills initially build. Between early developing oral language skills and fluent reading comprehension emerge several types of metalinguistic ability, including phonological and morphological awareness. Specifically, phonological awareness and morphological awareness have been established as valid indicators of later reading ability. Both phonological awareness and morphological awareness are thought to represent different levels of metalinguistic knowledge, with morphological awareness being more advanced (Deacon & Kirby, 2004).

Many years since, the relationship between metalinguistic awareness and reading was assumed to be unidirectional. But it seems too simplistic to argue that language deficit and the inability to reflect consciously on language forms even after these forms have been acquired is totally responsible for all the reading difficulties of children. In

recent years, the nature of relationship is recognised as reciprocal. Hence, difficulties in reading could also cause higher level language problems. This suggests that clinical objectives for preschool and school aged language disordered children should include not only the usual comprehension, production and conversational objectives but metalinguistic objectives as well, in particular, those that target word, syllable and sound awareness in both assessment and remedial programmes.

Tunmer and Cole (1985) suggest a hierarchical relationship between metalinguistic awareness and reading. Reading requires that children apply their knowledge of oral language to textual material. They argue that this must initially occur at the word level. The child's first task when learning to read is to recognise that one specific spoken word corresponds to one written word. Thus, word awareness is fundamental to the task of reading. Phonological awareness assists in the ability to decode text. In order to develop automaticity in reading, children must "crack" the orthographic code by relating phonemes to graphemes. Development of an understanding of grapheme-phoneme correspondence requires phonological awareness. Following development of decoding skills, students require higher-order, metacognitive knowledge to aid comprehension. Thus, form awareness is necessary to interpret linguistic information once it has been decoded from text. Pragmatic awareness does not appear to be particularly related to reading (Tunmer et al., 1988).

This analysis suggests that three components of metalinguistic awareness are necessary, although not sufficient conditions for proficiency in reading. Furthermore, the

components are hierarchically organised so that each builds on competencies developed at an earlier stage. Thus, in initially learning to read, word and phonological awareness are critical skills.

Reading

Reading is a complex process. It involves a number of components that in the skilled reader work together in a seamless fashion, so much so that written text appears to convey meaning almost automatically. Reading is a secondary language system which is built upon vital oral language learning that occurs in early childhood through such activities as conversing, listening to and telling stories, singing songs, and engaging in imaginative play. It is a complex activity involving many different processes. Catts and Kamhi (1986) define reading as a "cognitive process by which one derives meaning from printed symbols". There are two basic components involved in reading- word recognition (decoding) and comprehension. Reading is defined as decoding ability, the skill of transforming printed words into spoken words. Reading is also defined as comprehension skill in that reading is thinking guided by print (Perfetti, 1986). Jackson and Coltheart (2001) defined reading as a cognitive activity that is accomplished by a mental information processing system that is made up of a number of distinct processing subsystems.

Reading comprehension depends on metalinguistic awareness because understanding text requires attention to its linguistic form (Nagy, 2007). However, most

researchers agree that the key components of reading comprehension include phonological processing of letters and the sounds that they represent, word retrieval, use of the grammatical structure of language to understand and predict upcoming information in sentences, and discourse processing to organize and construct interpretations of information contained in longer passages (Snyder & Downey, 1991).

Understanding of how all these parameters are related to early language development requires some basic language concepts that need to be established. Miller (1990) divides language into two different levels (Level I and Level II). Level I contain such basic language components as semantics (word meanings), syntax (grammar), morphology (word forms), phonology (sound system) and pragmatics (functions of language). It is competence with these components that enables a child to understand and speak in clearly articulated, meaningful, grammatically correct sentences that are situation-appropriate. Children typically acquire this ability by the time they are three or four years old through interactions that occur naturally in their environments. This basic competence with language enables a child to access word meanings and use sentence structure to predict upcoming words when reading. However, it appears that while these abilities are necessary to learn to read, they are not sufficient. In order to become a competent reader a child must develop proficiency with the higher order language processes (Level II), which includes metalinguistic awareness and discourse knowledge. It is competence with this level of language that allows a child to develop sound-symbol associations and engage in higher levels of organization, prediction and interpretation when reading.

Components of Skilled Reading

The following components are often listed as important for skilled reading:

- Detection of visual features of letters leading to letter recognition
- Knowledge of the grapheme-phoneme correspondence rules
- Word recognition
- Semantic knowledge
- Comprehension, interpretation

A distinction is made between normal language processing and a meta-linguistic ability to manipulate the language for, among others, the purposes of reading and writing. Normal language processing is the expected outcome of acquiring a native language. Metalinguistic skills for the purposes of reading and writing are a prerequisite for and/or a product of successful literacy learning and/or acquisition and probably in some way (causally or epiphenomenally) underlie beginning reading. Possibly, they can be taught for effective pre-reading and remedial reading instruction (Jannuzi, 1998).

True metalinguistic awareness requires that knowledge of the language system be explicit. For example, Bialystok (1991) found that non-reading preschool children who knew the letters of the alphabet and who knew the sounds associated with them had no explicit knowledge that the letters represented the sounds, and thus did not have true metalinguistic awareness.

Phonological awareness is necessary and critical for reading acquisition. It lays the foundation for students' expectations about the sound structure in words, including sequence of letters and phoneme and the discrete word specific characteristics that distinguish one word from another (Vellutino & Scanlon, 1987; Adams, 1990; Liberman & Shankweiler, 1991; Ball & Blachman, 1991).

Historically, dyslexia was thought to be caused by deficits in visual-perceptual processing, with spontaneous letter reversals being a classic example (e.g., treating a /b/ as a /d/ and a /w/ as a /m/). Currently, however, visual-perceptual deficits are felt to play only a very minor role in dyslexia (Fletcher, Foorman, Shaywitz, & Shaywitz, 1999); the dominant view is that dyslexia is a language-specific disorder, characterized by marked deficits in linguistic processing (Morrison, 1993; Shankweiler, 1999; Stanovich, 1993, 2000). Although there is no consensus as to whether dyslexia is a single disorder or a cluster of related disorders (dyslexias), it is clear that dyslexic children have significantly more problems in phonological processing than children of average reading abilities. For example, children with dyslexia perform poorly in segmenting words, in naming, and in phonological short-term memory tasks (Stanovich, 1993).

The findings of the study by Alexander, Anderson, Heilman, Voeller and Torgesen, (1991) strongly suggested that children who lack phonemic awareness skill as a precursor to learning to read were at risk of developing reading disabilities and required explicit instruction in phonemic awareness if they were to become skilled readers and

spellers. Hatcher, Hulme and Ellis (1994) proposed the phonological linkage hypothesis in which children make optimal progress in reading when explicit links are formed between their underlying phonological awareness and their experiences in learning to read. The above studies suggest that there exists a strong connection between phonological awareness and reading. Research has shown that phonemic awareness, a crucial part of phonological awareness is both a prerequisite and a consequence of learning to read.

Muter and Snowling (1998) reported that phoneme awareness was found to be a very powerful predictor of reading accuracy, both in the short term (the first year at school) and in the long term (at age 9). A phoneme awareness task given at age 9 was a statistically significantly better predictor of concurrent reading accuracy than was a test of rhyme discrimination. Furthermore, a test of phoneme deletion given at ages 5 and 6 statistically significantly predicted reading accuracy at age 9 and was also successful in discriminating good from poor readers on long-term follow-up.

Muter and Snowling (1998) reported that the two best long-term predictors of reading accuracy at age 9 were the phoneme deletion and nonword repetition measures obtained at ages 5 and 6. This finding was consistent with the idea that reading skill is strongly related to the integrity of underlying phonological representations that are, in turn, most sensitively tapped by tests of phonemic processing, nonword repetition, and speech rate (Snowling & Hulme, 1994). The authors also reported that in addition to measures of phoneme awareness, an important concurrent predictor of reading accuracy

in middle childhood was found to be grammatical awareness. This was in agreement with the findings of Tunmer (1989) who also showed that both phonological and syntactic awareness makes statistically significant and unique contributions to reading skill. Their findings supported Tunmer's (1989) claim that syntactic factors interact with decoding ability to increase word identification skills. This may be particularly true of older children who have moved beyond single word decoding of simple text toward an increasing appreciation of the value of content and context cues contained in more complex reading materials.

The principle of being focused on meaning is also clear in the way good readers read. Skilful readers pay no conscious attentions to the way words are written - they do not sound out each word or dissect the composition of a paragraph. Rather, they are interested only in gaining an understanding of the writer's message. However, there are times when even proficient readers make use of metalinguistic skills. This is most evident when confronted with the learning of a new skill. For instance, reading a technical manual about computers - or any task where the language is difficult or unfamiliar. Students with language impairment generally have poor metalinguistic skills, and are at a considerable disadvantage when they reach the middle primary years. After grade 4 students shift from learning to read to reading to learn. That is, students begin learning from more expository (non-fiction) text where language is far more decontextualized (Wallach, 2007).

Although metasyntactic awareness has been studied less frequently than other metalinguistic skills, a number of studies have demonstrated the connection between metasyntactic judgments and the development of reading. These studies have shown that grammatical judgments are a predictor of reading ability (Bohannon, Warren-Leubecker, & Hepler, 1984; Pratt et al., 1984; Tunmer et al., 1988; Bentin et al., 1990; Dermont & Gombert, 1996; Nation & Snowling, 2000) and reading comprehension in particular (Cairns et al., 2006). Some investigators (Grieve, Tunmer & Pratt, 1983; Gombert, 1992; Van Kleeck, 1994) agree that syntactic awareness is important for learning to read and write. Thus, promoting children's acquisition of syntactic awareness is beneficial to children's literacy achievement.

Bentin et al. (1990) sought to examine the relationship between reading ability and syntactic awareness in children (native speakers of Hebrew) who differ in reading competence. Unlike the vast majority of previous studies (Byrne, 1981a, 1981b; Stein, Cairns & Zurif, 1984; Bowey, 1986a, 1986b; Menyuk et al., 1991; Scarborough, 1998; Waltzman & Cairns, 2000), auditory rather than written stimuli were used. The groups consisted of severely reading impaired children and unimpaired good and poor readers in the fourth grade. The results indicate that the difference between the correct identification of syntactically deviant and syntactically accurate sentences was smaller in the group of children with severe reading disability than in either good readers or relatively poor readers. Good as well as poor readers performed better than the reading disabled children in the judgement task.

According to Bentin et al. (1990) this apparent inferiority of the latter group cannot be explained only by a reduction of the participants' short term memory span because

1. Very short and simple sentences (three or four words) were used
2. When tested formally, all the children repeated sentences verbatim without any problem and
3. The nature of the stimuli in question did not involve "the manipulation of subtle syntactic aspects" but rather included straightforward syntactic violations of the subject predicate relation and word order.

They argue that inadequate phonological processing does not justify and explain all aspects of poor reading since in their study, poor readers were nevertheless good decoders. The linguistic deficiency in these children is thus ascribed to syntax rather than phonology.

Tunmer, Nesdale and Wright (1987) compared good, younger readers (in grade two) to poor, older readers (in grade four) on four measures of reading ability (real word recognition, pseudo-word naming, reading fluency and reading comprehension) as well as verbal intelligence. Tunmer et al. (1987) hypothesized that syntactic awareness is causally associated with learning to read in two ways:

1. Syntactic awareness may significantly aid the child in acquiring phonological recoding, which is understood as the ability to translate letters into phonological form. This skill may enable beginning readers to recognize new words, develop "speed and automaticity" in visual word recognition and indirectly support

comprehension. Also, children with good syntactic awareness might try out different pronunciations of words in which a single letter sequence is associated with more than one pronunciation; in this way, children come to learn about complex relationships between orthographic patterns and pronunciations.

2. It is plausible that syntactic awareness enables beginning readers to monitor their comprehension processes more efficiently. This allows them to check on the meanings of words they encounter by reference to surrounding grammatical context, and to make intelligent and informed guesses about word pronunciations.

The results of Tunmer et al. (1987) indicate that good, younger readers scored significantly better than poor, older readers on two tests of syntactic awareness, the oral cloze task and oral correction task. This further suggests that the older, unskilled readers were "developmentally delayed" in syntactic awareness and that this delay may have altered reading development. Compatible with this interpretation are the subsequent findings that the two measures of syntactic awareness varied with reading level at each grade: the better readers of each grade scored better on syntactic awareness tasks than the poor readers. In Tunmer et al.'s (1987) view, it is the combination of both results, the higher performance of the good, young readers and the differences among the "chronological age matches" that points to a causal link between syntactic awareness and reading acquisition.

Furthermore, in a longitudinal study, Tunmer (1989) administered tests of verbal ability, phonological and syntactic awareness, and reading to 100 six year old children, at

the end of first grade and again a year later. The results demonstrated that both phonological and syntactic awareness influenced reading comprehension through phonological recoding (as measured by a nonword reading test).

Bowey (1986b) investigated the development of metasyntactic skill (e.g. children's ability to correct grammatically incorrect sentences) and its relation to reading achievement and found that performance on a syntactic awareness task was correlated with measures of reading comprehension and comprehension monitoring, even after general verbal ability effects were controlled. Bowey (1986b) concluded that less skilled readers have a delay in their syntactic and grammatical development and this adversely affects their monitoring of ongoing comprehension processes. In addition, Willows and Ryan (1986) showed that children become increasingly sensitive to semantic and syntactic features in reading tasks from Grades 1 through 3. This suggests that children need to have syntactic skills sufficiently refined to enable them to make sense of contextual cues as they proceed from early single word decoding to the mastery of more complex text.

Writing

Orthography (or a writing system) is a graphic representation of language. Spoken language has two dimensions – sound and meaning. A writing system theoretically can serve as a representative of language at phoneme, consonant, vowel syllable level of its sounds; or at morpheme word level of meaning.

Taxonomically, writing systems can be classified into three types based on their levels of representation.

1. Ideography language: e.g. Chinese script represents the language at the level of morpheme.
2. Syllabary language: e.g. Japanese Kana represents the language at the level of syllables.
3. Alphabetic language: e.g. Roman scripts represent the language at the level of phonemes.

Since there are variations in writing systems, reading a particular type of script requires accessing the text to the level of representation encoded in the print with regard to orthographic characteristics. It is generally assumed that the alphabetic scripts put the heaviest demand, ideographic the least and the syllabary poses optimal level of demand. The match between writing system and language ensures degree of efficiency for the reading and writing process (Katz & Frost, 1992).

Writing and reading are inextricably linked, and both influence and are influenced by the child's ongoing language development and metalinguistic knowledge (Perera, 1986; Adams, Treiman & Pressley, 1998). The grapheme-phoneme correspondence rules that must be learned in order to read are the same rules that must be learned in order to spell conventionally. Skill in writing develops slowly in most children and adolescents

and reaches maturity only in adulthood, and then only in some writers (Applebee, Langer, Mullis, & Jenkins, 1990; Bartlett, 2003).

Written language is usually seen as secondary to spoken language and one would expect any deficits in syntax to manifest in written language learning also. However, it is possible that there may be subtle difficulties in being sensitive to syntax and syntactic development is not totally complete when the child learns to read. Also, that the reading disabled child's profile of deficits changes over time perhaps reflecting the persistent influence of the presumed limitation on the child's responses to a succession of developmental challenges. Hence, the causal role of such deficits would be more difficult to demonstrate because they could easily be secondary results of a reading disability. The diverse opinion that exists on the relation between syntax and reading may be summarized as follows:

1. Differences in syntactic skills are found between young 'high-risk' and 'non-risk' children. It appears that syntactic deficit predates reading problem.
2. Differences in syntactic skills between good and poor readers do not seem to disappear with maturation.
3. Attempts to decrease the impact of syntactic deficit through training have not altered the reading retardation.

A longitudinal study also found that grammatical ability correlated highly with spelling ability (Muter & Snowling, 1997). In addition, grammatical ability significantly predicted performance on an orthographic choice task in which the child decided which

word was orthographically correct (e.g. dreem versus dream). Consequently, Muter and Snowling (1997) argue that grammatical skills are important in developing orthographic proficiency and consequently, may enhance spelling skills.

Because reading disabled children have deficits in the language subsystems of phonology and syntax, it seems reasonable to predict that their semantic system would be similarly deficient. In relation to aspects of semantic processes, Goodman (1969), Smith (1971) and Kolers (1975) argue that phonological or articulatory mediation i.e., translating the visual input into a sound or speech based code is an unnecessary component of reading and that poor readers have difficulty with reading because they tend to use this kind of strategy.

Bilingualism and Metalinguistics

Another major language related factor that complicates the issue of Learning Disability is bilingualism/multilingualism. Children whose mother tongue differs from that used at school have the additional burden of learning to cope with the linguistic differences in the school environment adding to their learning difficulties particularly in the early school years.

As first-language metalinguistic awareness is established, bilingual readers can automatically activate and apply this skill to reading in their second language.

Metalinguistic awareness entails the ability to compare and contrast two language systems to discover commonalities as well as differences.

The progression in metalinguistic awareness and transfer from L1 to L2 proceeds from implicit understanding and unarticulated knowledge through non-structured experiences toward explicit understanding and articulated knowledge through structured experiences such as direct instruction in transference knowledge and skills. This explicit knowledge formation in turn results in increases in students' self-regulatory control and enhanced language use in cognitive performance on literacy tasks (Mora, 2001).

Studies have demonstrated that children's performance in various phonological awareness tasks is strongly related to the acquisition of reading skills in English (Bradley & Bryant, 1985; Tunmer & Nesdale, 1986), Italian (Cossu, Shankweiler, Liberman, Katz & Tola, 1988), French (Bertelson, Morais, Alegria & Content, 1985), Spanish (deManrique & Gramigna, 1984) and Hebrew (Bentin & Leshem, 1993).

Bilingualism, which has been shown to affect metalinguistic abilities, influences reading performance via these abilities. The consensus in the field is that learning a second language permits children to view their language as one system among others, thereby enhancing their linguistic awareness. It is believed that the systematic separation of form and meaning that is experienced in early bilingualism gives children added control of language processing. The general pattern of the effects of bilingualism is as follows: bilinguals achieve higher scores than monolinguals on tests of arbitrariness

(Ben-Zeev, 1977; Edwards & Christofersen, 1988) and phonological awareness (Dash & Mishra, 1992), and lower scores than monolinguals on tests of vocabulary size (Doyle, Champagne & Segalowitz, 1978).

A theory of L2 language acquisition that informs literacy instruction for teachers of bilingual learners is the cross-linguistic transfer hypothesis (Odlin, 1989; Hornberger, 1994; Koda, 1997; Bialystok, 2007). This theory posits that knowledge is transferred from the learners' first language into the performance of cognitive and linguistic tasks in the second language. The cross-linguistic hypothesis suggests that the greater the similarity in the writing systems of the two languages, the greater the degree of transfer, thus reducing the time and difficulties involved in learning to read and write the second language (Odlin, 1989).

Literature provides to educators a description of the domains of knowledge and reading processes where transfer occurs that facilitates and supports students' skills in reading and writing in both L1 and L2 (Bialystok, 2007). Metalinguistic transfer is the application of particular metalinguistic awareness and knowledge acquired in students' L1 to speaking, reading and writing in their L2 English. In bilingual learners, Koda (2008) proposed a "Transfer facilitation model" based on the research findings that reading skills transfer across languages. Children are sensitive to the regularities of spoken language as they develop oral language skills. Since all writing systems are structured to capture and represent these regularities, learning to read involves mapping spoken language elements onto the graphic symbols of the language of the text.

Metalinguistic awareness enables learners to analyze spoken words into their constituent parts. This process becomes more explicit with increasing experiences with print.

Bilingual children also outperform monolingual children on some metalinguistic and emergent literacy tasks (Bialystok, Shenfield, & Codd, 2000; Bialystok, 2001a, 2001b). For example, they learn at an early age about the arbitrary relation between words and their referents (Reynolds, 1991).

Western vs. Indian Context

Studies in the Western countries present an intimate and intricate kind of relationship between literacy acquisition and phonemic awareness (Bradley & Bryant, 1983; Bertelson et al., 1985). However, recent studies suggest that phonemic awareness may not be so crucial in learning to read and write nonalphabetic scripts (Morais, 1991a, Morais, 1991b).

Research in Indian languages has been scarce and fragmentary. The Indian studies have focussed on issues such as, distinctive features of Kannada alphabet (Purushothama, Jagadish & Kumar, 1986), sound and syllable distribution in written Kannada (Jayaram, 1986), reading and writing errors in children learning Indian languages (Pathak, 1988; Purushothama, 1988), metalinguistic abilities in literate and illiterate adults (Karanth, Kuduva & Vijayan, 1995) and school children (Patel & Soper, 1987; Mohanty & Goel, 1990; Chandrika, 1990; Prakash, Rekha, Nigam & Karanth, 1993; Sunitha, 1995; Rekha,

1996, Karanth & Prakash, 1996) and evaluation and instructional processes (Srivastava, 1979; Ramaa, 1985). Beginning in the early 1980's, there has been a spurt of research on acquisition of reading and reading disorders in a few Indian languages and scripts.

The Indian orthography is derived from Brahmi which is said to be semisyllabic in nature having a transparent orthography. It does not strictly fall into any of the classifications proposed. Rather, it represents a mixture of syllabic and alphabetic principles. The letters are expressed in syllabic units wherein, each syllable form can be analysed into its consonant and vowel components. Kannada, one of the major Dravidian languages, has an orthographic structure comparable to other Indian scripts. It has 50 basic letter symbols which are arranged in phonetic manner like other Indian scripts. Karanth (1981, 1985), Purushothama (1988), Prakash and Joshi (1989) have described the orthographic features of Kannada script with reference to reading.

Purushothama et al. (1986) list the 'distinctive features' of Kannada alphabet, while Prakash and Joshi (1989) list the 'contrast features' of Kannada orthography. There is a wide acceptance that the Kannada script which, like other Indian scripts originated from Brahmi, is a mixture of syllabic and alphabetic principles. There is almost one to one graphophonological equivalence expressed in the syllable structure excepting the 'Arka' and 'Anuswara' which function as phonemes with independent graphemic status. Also because homonyms in Kannada are both homophones and homographs, homophone- homograph dissociation does not exist. Hence it is called Alphabetic syllabary or Syllabi alphabetic. This semi-syllabic system which has special features of

syllabic and alphabetic scripts with specific diacritic marks to denote phoneme-changes and the presence of distinct graphemes to represent the allomorphs provides a new dimension to the study of reading acquisition.

Metalinguistic skills in semi-syllabic scripts

In the late 1980's and early 1990"s, the focus of Indian studies shifted from script features to the metaphonological skills and reading abilities. The results of these studies contradicted the hitherto accepted notion that metaphonological abilities are prerequisites for acquisition of reading. The reports are unequivocal on the importance of script specific features and the instructional methods in learning to read a non-alphabetic script (Prakash et al. 1993; Prakash, 1987; Patel & Soper, 1987; Rekha, 1987, 1996; Sunitha, 1995; Anitha, 1995). Evidence from studies on adult literates/illiterates support the premise that knowledge of script influences acquisition of metaphonological skills. Prakash et al. (1993), investigated the metaphonological abilities whereas Karanth and Suchitra (1993), the grammaticality judgement abilities of adult literates and illiterates. Their reports clearly indicate that acquisition of reading (literacy) itself facilitates metaphonological and metasyntactic abilities, rather metalinguistic abilities.

The contribution of rhymes in learning to read nonalphabetic Indian scripts at different stages of acquisition is yet to be recorded authentically. Prakash (1999) and Prakash, Chandana and Suma (2001) investigated the role of knowledge of orthographic principle in reading Kannada and found that the dyslexic children in Kannada were very

poor on their orthographic awareness. They seemed to have a very poor mental representation of how phonology and orthography are interrelated and expressed in the script. There was a tremendous improvement in their reading performance when given training in the form of language games that would foster such awareness; thus leading to the speculation that 'as phoneme awareness is to alphabetic scripts, *aksar awareness* (not mere letter recognition) is to Indian scripts'.

A study by Prakash (2002) revealed that phonemic awareness is more a consequence of exposure to alphabetic literacy rather than a prerequisite to learning to read and write alphabetically in a convincing manner. The development of phonemic awareness in children learning to read and write in a nonalphabetic milieu is greatly influenced by alphabetic like features present in the orthography. A rhyme, a macro level of phonological awareness, is more associated with syllable awareness than with phonemic awareness in Kannada (Prakash, 2002). Different levels of phonological awareness (such as rhymes, rimes and phonemes) have been found to be important in alphabetic scripts depending on their transparency or opacity (Goswami, 1999).

The data on children acquiring literacy in Kannada (a semi-syllabic Indo-Dravidian script) suggests that the optimal unit for beginners is the syllable, although more proficient readers/spellers can also manipulate phonemes (Padakannaya, Rekha, Vaid & Joshi, 2002). Also, from a longitudinal study of Brazilian children learning to read Portugese, Cardoso-Martins (2001) concluded that children do not begin at the grapheme–phoneme level unless explicitly instructed in phonemic awareness. Liow and Lee (2004) successfully tapped metalinguistic awareness using a spelling task in Malay,

which follows an alphabetic- syllabic script and showed that syllables and affixes were more salient than phonemes for young Malay children.

In the area of basic reading skills, it has been found that young bilingual children can transfer specific types of reading related skills such as phonological skills (phonological awareness and decoding) and word identification skills from one language to another. It is important to note that cross-linguistic studies provide evidence for the positive transfer of phonological processing skills and word recognition ability not only between languages sharing the Latin alphabet as in the case of Spanish and English, but also between languages belonging to different linguistic families with distinct orthographies (e.g., Hebrew-English, Geva, & Wade-Wooley, 1998; Chinese-English, Gottardo, Yan, Siegel, & Wade-Woolley, 2001; Russian-Hebrew, Schwartz, Leikin & Share, 2005). This suggests that phonological processing skills underlying the development of reading skills represent genuine cross-language ability independent of the specific language spoken by the bilingual children, strongly supporting the central processing hypothesis. According to the central processing hypothesis, the acquisition of reading skills does not depend on the nature of the orthography (Gleitman, 1985). It stresses the role of underlying cognitive processes such as short term memory and naming, and metalinguistic components such as phonological awareness transferring from L1 to L2.

Schwartz, Geva, Share and Leikin (2007) studied the cross linguistic transfer of phonological processing skills in learning to read English as a third language (L1 and L2

being Russian and Hebrew respectively). The results revealed that cross-linguistic transfer of early literacy skills can be found even in the context of different alphabetic orthographies. The authors further reported that the outcomes of the study suggest that the actual mechanism of transfer of early literacy skills across alphabetic orthographies is the interaction between the generalized insight into the alphabetic principle and the specific benefits of knowledge of an orthography characterized by fully-fledged alphabet with letters representing consonants and vowels (i.e. Russian) in the acquisition of the another alphabet such as English.

Schwartz, Leikin, Share, and Kozminsky (2008) speculated that bi-literate bilinguals' superiority in phonological processing and word identification measures might be attributable to an early start in alphabetic code acquisition in L1 and/or to specific meta-linguistic insights developed while learning a specific orthography—Russian. More specifically, in accordance with the "script dependent hypothesis" Schwartz et al. (2008) proposed that specific orthographic and linguistic features of L1 Russian may positively influence reading acquisition in Hebrew (L2).

Prema (1997) studied 150 reading disabled children with the objectives of developing a profile for acquisition of reading and writing, delineating the specifics of reading with respect to the orthographic features of Kannada, identifying predictors of reading ability and identifying reading disabled children. A Linguistic Profile Test was administered comprising items for phonology, syntax and semantics, a metaphonological test with words and non-words, a reading and writing test with hierarchically graded

items, and a reading comprehension test with passages and stories. On the basis of this study, Prema (1997) claimed that research on alphabetic scripts is not wholly applicable to non-alphabetic scripts such as Kannada; reading tests and remedial reading procedures should, therefore, be developed which keep in view the nature of the script. The author also stressed the importance of metalinguistic skills, knowledge of orthographic principles and reading comprehension skills, all of which need to be trained intensively in the early school years. The hierarchy of predictors of reading abilities in Kannada monolingual–monoliterates was found to be metasemantics, metasyntactic and metaphonology.

Ponnumani & Prema (2008) and Shilpashri & Prema (2008) have developed Remediation Manual on metaphonological skills for children with reading disability in Malayalam and Kannada respectively. These manuals were tried out on children with dyslexia by Speech Language Pathologists, teachers and parents and reported to be quite effective in improving phonological skills.

A profile analysis of 60 primary school children by Jayaram (1998) led to the identification of seven categories of children with reading difficulties in the Kannada language. He used a series of tests measuring different factors associated with reading. The categories were:

Category I—General impairment group (21.67%): these were children who exhibited poor performance on five or more tasks out of 14. Their major problems were not in any specific task.

Category II—Cognitive impairment group (3.33%): these were children who had performed very badly only on cognitive tasks.

Category III—Linguistic impairment group (3.33%): these were only those children who performed poorly on linguistic tasks.

Category IV—Phonemic impairment group (11.67%): here, those children having difficulty in phonemic tasks were grouped together. None of the children showed any specific difficulties on syllable rhyme, grammaticality judgement and synonymy judgement tests.

Category V—Metalinguistic impairment group (11.67%): This group consisted of individuals who found difficulty on two or more metalinguistic tasks (related to syllables, phonemes, rhyme, grammaticality and synonymy judgement tasks).

Category VI—Linguistic and metalinguistic impairment group (35%): These children exhibited severe difficulties on both linguistic and metalinguistic tasks.

Category VII—Cognitive and metalinguistic impairment group (8%): This group showed severe problems in cognitive and metalinguistic skills.

As compared to Kannada monolinguals, the bilingual –biliterates who had exposure to the alphabetic script performed significantly better in tasks such as phoneme stripping and phoneme deletion. Prakash and Rekha (1992) documented that children studying in Kannada medium schools showed a spurt in performance on phoneme awareness tasks such as phoneme stripping and phoneme oddity after having been introduced to English language in the fourth grade. They concluded that the difference in

phonemic awareness was due to the orthographic nature of the two scripts with phonemic awareness increasing when introduced to the alphabetic script of English.

Sharma (2000) investigated the language skills of 23 Hindi-speaking children diagnosed as having Learning Disability (LD) using the Hindi version of the Linguistic Profile Test (LPT) (Karanth, Gandhi & Usha, 1984; Sharma, 1995). These children had their mother tongue as well as medium of instruction as Hindi and ranged in age from 7 to 15 years. The results indicated poor performance of children with LD on the LPT, with syntax and semantics affected more than phonology. The older children with LDs performed well on items related to plurals, tenses and case markers but had considerable difficulty with the more complex participial and conditional clauses. Semantic relations such as paradigmatic and syntagmatic relationships, and contiguity were poorly understood by children with LD as compared to their normal peers.

These findings were further replicated by George (2001) on a group of 21 Malayalam-speaking children diagnosed as having Learning Disability (LD). These children had their mother tongue as well as medium of instruction as Malayalam and ranged in age from 6 to 15 years. The findings were similar to that reported by Sharma (2000) and it was further observed that the gap between the chronological age and language age of the children with LD increased with age.

Cutinho (2000) studied the early metalinguistic skills in English in Kannada speaking typically developing children and children with Learning Disability in the age

range of 7-12 years. Two types of tasks were carried out namely the text based (word cover and word circle) and speech based (pre-test word repetition, training phase and post-test word repetition) tasks. The results indicated that older children with LD have definite problems with the understanding of the concept of word, both in text and speech as compared to younger normal children. Also, it was evident that most of the 12 year old LD children had metalinguistic awareness of a 6 year old normal child, thus, adding to the evidence of metalinguistic deficits in children with Learning Disability.

It has been well documented that children with developmental dyslexia have reading as one of their core deficits and various components that are necessary for the acquisition of reading, particularly language, are affected. Studies in the area of metalinguistic abilities in bilingual-biliterate (Kannada and English) children with developmental dyslexia are limited. Further, the relationship between different metalinguistic skills (metasemantics, metasyntax, metaphonology) and reading have not been addressed in this population. Karanth (2008) reported that the emphasis on semantics and syntax would have to be greater in children learning to read the Indian scripts.

The exposure to English as a medium of instruction at school has been reported to foster the metaphonological skills in bilingual biliterate children. Given the findings of Prema (1997) and Karanth (2008), one could expect the skills that contribute to the acquisition of reading and writing skills in bilingual biliterate children to be different from that of monolingual monoliterate children. However, the other components of

metalinguistics have not been studied in this population. On similar lines, the skills that contribute to the acquisition of reading and writing abilities in bilingual-biliterate children with developmental dyslexia may be the same as or different from that of typically developing children.

Thus, it is of interest to study the metalinguistic abilities and thereby its implications for reading and writing in the native language (Kannada) in typically developing Kannada-English bilingual-biliterate children and also children with developmental dyslexia. It would also provide insight into the specific metalinguistic components that contribute significantly to the development of literacy skills in this population, which might have implications in the management of children with developmental dyslexia.

METHOD

The significant role of metalinguistics in the acquisition of literacy skills have been well documented for alphabetic scripts and also syllabic and semi-syllabic scripts. However, most of the investigations in the semi-syllabic scripts in the Indian scenario have been carried out in monolingual-monoliterate children. The reported research on bilingual-biliterate children in the Indian context have most often focused on the influence of the native language on metaphonological skills in the second language i.e. English. The influence of the alphabetic script of English on the metalinguistic abilities and its contributions to reading and writing in the native language having a semi-syllabic script has been sparsely addressed. Thus, the present study was undertaken to address the influence of English on the metalinguistic, reading and writing abilities in Kannada (semi-syllabic script) in typically developing children and also in children with developmental dyslexia.

Aims of the study

The study was undertaken with the following aims:

I. To compare the performance of bilingual- biliterate (Kannada-English) typically developing children and children with developmental dyslexia across the major domains of Metalinguistics, Reading and Writing.

II. To compare the performance of bilingual- biliterate typically developing children and children with developmental dyslexia across the sub-domains of Metalinguistic components, Reading and Writing.

III. To study the correlation of Reading and Writing with the Components of Metalinguistic Skills.

IV. To determine the Metalinguistic Skills that contributes significantly to the acquisition of Reading and Writing abilities in bilingual- biliterate typically developing children and children with developmental dyslexia.

V. To compare the pattern of errors on Metalinguistic, Reading and Writing tasks based on Qualitative Analysis in the two groups of children.

Participants

The participants were classified into experimental and control groups.

Experimental group: A total of twenty children (18 males & 2 females) with developmental dyslexia in the age range of 8-13 years (mean age: 10 years 6 months) constituted the experimental group.

Control group: Equal number of typically developing children (mean age: 9 years 2 months), matched for gender and language age of the subjects in the experimental group constituted the control group.

Subject Selection Criteria

All the participants spoke Kannada as their native language and were studying in schools with English as the medium of instruction. There was no change in the medium of instruction at any time for any of the participants. Participants and/or parents were explained about the purpose of the study and an informed written consent was taken.

Experimental group

- Children in the age range of 8-13 years diagnosed as having developmental dyslexia. The diagnosis of developmental dyslexia was based on the performance in the test of Early Reading Skills (norms developed by Prema & Jayaram, 2002) as assessed by a qualified Speech Language Pathologist and assessment by a Clinical Psychologist.
- Children with developmental dyslexia who have attended therapy for not more than 6 months.
- Children with additional disabilities like ADHD, stuttering, misarticulation or any other neurological deficits were excluded from the study.

Control group

Participants in this group were screened using the WHO Ten Question Disability Screening Checklist (cited in Singhi, Kumar, Prabhjot & Kumar, 2007 - Refer Appendix 1) to rule out:

- Learning disability
- Language deficits
- Delayed speech and language milestones,
- Hearing impairment
- Mental retardation
- Behavioural and emotional disorders
- Neurological deficits.

Procedure

The following tests were carried out individually for all the participants (experimental and control subjects) in a quiet environment (Refer to Table 1).

Table 1: Tests administered on the participants of the study

Tests	Purpose
➢ WHO Ten Question Disability Screening checklist **(**cited in Singhi, Kumar, Prabhjot & Kumar, 2007)	• To rule out any disability in control group • To rule out disabilities in areas other than language in experimental group

➢ Linguistic Profile Test in Kannada (Karanth, 1980)	• To assess the language age, metasemantics and metasyntactic abilities.
➢ Reading Acquisition Profile in Kannada (RAP-K) (Prema, 1997) • Test for Metaphonological skills • Reading Tests • Writing Tests	• To assess the metaphonological, reading and writing skills.

The tests were administered on all the participants by the investigator. The participants in the control group were tested individually in a quiet environment in the school setting and the participants in the experimental group were tested in a quiet environment in the clinical setting. The testing was carried out in 2-3 sittings (on consecutive days) depending on the comfort level of the participants. The total time taken for testing each participant ranged between 2 ½ to 3 hours. The order of the tasks was randomised across subjects and across groups to rule out order effect.

I. Linguistic Profile Test in Kannada

Linguistic Profile Test (LPT) in Kannada was developed by Karanth (1980) for assessment of the phonological, syntactic and the semantic aspects of the Kannada language in children above six years of age and in adults. The LPT has items to test phonemic discrimination and phonetic expression; sentence structure covering the core

syntactic features of the language; various semantic categories and relationships to evaluate the individual's semantic knowledge. The syntax section requires the subjects to judge the grammaticality of auditorily presented phrases and sentences which systematically sample a broad range of sentence structures covering the core syntactic features of Kannada and is a quick measure of the syntactic competence of an individual.

The phonological section of LPT tests phoneme discrimination and production, and not the metalinguistic skill of phoneme awareness. In contrast, the section on syntax in the LPT is heavily dependent on metasyntax, as the tasks in this section require the subject to perform grammaticality judgments (Karanth, 2008). Similarly, the various subsections under semantic expression enable assessment of metasemantic abilities of an individual. The sections of LPT considered for assessment of metasyntax and metasemantics are given in Table 2.

Table 2: Tasks for assessing Metasyntactic and Metasemantic Skills

Sl. No.	METASYNTAX		METASEMANTICS	
	Sub-domains	*Max. Score*	*Sub-domains*	*Max. Score*
1	Morphophonemic structures	10	Naming	20
2	Plurals	5	Lexical Category	15
3	Tenses	5	Synonyms	5
4	PNG Markers	10	Antonyms	5
5	Case Markers	10	Homonyms	5
6	Transitives, Intransitives & Causatives	10	Polar Questions	10
7	Sentence Types	10	Semantic Anomaly	5
8	Predicates	10	Paradigmatic Relations	5

9	Comparatives, Conjunctions & Quotatives	10	Syntagmatic Relations	5
10	Conditional Clauses	10	Semantic Contiguity	5
11	Participial Constructions	10	Semantic Similarity	5

Initially, the participants were administered LPT and the responses were scored as correct or incorrect. The errors made by the participants were also recorded for qualitative analysis. Based on the performance on LPT, the language age was computed for each participant to match the participants in the two groups based on language age. The total scores obtained on the domains considered for assessment of metasyntax and metasemantics were then computed separately for analysis.

II. Reading Acquisition Profile in Kannada

Reading Acquisition Profile in Kannada (RAP-K) was developed by Prema (1997) to profile the acquisition of reading and writing skills in Kannada speaking children. Among the various sections of the RAP-K, Tests for Metaphonological Skills and Reading and Writing Tests were included in the present study. The tasks used for assessment of metaphonological skill are listed in Table 3.

Table 3: Tasks for assessing Metaphonological Skill

Sl. No.	Tests	No. of items	Max. Score
1	Rhyme Recognition	12 pairs of rhyming/non rhyming words (CVCVCV)	12
2	Syllable Stripping	12 words (CVCVCV)	12
3	Syllable Oddity (Words)	12 sets of (CVCVCV) words	12
4	Syllable Oddity (Non-words)	12 sets of (CVCVCV) non-words	12
5	Phoneme stripping	12 words of CVCV type	12
6	Phoneme Oddity	12 non-words of CVCV type	12

These tests were individually administered verbally with suitable and sufficient illustration and practice trials. The responses were scored as correct or incorrect and the errors recorded for qualitative analysis. The tasks used for assessment of reading and writing skills are listed in Table 4.

Table 4: Tasks for assessing Reading and Writing

Tests	*Example*	No. of Lists for Reading & Writing	Max. Score
1. Syllable Inventory			
• CV	/la/	4 lists of 10 CV each	40
• CCV	/sne/	1 list of 10 CCV each	10
• CCCV	/smra/	1 list of 10 CCCV each	10
2. Simple Words (CVCVCV)			
Words	/malaya/	2 lists of 10 words each	20
Non words	/nakaja/	2 lists of 10 non words each	20
3. Geminates			
Words	/appaNe/	1 list of 10 words each	10
Non words	/nappiso/	1 list of 10 non words each	10
4. Polysyllabic			
Words	/hancikoLLu/	1 list of 10 words each	20
Non words	/gokuhaaNa/	1 list of 10 non words each	20
5. Special words			
Arka			
Words	/kaarmika/	1 list of 10 words each	10
Non words	/tirvasi/	1 list of 10 non words each	10
Anuswara			

Words Non words	/bhanga/ /suvandi/	1 list of 10 words each 1 list of 10 non words each	10 10

For the reading tests, the participants were asked to read the test words and non-words aloud. The responses were noted verbatim. The children were encouraged to read the entire inventory even though they made errors. For those who failed to read, the reading test was terminated after consecutive failures. The responses were scored for accuracy and the errors were analysed qualitatively. Test words and non-words were given for dictation in the writing tests. The written responses to dictation were scored and also analysed qualitatively.

Data Analysis

The scores obtained in each of the domains were computed and tabulated. The data was then subjected to suitable statistical measures and analyzed quantitatively. Qualitative analysis of the data was also carried out to determine the pattern of errors in both the groups of subjects. The results of the analysis are presented and discussed in the sections that follow.

RESULTS AND DISCUSSION

The study aimed to compare the metalinguistic skills (metaphonology, metasemantics and metasyntax) between children with developmental dyslexia and language age matched typically developing children. It also aimed to study the correlation of reading abilities and different metalinguistic skills (metaphonology, metasemantics and metasyntax) that emerge in order to understand the metalinguistic skills that contribute significantly to the acquisition of reading and writing in typically developing (TD) children and children with developmental dyslexia (DD).

Participants in both groups were administered metaphonological, metasemantic, metasyntactic, reading and writing tasks individually and the performance is compared within groups as well as across groups. The performance of children with DD and the language age matched TD children will be presented under the following sections:

I. Performance of children across the major domains of Metalinguistics, Reading and Writing.
II. Performance of children across the sub-domains of Metalinguistic components, Reading and Writing.
III. Correlation of Reading and Writing with the Components of Metalinguistic Skills.
IV. Metalinguistic Skills that contribute to the acquisition of Reading and Writing Abilities.
V. Qualitative Analysis

I. Performance of children across the major domains of Metalinguistics, Reading and Writing

The mean percent and standard deviation (SD) values for tasks assessing metaphonology, metasemantics, metasyntax, reading and writing skills for the two groups of subjects are shown in Table 5 and figure 1. The results from Table 5 and figure 1 reveal that the TD group performed better than DD on all the tasks under study.

Table 5: Percent Mean and Standard Deviation (SD) for the two groups of subjects on metalinguistic, reading and writing tasks

	Groups	Percent Mean	SD
Metaphonology	TD	79.16	7.89
	DD	49.65	13.70
Metasemantics	TD	89.52	6.04
	DD	70.67	8.33
Metasyntax	TD	88.60	5.82
	DD	56.90	11.89
Reading	TD	85.38	8.62
	DD	40.25	20.25
Writing	TD	82.13	9.26
	DD	24.33	14.64

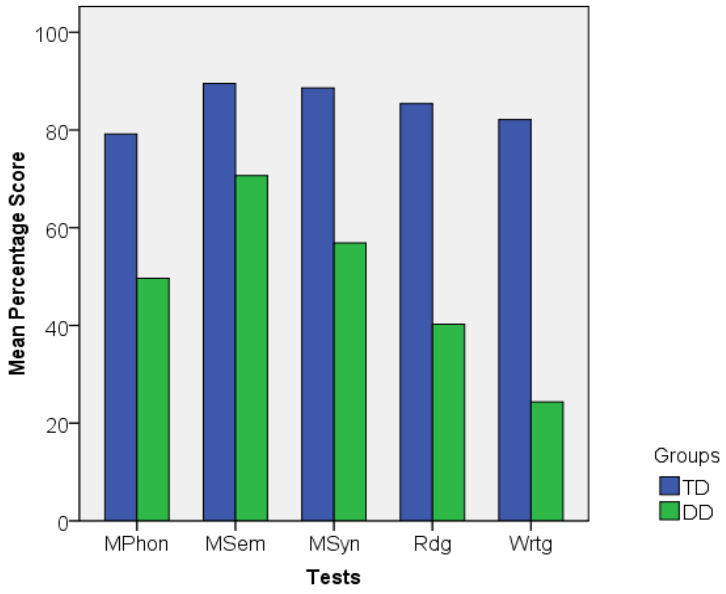

Figure 1: Performance of the two groups of subjects on metalinguistic, reading and writing tasks.

This was statistically analyzed using mixed ANOVA for tests with groups as the independent factor. The results revealed a significant effect of test [$F(4, 152) = 82.034$, $p < 0.001$] in the performance of the two groups of subjects. Pair-wise comparisons using Bonferroni's multiple comparison showed a significant difference between all the domains ($p < 0.001$) except for metaphonology and reading ($p > 0.05$).

Since the mixed ANOVA revealed a significant interaction between tests and groups [$F(4, 152) = 44.754$, $p < 0.05$], independent '*t*' test was carried out to compare the performance across the two groups of subjects. The results revealed significant differences between TD and DD groups for all the five domains i.e. metaphonology ($t = 8.346$, $p < 0.001$), metasemantics ($t = 8.191$, $p < 0.001$), metasyntax ($t = 10.704$, $p <$

0.001), reading ($t = 9.169$, $p < 0.001$) and writing ($t = 14.917$, $p < 0.001$), thus confirming the poor performance of DD when compared to the TD group.

The results of mixed ANOVA also revealed a significant effect of groups [$F (1, 38) = 147.369$, $p < 0.001$] in the performance on the test domains under study. This suggests that the performances of the two groups of subjects on the metalinguistic, reading and writing tasks are different. Hence, repeated measures ANOVA was carried out across the tests within each subject group.

Statistical analysis using repeated measure ANOVA revealed a significant effect of tests [$F (4, 76) = 14.663$, $p < 0.001$] in the TD group. Examination of pair-wise performance using Bonferroni's multiple comparison revealed significant differences between all the test domains ($p < 0.05$) except for metaphonology and writing; metasemantics and metasyntax; metasemantics and reading; metasyntax and reading; and reading and writing ($p > 0.05$). This suggests that the performance of typically developing children were similar in these test domains.

Repeated measure ANOVA in the DD group revealed a significant effect of tests [$F (4, 76) = 79.974$, $p < 0.001$]. Examination of pair-wise performance using Bonferroni's multiple comparison revealed a significant difference between all the domains ($p < 0.05$) except for metaphonology and reading ($p > 0.05$). Thus, the performance of DD group was similar to the overall group trend.

A discriminant graph was generated which differentiated children with DD as one homogenous group from the TD children. The graph revealed that the performance of both the groups were clearly distinct on all the tasks (Figure 2).

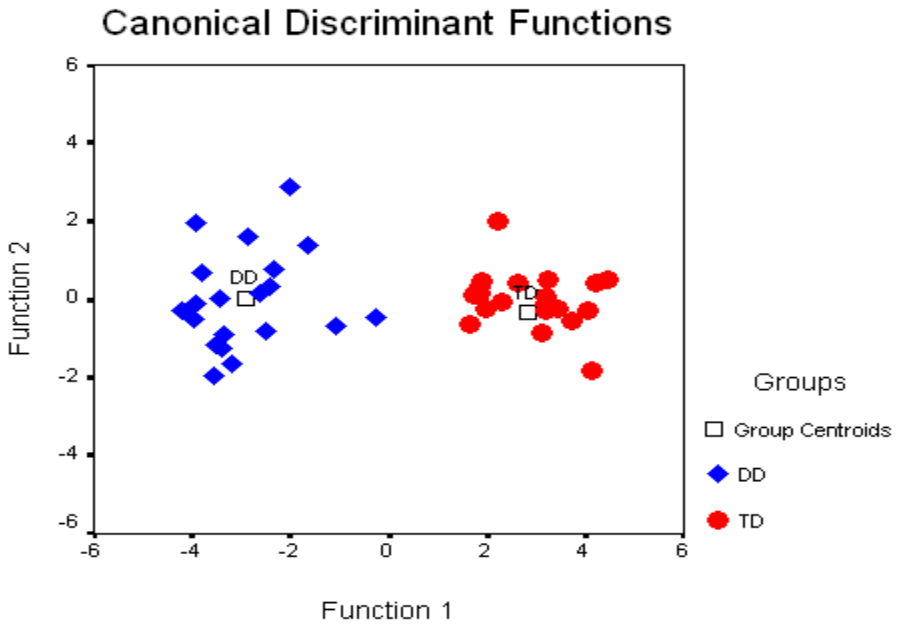

Figure 2: Discriminant graph depicting the performance of TD and DD groups.

The finding that children with DD perform poorly than the TD children on metalinguistic tasks are in consonance with literature reported on metalinguistic abilities in children with language disorders (Kamhi at al., 1985; Carlisle, 1987; Menyuk, 1993; Wallach & Butler, 1994, Cutinho, 2000; Butler & Silliman, 2002; Lewis, et al., 2007). These investigators reported poor performance of children with language disorders including learning disability, SLI and autism on various aspects of metalinguistics. Poor performance of children with DD on metalinguistic tasks draws support from the same. Cutinho (2000) reported poor metalinguistic skills in English in children with Learning Disability whose native language was Kannada whereas the present study revealed poor

metalinguistic skills in Kannada language in Kannada-English bilingual-biliterates. Thus, children with DD may be thought to have metalinguistic deficits in both the languages. However, the nature of the tasks used in both the studies was different.

There were no significant differences between the performances of TD children on metalinguistic abilities (metasemantic and metasyntax) and reading and between metaphonology and writing. This supports the intricate relationship that exists between metalinguistic skills and literacy. On the other hand, differences between these domains were obtained for children with DD, suggesting that the relationship between metalinguistic and literacy skills may not be similar to that observed in TD children.

The findings of the present study are also in consonance with that of Prakash et al. (1993), and Karanth and Suchitra (1993), whose findings indicate that acquisition of reading (literacy) itself facilitates metaphonological and metasyntactic abilities, rather metalinguistic abilities. The finding of significantly poor performance of children with DD on reading and writing tasks are in agreement with Prakash (1999) and Prakash et al. (2001) who reported that the dyslexic children in Kannada were very poor on their orthographic awareness. This could be attributed to the poor mental representation in these children of how phonology and orthography are interrelated and expressed in the script.

II. Performance across the sub-domains of Metalinguistic components, Reading and Writing.

The performance across the sub-domains for the two groups of subjects will be presented under the following headings:

1. Metaphonology
2. Metasemantics
3. Metasyntax
4. Reading
5. Writing

For each of the domains, statistical analyses were carried out using mixed ANOVA for the sub-domains with groups as the independent variable. This was followed by independent '*t*' test to compare the performance across the two groups of subjects and repeated measures ANOVA was carried out across the tests within each subject group.

1. Metaphonology

The mean percent and SD for the sub-domains of metaphonology for the two groups of subjects are given in Table 6 and figure 3. The results from Table 6 and figure 3 reveal that the TD group performed better than DD on all the sub-domains of metaphonology.

Table 6: Percent mean and SD for the sub-domains of metaphonology for TD and DD groups

	Groups					
	TD			DD		
	Mean %	SD	N	Mean %	SD	N
Rhyme Recognition	98.75	4.07	20	85.00	17.01	20
Syllable Deletion	94.58	8.23	20	65.83	21.78	20
Syllable Oddity (Words)	82.08	11.55	20	50.83	16.86	20
Syllable Oddity (Non-words)	73.75	13.59	20	40.83	14.28	20
Phoneme Deletion	64.16	17.54	20	20.41	13.64	20
Phoneme Oddity (Non-words)	66.25	12.23	20	35.00	13.94	20

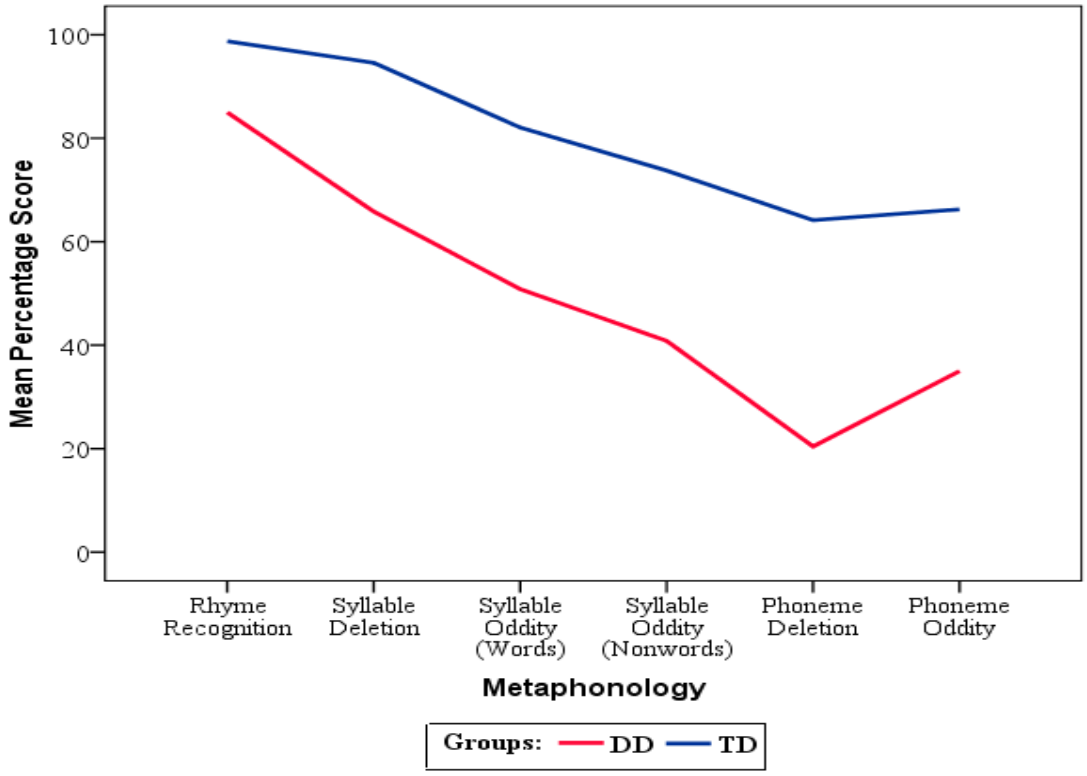

Figure 3: Performance of the two groups of subjects on the sub-domains of metaphonology.

Mixed ANOVA was carried out for the sub-domains of metaphonology with groups as the independent variable. The results revealed a significant effect of the sub-domains [F (5, 190) = 151.697, $p < 0.001$] in the performance of the two groups of subjects. Pair-wise comparisons using Bonferroni's multiple comparison showed a significant difference between all the sub-domains ($p < 0.05$).

Mixed ANOVA revealed a significant interaction between sub-domains and groups [F (5, 190) = 10.170, $p < 0.05$], and thus, independent '*t*' test was carried out to compare the performance across the two groups of subjects in each of the sub-domain of metaphonology. The results, as given in Table 7, show significant differences between TD and DD groups for all the six sub-domains of metaphonology, thus, confirming the poor performance of DD on metaphonological tasks when compared to the TD group.

Table 7: Results of independent 't' test for the sub-domains of metaphonology

	t	df
Rhyme Recognition	3.515*	38
Syllable Deletion	5.522*	38
Syllable Oddity (Words)	6.836*	38
Syllable Oddity (Non-words)	7.467*	38
Phoneme Deletion	8.803*	38
Phoneme Oddity (Non-words)	7.534*	38

*Note: *- p<0 .05 (2-tailed).*

The results of mixed ANOVA also revealed a significant effect of groups [F (1, 38) = 69.761, $p < 0.001$] in the performance on the sub-domains of metaphonology.

Repeated measure ANOVA revealed a significant effect of sub-domains ($F(5, 95) = 51.084$, $p < 0.001$) in the TD group. Examination of pair-wise performance using Bonferroni's multiple comparison revealed significant differences between all the sub-domains of metaphonology ($p < 0.05$) except for rhyme recognition and syllable deletion; syllable oddity (nonwords) and phoneme oddity (nonwords); and phoneme deletion and phoneme oddity (nonwords) ($p > 0.05$). This suggests that the performance of typically developing children were similar in these sub-domains of metaphonology.

Repeated measure ANOVA in the DD group revealed a significant effect of tests [$F(5, 95) = 105.12$, $p < 0.001$]. Pair-wise comparisons using Bonferroni's multiple comparison revealed a significant difference between all the sub-domains of metaphonology ($p < 0.05$) except for syllable oddity (nonwords) and phoneme oddity (nonwords) ($p > 0.05$). Thus, the trend in performance of DD group was different from that of the TD group.

2. Metasemantics

The mean percentage and SD for the sub-domains of metasemantics for the two groups of subjects are given in Table 8 and figure 4. The results from Table 8 and figure 4 reveal that the TD group performed better than DD on all the sub-domains of metasemantics.

Table 8: Percent mean and SD for the sub-domains of metasemantics for TD and DD groups

	Groups					
	TD			DD		
	Mean %	SD	N	Mean %	SD	N
Naming	99.25	2.44	20	87.50	10.32	20
Lexical Category	77.00	10.02	20	66.66	10.81	20
Synonyms	91.00	13.72	20	62.00	15.76	20
Antonyms	98.00	6.15	20	80.00	12.97	20
Homonyms	62.00	18.80	20	44.00	11.87	20
Polar Questions	100.00	0.00	20	81.00	11.19	20
Semantic Anomaly	100.00	0.00	20	68.00	17.65	20
Paradigmatic Relations	91.00	10.20	20	62.50	20.48	20
Syntagmatic Relations	87.00	14.90	20	67.00	19.76	20
Semantic Contiguity	76.50	15.65	20	43.00	16.25	20
Semantic Similarity	89.50	15.03	20	64.00	17.88	20

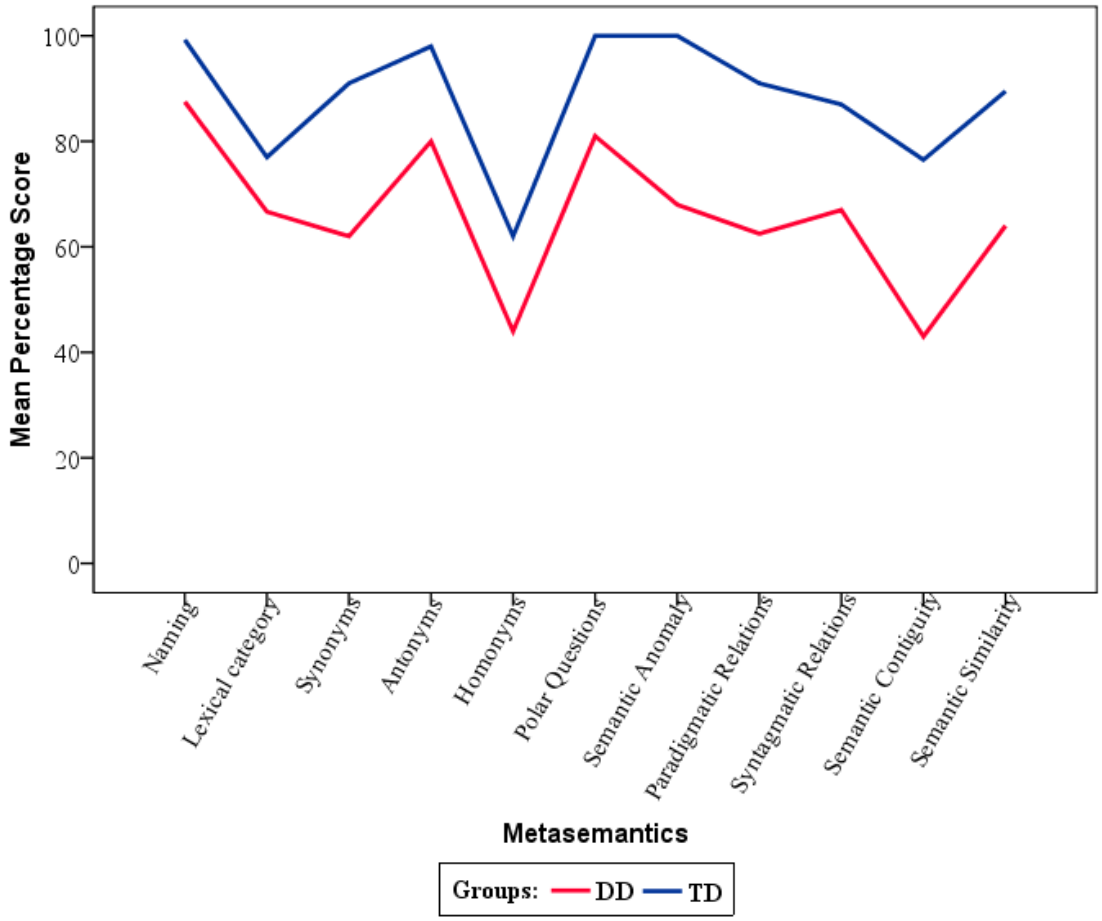

Figure 4: Performance of the two groups of subjects on the sub-domains of metasemantics.

From the descriptive statistics (Table 8) and figure 4, it can be seen that the performance of the two groups of subjects was the highest for naming, antonyms, polar questions and semantic similarity and the lowest for homonyms and semantic contiguity. It is also evident that the performance of children with DD was poorer on tasks of semantic anomaly detection, synonyms and paradigmatic relations when compared to the TD group.

The results of mixed ANOVA for the sub-domains of metasemantics with groups as the independent variable revealed a significant effect of the sub-domains [F (10, 380) = 52.421, $p < 0.001$] in the performance of the two groups of subjects. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 9.

Table 9: Pair-wise comparisons of the sub-domains of metasemantics

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		21.54*	16.87*	4.37	40.37*	2.87	9.37*	16.62*	16.37*	33.62*	16.62*
2	21.54*		4.66	17.16*	18.83*	18.66*	12.16*	4.91	5.16	12.08*	4.91
3	16.87*	4.66		12.50*	23.50*	14.00*	7.50	0.25	0.50	16.75*	0.25
4	4.37	17.16*	12.50*		36.00*	1.50	5.00	12.25*	12.00*	29.25*	12.25*
5	40.37*	18.83*	23.50*	36.00*		37.50*	31.00*	23.75*	24.00*	-6.75	23.75*
6	2.87	18.66*	14.00*	1.50	37.50*		6.50*	13.75*	13.50*	30.75*	13.75*
7	9.37*	12.16*	7.50	5.00	31.00*	6.50*		7.25	7.00	24.25*	7.25
8	16.62*	4.91	0.25	12.25*	23.75*	13.75*	7.25		0.25	17.00*	0.00
9	16.37*	5.16	0.50	12.00*	24.00*	13.50*	7.00	0.25		17.25*	0.25
10	33.62*	12.08*	16.75*	29.25*	6.75	30.75*	24.25*	17.00*	17.25*		17.00*
11	16.62*	4.91	0.25	12.25*	23.75*	13.75*	7.25	0.00	0.25	17.00*	

*Note: *- p<0 .05.*

Key: 1 – Naming, 2- Lexical Category, 3- Synonyms, 4- Antonyms, 5- Homonyms, 6- Polar Questions, 7- Semantic Anomaly, 8- Paradigmatic Relations, 9- Syntagmatic Relations, 10- Semantic Contiguity, 11- Semantic Similarity.

Since the mixed ANOVA revealed a significant interaction between sub-domains and groups [F (10, 380) = 5.269, $p < 0.05$], independent '*t*' test was carried out to compare the performance across the two groups of subjects in each of the sub-domain of metasemantics. The results showed significant differences ($p < 0.05$) between TD and

DD groups for all the eleven sub-domains of metasemantics, thus confirming the poor performance of DD on all the metasemantic tasks (Table 10).

Table 10: Results of independent 't' test for the sub-domains of metasemantics

	t	df
Naming	4.953*	38
Lexical Category	3.134*	38
Synonyms	6.205*	38
Antonyms	5.604*	38
Homonyms	3.619*	38
Polar Questions	7.592*	38
Semantic Anomaly	8.107*	38
Paradigmatic Relations	5.568*	38
Syntagmatic Relations	3.614*	38
Semantic Contiguity	6.639*	38
Semantic Similarity	4.880*	38

*Note: *- p<0 .05 (2-tailed).*

The results of mixed ANOVA also revealed a significant effect of groups [F (1, 38) = 63.002, $p < 0.001$] in the performance on the sub-domains of metasyntax. Repeated measure ANOVA for the TD group revealed a significant effect of sub-domains [F (10, 190) = 19.885, $p < 0.001$]. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 11.

Table 11: Pair-wise comparisons of the sub-domains of metasemantics in the TD group

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		22.25*	8.25	1.25	37.25*	0.75	0.75	8.25	12.25	22.75*	9.75
2	22.25*		14.00*	21.00*	15.00*	23.00*	23.00*	14.00*	10.00	0.50	12.50
3	8.25	14.00*		7.00	29.00*	9.00	9.00	0.00	4.00	14.50*	1.50
4	1.25	21.00*	7.00		36.00*	2.00	2.00	7.00	11.00	21.50*	8.50
5	37.25*	15.00*	29.00*	36.00*		38.00*	38.00*	29.00*	25.00*	14.50*	27.50*
6	0.75	23.00*	9.00	2.00	38.00*		0.00	9.00*	13.00	23.50*	10.50
7	0.75	23.00*	9.00	2.00	38.00*	0.00		9.00*	13.00	23.50*	10.50
8	8.25	14.00*	0.00	7.00	29.00*	9. 00*	9.00*		4.00	14.50*	1.50
9	12.25	10.00	4.00	11.00	25.00*	13.00	13.00	4.00		10.50	2.50
10	22.75*	0.50	14.50*	21.50*	14.50*	23.50*	23.50*	14.50*	10.50		13.00
11	9.75	12.50	1.50	8.50	27.50*	10.50	10.50	1.50	2.50	13.00	

*Note: *- p<0 .05.*

Key: 1 – Naming, 2- Lexical Category, 3- Synonyms, 4- Antonyms, 5- Homonyms, 6- Polar Questions, 7- Semantic Anomaly, 8- Paradigmatic Relations, 9- Syntagmatic Relations, 10- Semantic Contiguity, 11- Semantic Similarity.

There was a significant effect [F (10, 190) = 4.368, p < 0.001] of sub-domains of metasemantics in the DD group as revealed by Repeated measure ANOVA. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 12.

Table 12: Pair-wise comparisons of the sub-domains of metasemantics in the DD group

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		20.83*	25.50*	7.50	43.50*	6.50	19.50*	25.00*	20.50*	44.50*	23.50*
2	20.83*		4.66	13.33*	22.66*	14.33*	1.33	4.16	0.33	23.66*	2.66
3	25.50*	4.66		18.00*	18.00*	19.00*	6.00	0.50	5. 00	19.00*	2.00
4	7.50	13.33*	18.00*		36.00*	1.00	12.00	17.50*	13.00	37.00*	16.00*
5	43.50*	22.66*	18.00*	36.00*		37.00*	24.00*	18.50*	23.00*	1.00	20.00*
6	6.50	14.33*	19.00*	1.00	37.00*		13.00	18.50*	14.00*	38.00*	17.00*
7	19.50*	1.33	6.00	12.00	24.00*	13.00		5.50	1.00	25.00*	4.00
8	25.00*	4.16	0.50	17.50*	18.50*	18.50*	5.50		4.50	19.50*	1.50
9	20.50*	0.33	5.00	13.00	23.00*	14.00*	1.00	4.50		24.00*	3.00
10	44.50*	23.66*	19.00*	37.00*	1.00	38.00*	25.00*	19.50*	24.00*		21.00*
11	23.50*	2.66	2.00	16.00*	20.00*	17.00*	4.00	1.50	3.00	21.00*	

*Note: *- p<0 .05.*

Key: 1 – Naming, 2- Lexical Category, 3- Synonyms, 4- Antonyms, 5- Homonyms, 6- Polar Questions, 7- Semantic Anomaly, 8- Paradigmatic Relations, 9- Syntagmatic Relations, 10- Semantic Contiguity, 11- Semantic Similarity.

3. Metasyntax

The mean percentage and SD for the sub-domains of metasyntax for the two groups of subjects are given in Table 13 and figure 5. The results from Table 13 and figure 5 reveal that the TD group performed better than DD on all the sub-domains of metasyntax.

Table 13: Percent mean and SD for the sub-domains of metasyntax for TD and DD groups

	Groups					
	TD			DD		
	Mean %	SD	N	Mean %	SD	N
Morphophonemic structures	91.50	7.27	20	56.75	16.16	20
Plurals	94.50	8.25	20	55.50	17.00	20
Tenses	95.50	8.87	20	61.50	21.58	20
PNG Markers	92.00	8.33	20	58.25	15.75	20
Case Markers	91.50	8.12	20	52.50	12.08	20
Transitives, Intransitives & Causatives	84.00	9.94	20	58.50	10.89	20
Sentence Types	99.50	2.23	20	66.50	11.82	20
Predicates	92.00	7.67	20	59.50	16.37	20
Comparatives, Conjunctions & Quotatives	77.50	12.08	20	51.50	13.08	20
Conditional Clauses	81.00	12.09	20	51.50	13.86	20
Participial Constructions	82.00	8.33	20	55.50	15.38	20

From the descriptive statistics, it can thus be inferred that the performance was highest for sentence types followed by tenses, plurals, predicates, PNG markers, morphophonemic structures, case markers, transitives, intransitives and causatives, participial constructions, conditional clauses and comparatives, conjunctions and quotatives in that order in the TD group.

On the other hand, the performance of DD group was highest for sentence types followed by tenses, predicates, transitives, intransitives and causatives, PNG markers,

morphophonemic structures, plurals, participial constructions, case markers, conditional clauses and comparatives, conjunctions and quotatives.

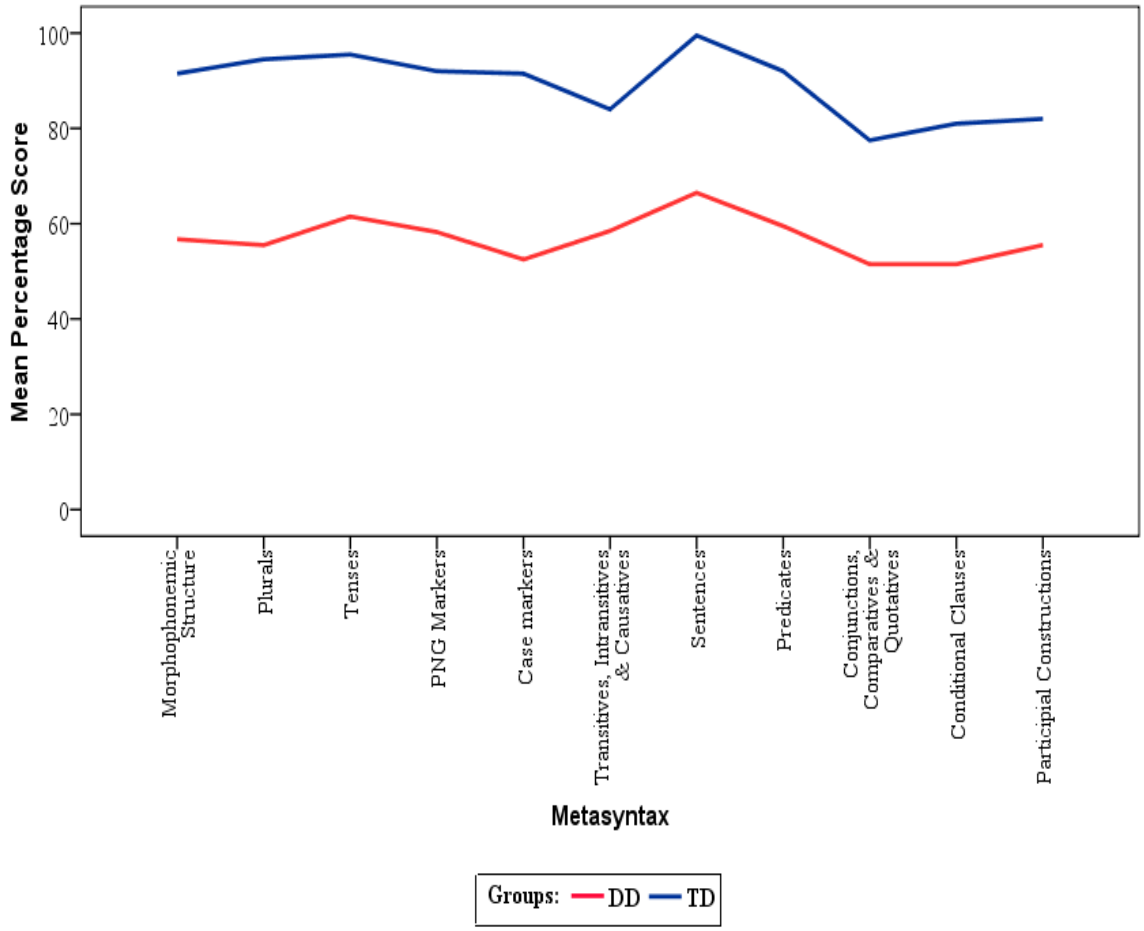

Figure 5: Performance of the two groups of subjects on the sub-domains of metasyntax.

Mixed ANOVA was carried out for the sub-domains of metasyntax with groups as the independent variable. A significant effect of the sub-domains [$F(10, 380) = 16.094$, $p < 0.001$] was revealed in the performance of the two groups of subjects. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 14.

Table 14: Pair-wise comparisons of the sub-domains of metasyntax

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		0.87	4.37	1.00	2.12	2.87	8.87*	1.62	9.62*	7.87*	5.37
2	0.87		3.50	0.12	3.00	3.75	8.00*	0.75	10.50*	8.75*	6.25
3	4.37	3.50		3.37	6.50	7.25	4.50	2.75	14.00*	12.25*	9.75*
4	1.00	0.12	3.37		3.12	3.87	7.87*	0.62	10.62*	8.87*	6.37
5	2.12	3.00	6.50	3.12		0.75	11.00*	3.75	7.50*	5.75	3.25
6	2.87	3.75	7.25	3.87	0.75		11.75*	4.50	6.75*	5.00	2.50
7	8.87*	8.00*	4.50	7.87*	11.00*	11.75*		7.25*	18.50*	16.75*	14.25*
8	1.62	0.75	2.75	0.62	3.75	4.50	7.25*		11.25*	9.50*	7.00*
9	9.62*	10.50*	14.00*	10.62*	7.50*	6.75*	18.50*	11.25*		1.75	4.25
10	7.87*	8.75*	12.25*	8.87*	5.75	5.00	16.75*	9.50*	1.75		2.50
11	5.37	6.25	9.75*	6.37	3.25	2.50	14.25*	7.00*	4.25	2.50	

*Note: *- p<0 .05.*

Key: 1 – Morphophonemic structures, 2- Plurals, 3- Tenses, 4- PNG Markers, 5- Case Markers, 6- Transitives, Intransitives & Causatives, 7- Sentence Types, 8- Predicates, 9- Comparatives, Conjunctions & Quotatives, 10- Conditional Clauses, 11- Participial Constructions.

A significant interaction between sub-domains and groups [F (10, 380) = 3.198, p < 0.05], was obtained from the results of mixed ANOVA and hence, independent '*t*' test was carried out to compare the performance across the two groups of subjects in each of the sub-domain of metasyntax. The results as given in Table 15 showed significant differences (p < 0.05) between TD and DD groups for all the eleven sub-domains of metasyntax, thus confirming the poor performance of DD on all the metasyntactic tasks.

Table 15: Results of independent 't' test for the sub-domains of metasyntax

	t	df
Morphophonemic structures	8.768*	38
Plurals	9.226*	38
Tenses	6.515*	38
PNG Markers	8.470*	38
Case Markers	11.976*	38
Transitives, Intransitives & Causatives	7.730*	38
Sentence Types	12.267*	38
Predicates	8.036*	38
Comparatives, Conjunctions & Quotatives	6.527*	38
Conditional Clauses	7.169*	38
Participial Constructions	6.774*	38

*Note: *- p<0 .05 (2-tailed).*

The results of mixed ANOVA also revealed a significant effect of groups [F (1, 38) = 115.395, $p < 0.001$] in the performance on the sub-domains of metasyntax. There was a significant effect of sub-domains [F (10, 190) = 19.885, $p < 0.001$] in the TD group as revealed by Repeated measures ANOVA. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 16.

Table 16: Pair-wise comparisons of the sub-domains of metasyntax in the TD group

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		3.00	4.00	0.50	0.00	7.50*	8.00*	0.50	14.00*	10.50	9.50*
2	3.00		1.00	2.50	3.00	10.50*	5.00	2.50	17.00*	13.50*	12.50*
3	4.00	1.00		3.50	4.00	11.50*	4.00	3.50	18.00*	14.50*	13.50*
4	0.50	2.50	3.50		0.50	8.00	7.50*	0.00	14.50*	11.00	10.00*
5	0.00	3.00	4.00	0.50		7.50*	8.00*	0.50	14.00*	10.50*	9.50*
6	7.50*	10.50*	11.50*	8.00	7.50*		15.50*	8.00*	6.50*	3.00	2.00
7	8.00*	5.00	4.00	7.50*	8.00*	15.50*		7.50*	22.00*	18.50*	17.50*
8	0.50	2.50	3.50	0.00	0.50	8.00*	7.50*		14.50*	11.00	10.00*
9	14.00*	17.00*	18.00*	14.50*	14.00*	6.50*	22.00*	14.50*		3.50	4.50
10	10.50	13.50*	14.50*	11.00	10.50*	3.00	18.50*	11.00	3.50		1.00
11	9.50*	12.50*	13.50*	10.00*	9.50*	2.00	17.50*	10.00*	4.50	1.00	

*Note: *- p<0 .05.*

Key: 1 – Morphophonemic structures, 2- Plurals, 3- Tenses, 4- PNG Markers, 5- Case Markers, 6- Transitives, Intransitives & Causatives, 7- Sentence Types, 8- Predicates, 9- Comparatives, Conjunctions & Quotatives, 10- Conditional Clauses, 11- Participial Constructions.

Repeated measure ANOVA in the DD group revealed a significant effect of the sub-domains of metasyntax [$F (10, 190) = 4.368$, $p < 0.001$]. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 17.

Table 17: Pair-wise comparisons of the sub-domains of metasyntax in the DD group

	Mean Difference										
	1	2	3	4	5	6	7	8	9	10	11
1		1.25	4.75	1.50	4.25	1.75	9.75	2.70	5.25	5.25	1.25
2	1.25		6.00	2.75	3.00	3.00	11.00	4.00	4.00	4.00	0.00
3	4.75	6.00		3.25	9.00	3.00	5.00	2.00	10.00	10.00	6.00
4	1.50	2.75	3.25		5.75	0.25	8.25	1.25	6.75	6.75	2.75
5	4.25	3.00	9.00	5.75		6.00	14.00*	7.00	1.00	1.00	3.00
6	1.75	3.00	3.00	0.25	6.00		8.00*	1.00	7.00	7.00	3.00
7	9.75	11.00	5.00	8.25	14.00*	8.00*		7.00	15.00*	15.00*	11.00*
8	2.75	4.00	2.00	1.25	7.00	1.00	7.00		8.00	8.00	4.00
9	5.25	4.00	10.00	6.75	1.00	7.00	15.00*	8.00		0.00	4.00
10	5.25	4.00	10.00	6.75	1.00	7.00	15.00*	8.00	0.00		4.00
11	1.25	0.00	6.00	2.75	3. 00	3.00	11.00*	4.00	4.00	4.00	

*Note: *- p<0 .05.*

Key: 1 – Morphophonemic structures, 2- Plurals, 3- Tenses, 4- PNG Markers, 5- Case Markers, 6- Transitives, Intransitives & Causatives, 7- Sentence Types, 8- Predicates, 9- Comparatives, Conjunctions & Quotatives, 10- Conditional Clauses, 11- Participial Constructions.

4. Reading

The mean percentage and SD for the sub-domains of reading for the two groups of subjects are given in Table 18 and figure 6. The results from Table 18 and figure 6 reveal that the performance of children with DD was poor on all the sub-domains of reading when compared to TD children.

Table 18: Percent mean and SD for the sub-domains of reading for TD and DD groups

	Groups					
	TD			DD		
	Mean %	SD	N	Mean %	SD	N
Syllable Inventory						
• CV	90.62	5.55	20	47.25	21.58	20
• CCV	80.50	18.48	20	29.50	29.10	20
• CCCV	47.50	24.89	20	14.50	20.12	20
CVCVCV						
• Words	99.00	2.61	20	67.25	20.61	20
• Non-words	94.50	7.59	20	62.00	18.16	20
Polysyllables						
• Words	89.00	11.19	20	35.50	27.04	20
• Non-words	79.50	14.68	20	35.00	26.45	20
Geminates						
• Words	95.50	6.86	20	46.50	27.58	20
• Non-words	82.50	12.51	20	33.00	24.51	20
Arka						
• Words	72.00	19.35	20	19.50	21.63	20
• Non-words	57.00	23.64	20	8.00	14.36	20
Anuswara						
• Words	91.00	11.65	20	32.00	28.58	20
• Non-words	86.00	15.69	20	23.50	28.70	20

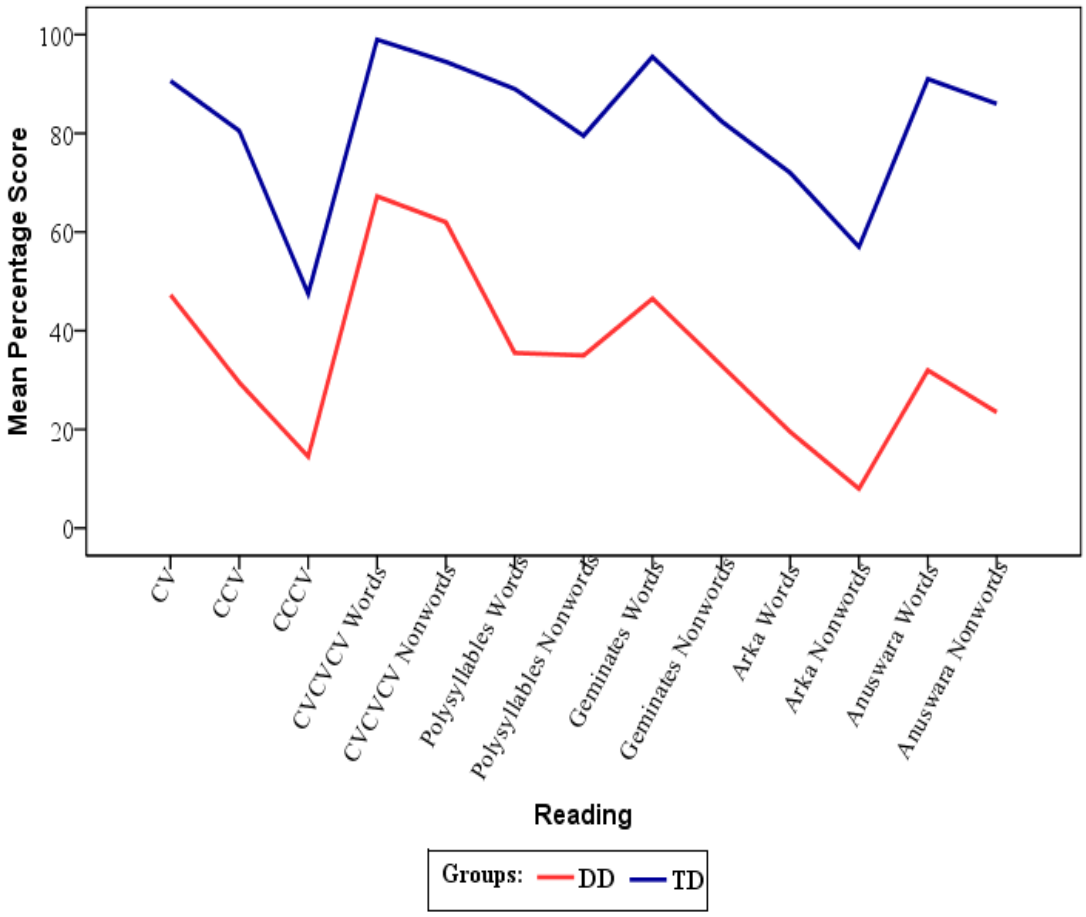

Figure 6: Performance of the two groups of subjects on the sub-domains of reading.

Statistical analysis using Mixed ANOVA for the sub-domains of reading with groups as the independent variable revealed a significant effect of the sub-domains [$F(12, 456) = 69.719$, $p < 0.001$] in the performance of the two groups of subjects. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 19.

Table 19: Pair-wise comparisons of the sub-domains of reading

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		13.93*	37.93*	14.18*	9.31*	6.68	11.68*	2.06	11.18*	23.18*	36.43*	7.43	14.18*
2	13.93*		24.00*	28.12*	23.25*	7.25	2.25	16.00*	2.75	9.25*	22.50*	6.50	.25
3	37.93*	24.00*		52.12*	47.25*	31.25*	26.25*	40.00*	26.75*	14.75*	1.50	30.50*	23.75*
4	14.18*	28.12*	52.12*		4.87	20.87*	25.87*	12.12*	25.37*	37.37*	50.62*	21.62*	28.37*
5	9.31*	23.25*	47.20*	4.87		16.00*	21.00*	7.25	20.50*	32.50*	45.75*	16.75*	23.50*
6	6.68	7.25	31.25*	20.87*	16.00*		5.00	8.75	4.50	16.50*	29.75*	.75	7.50
7	11.68*	2.25	26.25*	25.87*	21.00*	5.00		13.75*	.50	11.50*	24.75*	4.25	2.50
8	2.06	16.00*	40.00*	12.12*	7.25	8.75	13.75*		13.25*	25.25*	38.50*	9.50	16.25*
9	11.18*	2.75	26.75*	25.37*	20.50*	4.50	.50	13.25*		12.00*	25.25*	3.75	3.00
10	23.18*	9.25*	14.75*	37.37*	32.50*	16.50*	11.50*	25.25*	12.00*		13.25*	15.75*	9.00
11	36.43*	22.50*	1.50	50.62*	45.75*	29.75*	24.75*	38.50*	25.25*	13.25*		29.00*	22.25*
12	7.43	6.50	30.50*	21.62*	16.75*	.75	4.25	9.50	3.75	15.75*	29.00*		6.75
13	14.18*	.25	23.75*	28.37*	23.50*	7.50	2.50	16.25*	3.00	9.00	22.25*	6.75	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

Since the mixed ANOVA revealed a significant interaction between sub-domains and groups [F (12, 456) = 6.864, p < 0.05], independent '*t*' test was carried out to compare the performance across the two groups of subjects in each of the sub-domain of reading. The results showed significant differences (p < 0.05) between TD and DD groups for all the thirteen sub-domains of reading, thus confirming the poor performance of DD on all tasks of reading (Table 20).

Table 20: Results of independent ‘t’ test for the sub-domains of reading

	t	df
Syllable Inventory		
• CV	8.70*	38
• CCV	6.61*	38
• CCCV	4.61*	38
CVCVCV		
• Words	6.83*	38
• Non-words	7.38*	38
Polysyllables		
• Words	8.17*	38
• Non-words	6.57*	38
Geminates		
• Words	7.71*	38
• Non-words	8.04*	38
Arka		
• Words	8.08*	38
• Non-words	7.92*	38
Anuswara		
• Words	8.54*	38
• Non-words	8.54*	38

*Note: *- p<0 .05 (2-tailed).*

The results of mixed ANOVA also revealed a significant effect of groups [F (1, 38) = 80.229, p < 0.001] in the performance on the sub-domains of reading. Repeated measure ANOVA for the TD group revealed a significant effect of sub-domains [F (12, 228) = 38.877, p < 0.001]. The results of pair-wise comparisons using Bonferroni’s multiple comparison is given in Table 21.

Table 21: Pair-wise comparisons of the sub-domains of reading in the TD group

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		10.12	43.12*	8.37*	3.87	1.62	11.12	4.87	8.12	18.62*	33.62*	0.37	4.62
2	10.12		33.00*	18.50*	14.00*	8.50	1.00	15.00*	2.00	8.50	23.50*	10.50	5.50
3	43.12*	33.00*		51.50*	47.00*	41.50*	32.00*	48.00*	35.00*	24.50*	9.50	43.50*	38.50*
4	8.37*	18.50*	51.50*		4.50	10.00*	19.50*	3.50	16.50*	27.00*	42.00*	8.00	13.00
5	3.87	14.00*	47.00*	4.50		5.50	15.00*	1.00	12.00*	22.50*	37.50*	3.50	8.50
6	1.62	8.50	41.50*	10.00*	5.50		9.50	6.50	6.50	17.00*	32.00*	2.00	3.00
7	11.12	1.00	32.00*	19.50*	15.00*	9.50		16.00*	3.00	7.50	22.50*	11.50	6.50
8	4.87	15.00*	48.00*	3.50	1.00	6.50	16.00*		13.00*	23.50*	38.50*	4.50	9.50
9	8.12	2.00	35.00*	16.50*	12.00*	6.50	3.00	13.00*		10.50	25.50*	8.50	3.50
10	18.62*	8.50	24.50*	27.00*	22.50*	17.00*	7.50	23.50*	10.50		15.00*	19.00*	14.00*
11	33.62*	23.50*	9.50	42.00*	37.50*	32.00*	22.50*	38.50*	25.50*	15.00*		34.00*	29.00*
12	0.37	10.50	43.50*	8.00	3.50	2.00	11.50	4.50	8.50	19.00*	34.00*		5.00
13	4.62	5.50	38.50*	13.00	8.50	3.00	6.50	9.50	3.50	14.00*	29.00*	5.00	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

There was a significant effect [F (12, 228) = 37.854, p < 0.001] of the sub-domains of reading in the DD group as revealed by Repeated measure ANOVA. Bonferroni's multiple comparison was carried out to examine the pair-wise differences and the results are given in Table 22.

Table 22: Pair-wise comparisons of the sub-domains of reading in the DD group

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		17.75*	32.75*	20.00*	14.75	11.75	12.25*	0.75	14.25	27.75*	39.25*	15.25	23.75*
2	17.75*		15.00*	37.75*	32.50	6.00	5.50	17.00	3.50	10.00	21.50*	2.50	6.00
3	32.75*	15.00*		52.75*	47.50*	21.00*	20.50*	32.00*	18.50*	5.00	6.50	17.50*	9.00
4	20.00*	37.75*	52.75*		5.25	31.75*	32.25*	20.75*	34.25*	47.75*	59.25*	35.25*	43.75*
5	14.75	32.50*	47.50*	5.25		26.50*	27.00*	15.50	29.00*	42.50*	54.00*	30.00*	38.50*
6	11.75	6.00	21.00*	31.75*	26.50*		0.50	11.00	2.50	16.00*	27.50*	3.50	12.00
7	12.25*	5.50	20.50*	32.25*	27.00*	0.50		11.50	2.00	15.50*	27.00*	3.00	11.50
8	0.75	17.00	32.00*	20.75*	15.50	11.00	11.50		13.50*	27.00*	38.50*	14.50	23.00*
9	14.25	3.50	18.50*	34.25*	29.00*	2.50	2.00	13.50*		13.50	25.00*	1.00	9.50
10	27.75*	10.00	5.00	47.75*	42.50*	16.00*	15.50*	27.00*	13.50		11.50*	12.50	4.00
11	39.25*	21.50*	6.50	59.25*	54.00*	27.50*	27.00*	38.50*	25.00*	11.50*		24.00*	15.50
12	15.25	2.50	17.50*	35.25*	30.00*	3.50	3.00	14.50	1.00	12.50	24.00*		8.50
13	23.75*	6.00	9.00	43.75*	38.50*	12.00	11.50	23.00*	9.50	4.00	15.50	8.50	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

5. Writing

The mean percentage and SD for the sub-domains of writing for the two groups of subjects are given in Table 23 and figure 7. The results from Table 23 and figure 7 reveal that the TD group performed better than DD on all the sub-domains of writing.

Table 23: Percent mean and Standard Deviation for the sub-domains of writing for TD and DD groups

	Groups					
	TD			DD		
	Mean %	SD	N	Mean %	SD	N
Syllable Inventory						
• CV	90.62	4.92	20	39.50	16.27	20
• CCV	79.00	15.86	20	12.50	22.21	20
• CCCV	38.00	35.48	20	2.00	6.15	20
CVCVCV						
• Words	96.25	5.34	20	49.00	25.78	20
• Non-words	94.50	7.05	20	42.00	16.41	20
Polysyllables						
• Words	81.00	13.72	20	10.50	19.32	20
• Non-words	74.50	15.38	20	3.50	7.45	20
Geminates						
• Words	92.00	8.94	20	13.00	24.08	20
• Non-words	77.50	9.66	20	7.50	12.08	20
Arka						
• Words	67.50	28.99	20	10.50	20.38	20
• Non-words	58.50	31.50	20	5.00	12.35	20
Anuswara						
• Words	87.50	13.32	20	22.50	26.33	20
• Non-words	79.00	12.09	20	11.00	18.32	20

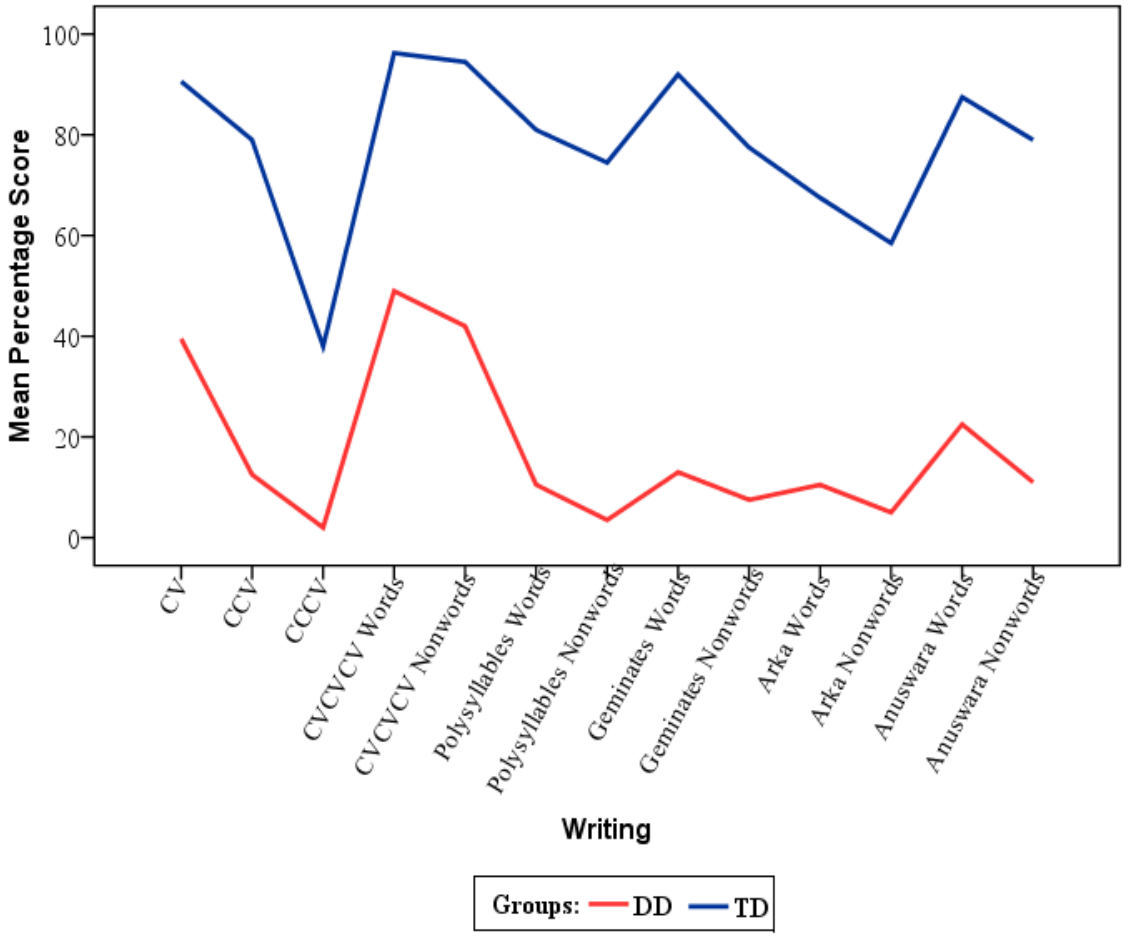

Figure 7: Performance of the two groups of subjects on the sub-domains of writing.

Mixed ANOVA was carried out for the sub-domains of writing with groups as the independent variable. The results revealed a significant effect of the sub-domains [$F(12, 456) = 48.652$, $p < 0.001$] in the performance of the two groups of subjects. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 24.

Table 24: Pair-wise comparisons of the sub-domains of writing

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		19.31*	45.06*	7.56*	3.18	19.31*	26.06*	12.56*	22.56*	26.06*	33.31*	10.06*	20.06*
2	19.31*		25.75*	26.87*	22.50*	0.00	6.75	6.75	3.25	6.75	14.00*	9.25	0.75
3	45.06*	25.75*		52.62*	48.25*	25.75*	19.00*	32.50*	22.50*	19.00*	11.75*	35.00*	25.00*
4	7.562*	26.87*	52.62*		4.37	26.87*	33.62*	20.12*	30.12*	33.62*	40.87*	17.62*	27.62*
5	3.18	22.50*	48.25*	4.37		22.50*	29.25*	15.75*	25.75*	29.25*	36.50*	13.25*	23.25*
6	19.31*	0.00	25.75*	26.87*	22.50*		6.75	6.75*	3.25	6.75	14.00*	9.25*	0.75
7	26.06*	6.75	19.00*	33.62*	29.25*	6.75		13.50*	3.50	0.00	7.25	16.00*	6.00
8	12.56*	6.75	32.50*	20.12*	15.75*	6.75*	13.50*		10.00*	13.50*	20.75*	2.50	7.50
9	22.56*	3.25	22.50*	30.12*	25.75*	3.25	3.50	10.00*		3.50	10.75	12.50*	2.50
10	26.06*	6.75	19.00*	33.62*	29.25*	6.75	0.00	13.50*	3.50		7.25*	16.00*	6.00
11	33.31*	14.00*	11.75*	40.87*	36.50*	14.00*	7.25	20.75*	10.75	7.25*		23.25*	13.25
12	10.06*	9.25	35.00*	17.62*	13.25*	9.25*	16.00*	2.50	12.50*	16.00*	23.25*		10.00*
13	20.06*	0.75	25.00*	27.62*	23.25*	0.75	6.00	7.50	2.50	6.00	13.25	10.00*	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

The results of mixed ANOVA revealed a significant interaction between sub-domains and groups [F (12, 456) = 8.048, p < 0.05], and hence, independent '*t*' test was carried out to compare the performance across the two groups of subjects in each of the sub-domain of writing. The results showed significant differences (p < 0.05) between TD and DD groups for all the thirteen sub-domains of writing, thus confirming the poor performance of DD on all tasks of writing (Table 25).

Table 25: Results of independent ‘t’ test for the sub-domains of writing

	t	df
Syllable Inventory		
• CV	13.44*	38
• CCV	10.89*	38
• CCCV	4.47*	38
CVCVCV		
• Words	8.02*	38
• Non-words	13.14*	38
Polysyllables		
• Words	13.30*	38
• Non-words	18.57*	38
Geminates		
• Words	13.75*	38
• Non-words	20.22*	38
Arka		
• Words	7.19*	38
• Non-words	7.07*	38
Anuswara		
• Words	9.84*	38
• Non-words	13.85*	38

*Note: *- p<0 .05* (2-tailed).

The results of mixed ANOVA also revealed a significant effect of groups [F (1, 38) = 211.155, p < 0.001] in the performance on the sub-domains of writing. There was a significant effect [F (12, 228) = 24.892, p < 0.001] of sub-domains in the TD group as

revealed by Repeated measure ANOVA. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 26.

Table 26: Pair-wise comparisons of the sub-domains of writing in the TD group

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		11.62	52.62*	5.62*	3.87	9.62	16.12*	1.37	13.12*	23.12	32.12*	3.12	11.62*
2	11.62		41.00*	17.25*	15.50*	2.00	4.50	13.00*	1.50	11.50	20.50	8.50	0.00
3	52.62*	41.00*		58.25*	56.50*	43.00*	36.50*	54.00*	39.50*	29.50*	20.50*	49.50*	41.00*
4	5.62*	17.25*	58.25*		1.75	15.25*	21.75*	4.25	18.75*	28.75*	37.75*	8.75	17.25*
5	3.87	15.50*	56.50*	1.75		13.50*	20.00*	2.50	17.00*	27.00*	36.00*	7.00	15.50*
6	9.62	2.00	43.00*	15.25*	13.50*		6.50	11.00*	3.50	13.50	22.50	6.50	2.00
7	16.12*	4.50	36.50*	21.75*	20.00*	6.50		17.50*	3.00	7.00	16.00	13.00	4.50
8	1.37	13.00*	54.00*	4.25	2.50	11.00*	17.50*		14.50*	24.50*	33.50*	4.50	13.00*
9	13.12*	1.50	39.50*	18.75*	17.00*	3.50	3.00	14.50*		10.00	19.00	10.00	1.50
10	23.12	11.50	29.50*	28.75*	27.00*	13.50	7.00	24.50*	10.00		9.00	20.00	11.50
11	32.12*	20.50	20.50*	37.75*	36.00*	22.50	16.00	33.50*	19.00	9.00		29.00*	20.50
12	3.12	8.50	49.50*	8.75	7.00	6.50	13.00	4.50	10.00	20.00	29.00*		8.50
13	11.62*	0.00	41.00*	17.25*	15.50*	2.00	4.50	13.00*	1.50	11.50	20.50	8.50	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

Repeated measure ANOVA in the DD group revealed a significant effect [F (12, 228) = 33.258, p < 0.001] of the sub-domains of writing. The results of pair-wise comparisons using Bonferroni's multiple comparison is given in Table 27.

Table 27: Pair-wise comparisons of the sub-domains of writing in the DD group

	Mean Difference												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1		27.00*	37.50*	9.50	2.50	29.00*	36.00*	26.50*	32.00*	29.00*	34.50*	17.00	28.50*
2	27.00*		10.50	36.50*	29.50*	2.00	9.00	0.50	5.00	2.00	7.50	10.00	1.50
3	37.50*	10.50		47.00*	40.00*	8.50	1.50	11.00	5.50	8.50	3.00	20.50	9.00
4	9.50	36.50*	47.00*		7.00	38.50*	45.50*	36.00*	41.50*	38.50*	44.00*	26.50*	38.00*
5	2.50	29.50*	40.00*	7.00		31.50*	38.50*	29.00*	34.50*	31.50*	37.00*	19.50*	31.00*
6	29.00*	2.00	8.50	38.50*	31.50*		7.00	2.50	3.00	.00	5.50	12.00	0.50
7	36.00*	9.00	1.50	45.50*	38.50*	7.00		9.50	4.00	7.00	1.50	19.00	7.50
8	26.50*	0.50	11.00	36.00*	29.00*	2.50	9.50		5.50	2.50	8.00	9.50	2.00
9	32.00*	5.00	5.50	41.50*	34.50*	3.00	4.00	5.50		3.00	2.50	15.00	3.50
10	29.00*	2.00	8.50	38.50*	31.50*	0.00	7.00	2.50	3.00		5.50	12.00	0.50
11	34.50*	7.50	3.00	44.00*	37.00*	5.50	1.50	8.00	2.50	5.50		17.50	6.00
12	17.00	10.00	20.50	26.50*	19.50*	12.00	19.00	9.50	15.00	12.00	17.50		11.50
13	28.50*	1.50	9.00	38.00*	31.00*	0.50	7.50	2.00	3.50	0.50	6.00	11.50	

*Note: *- p<0 .05.*

Key: 1 – CV, 2- CCV, 3- CCCV, 4- CVCVCV - Words, 5- CVCVCV - Non-words, 6- Polysyllables- Words, 7- Polysyllables- Non-words, 8- Geminates - Words, 9- Geminates- Non-words, 10- Arka – Words, 11- Arka – Non-words, 12 – Anuswara – Words, 13- Anuswara – Non-words.

The metaphonological deficits observed in children with DD are supported by a vast majority of studies in the literature which document poor phonological awareness in children with reading disability (Tunmer & Bowey, 1980; Kamhi et al., 1985; Vellutino & Scanlon, 1987; Wagner & Torgesen, 1987; Scarborough, 1998; Tunmer et al., 1988; Bentin et al., 1990; Adams, 1990; Goswami & Bryant, 1990; Brady & Shankweiler, 1991; Hodgson, 1992, Stanovich, 1993 and others). Metaphonological deficits in these

children have also been documented in the syllabic scripts (Jayaram, 1998; Padakannaya, Rekha, Vaid & Joshi, 2002; Liow & Lee, 2004; Schwartz, Leikin & Share, 2005; Shilpashri & Prema, 2008; Ponnumani & Prema, 2008). Of the metaphonological tasks, poor performance was found on phoneme deletion in both the groups of children. This supports the notion that phoneme awareness develops at a later age when compared to the other metaphonological tasks. Exposure to English facilitated better performance on phoneme awareness tasks (phoneme deletion and phoneme oddity) in TD children which is in consonance to that reported by Prakash and Rekha (1992). However, the same was not observed in children with DD which might suggest that these children were unable to integrate the principles of alphabetic script and the knowledge of orthographic principles of semi-syllabic script, which is considered to be essential for cross linguistic transfer of metaphonological tasks (Schwartz et al., 2007).

The performance of both groups of children on tasks assessing metasemantic and metasyntactic skills draws support from the results of investigations on these abilities in alphabetic scripts (Goodman, 1969; Smith, 1971; Kolers, 1975; Bowey, 1986b; Bentin et al., 1990) as well as semi-syllabic scripts (Sharma, 2000; George, 2001). While the reported literature is for monolingual-monoliterates, the present study revealed similar findings in bilingual-biliterate children for the native language. The performance on the sub-domains of metasemantics and metasyntax of the two groups of children in Kannada is similar to that reported by Sharma (2000) and George (2001) in Hindi and Malayalam languages respectively.

The results also support the view that judgment tasks are easier than revision tasks and is the first of the metasyntactic skills to develop since the younger typically developing children were able to judge the grammaticality of the sentence but unable to revise them.

III. Correlation of Reading and Writing with the Components of Metalinguistic Skills.

Pearson's correlation was done to determine the correlation of combined reading and writing abilities with that of metaphonology, metasemantics and metasyntax independently in TD and DD groups. In the TD group, the correlation of reading and writing was found to be significant with metaphonology and metasemantics but not for metasyntax. The correlation co-efficients for the combined reading and writing abilities with that of the metalinguistic components for the TD group is shown in Table 28.

Table 28: Correlation co-efficients for TD group

		Total Reading & Writing	Meta-phonology	Meta-semantics	Meta-syntax
Total Reading & Writing	Pearson Correlation	1.000	0.591**	0.489*	0.440
	Sig. (2-tailed)	-	0.006	0.029	0.052
	N	20	20	20	20

*Note: **- p<0 .01 (2-tailed), *- p<0 .05 (2-tailed).*

The trend of correlation in the DD group was found to be different from that of the TD group. In the DD group, the correlation of the combined reading and writing skills was found to be significant with metasemantics, metaphonology and metasyntax in that order. The correlation co-efficients for the combined reading and writing abilities with that of the metalinguistic components for the DD group is shown in Table 29. The correlation of scores on metaphonology, metasemantics and metasyntax with that of the total scores for reading and writing are depicted in figures 8, 9 and 10 respectively.

Table 29: Correlation co-efficients for DD group

		Total Reading & Writing	Meta-phonology	Meta-semantics	Meta-syntax
Total Reading & Writing	Pearson Correlation	1.000	0.660**	0.704**	0.558*
	Sig. (2-tailed)	-	0.002	0.001	0.011
	N	20	20	20	20

*Note: **- p<0 .01 (2-tailed), *- p<0 .05 (2-tailed).*

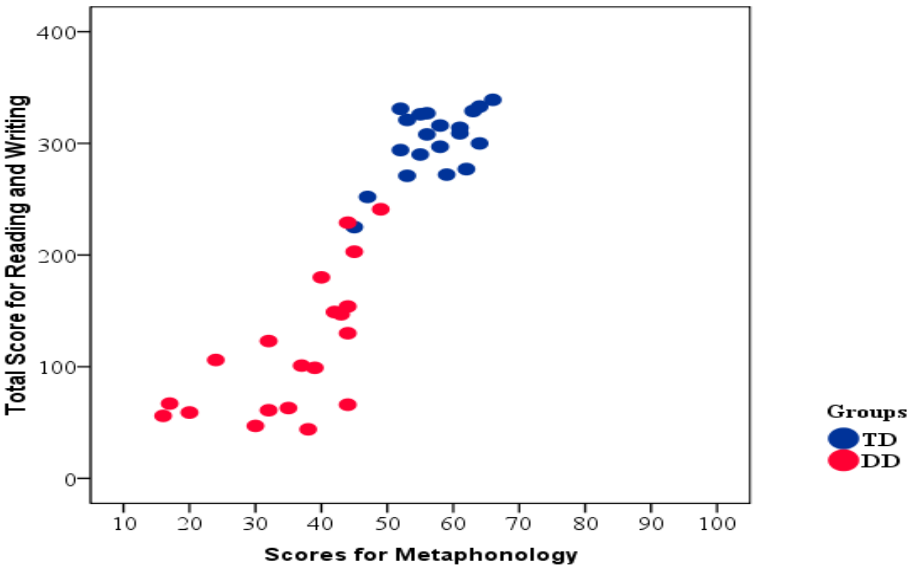

Figure 8: Correlation of scores on metaphonology with that of the total scores for reading and writing.

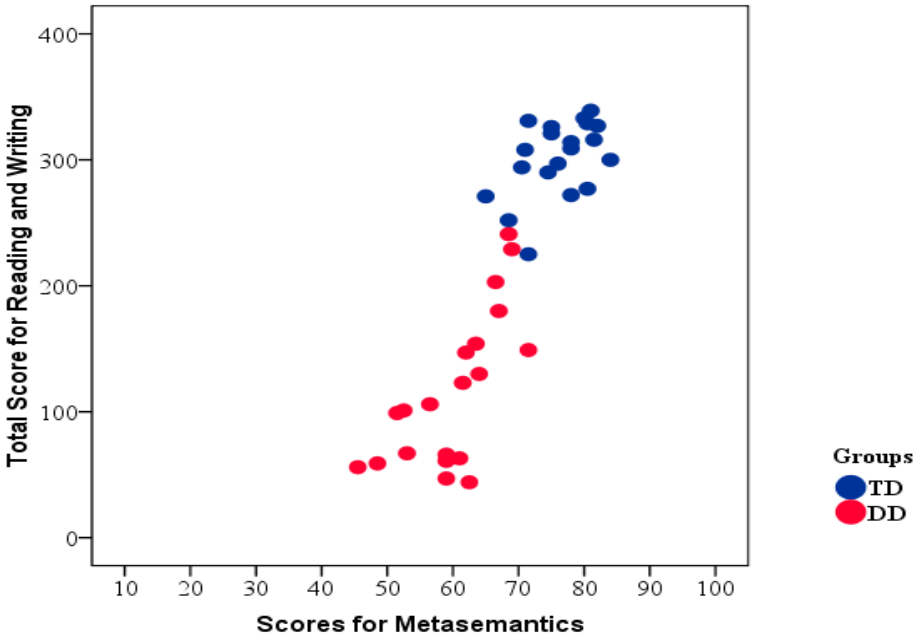

Figure 9: Correlation of scores on metasemantics with that of the total scores for reading and writing.

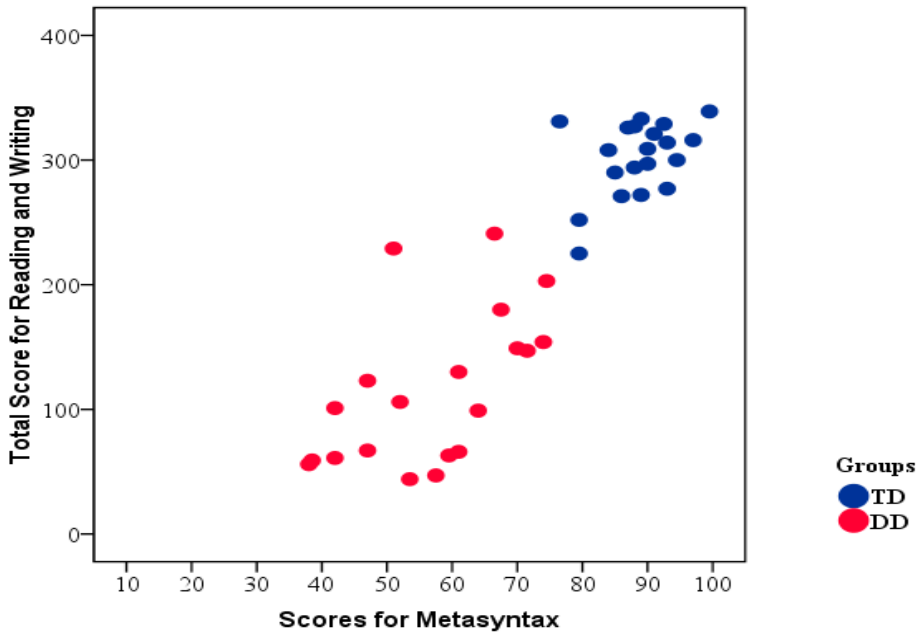

Figure 10: Correlation of scores on metasyntax with that of the total scores for reading and writing.

The findings of the present study on correlation of metalinguistic abilities with that of reading and writing in TD children are in consonance with those reported in literature (Liberman et al., 1974; Tunmer & Cole, 1985; Vellutino & Scanlon, 1987; Adams, 1990; Snyder & Downey, 1991; Liberman & Shankweiler, 1991; Ball & Blachman, 1991; Nagy, 2007) for alphabetic scripts. These studies have documented the high correlation of metaphonological skills with reading acquisition.

Tunmer and Cole (1985) suggested a hierarchical relationship between metalinguistic awareness and reading and that word and phonological awareness are critical in initial stages of learning to read. Form awareness is reported to appear later in the hierarchy and is necessary to interpret linguistic information once it has been decoded

from text. Thus, the three metalinguistic components were suggested as necessary, although not sufficient conditions for proficiency in reading. Further, the results of a study by Tunmer (1989) demonstrated that both phonological and syntactic awareness influenced reading comprehension through phonological recoding as measured by a non word reading task. The results of the present study also revealed that the metalinguistic components were significantly correlated with that of reading and writing.

However, the order of correlation was found to be different for the two groups of subjects. In the TD children, metaphonology had the highest correlation with reading and writing followed by metasemantics while metasyntax was not correlated with reading and writing. In contrast, metasemantics had the highest correlation with reading and writing in the DD group; followed by metaphonology and metasyntax.

The absence of a correlation between metasyntactic skills and literacy in TD children may be attributed to the difference in the nature of the tasks employed in the present study and those reported in literature. A grammatical judgment task alone was considered for the assessment of metasyntax in the present study whereas the studies reporting a significant influence of syntactic awareness on reading and writing abilities have employed both judgment and revision tasks (E.g., Bowey, 1986 b). Furthermore, the metasyntactic abilities are reported to have a significant influence particularly on reading comprehension and comprehension monitoring. The tasks to assess reading in the present study included reading aloud of words and non words. Reading comprehension and monitoring tasks were not incorporated which might have led to the absence of significant correlation between syntactic awareness and reading in the TD group.

The significant correlation of reading and writing with metasemantics, metaphonology and metasyntax in that order in children with DD suggests that these children have a persistent logographic reading and thus, rely heavily on semantic cues in reading. On the basis of the hierarchical relationship between metalinguistic awareness and reading put forth by Tunmer and Cole (1985), it may be speculated that children with DD have achieved only the word awareness which is placed at the lowest end of the hierarchy. Phonological awareness and the form awareness which are necessary to develop automaticity in reading and interpret linguistic information following decoding respectively are not sufficiently developed in this population and hence, the poor performance on tasks of reading and writing.

Schwartz et al. (2007) reported that cross-linguistic transfer of early literacy skills can be found even in the context of different alphabetic orthographies. Schwartz et al. (2008) reported that specific orthographic and linguistic features of L1 Russian may positively influence reading acquisition in Hebrew (L2). On similar lines, the present study revealed influences of English (L2) on the metalinguistic and literacy skills in Kannada (L1), thus supporting the cross linguistic transfer of these skills across different orthographic systems (alphabetic and semi-syllabic).

However, the Indian studies reported that phonological awareness is not a crucial factor in learning to read a non-alphabetic script or semi-syllabic scripts, rather the knowledge of orthographic principles appeared to be more significant (Patel & Soper,

1985; Prakash, 1987; Rekha, 1987; Chandrika, 1990; Prakash, et al., 1993; Sunitha, 1995; Rekha, 1996). They observed that poor knowledge of orthographic principles was the important factor in determining reading disability.

Exposure to English has been reported to facilitate metaphonological development. Prakash and Rekha (1992) reported that children studying in Kannada medium schools showed a spurt in performance on phoneme awareness tasks after having been introduced to English language in the fourth grade. Since the subjects in the present study were introduced to both alphabetic and semi-syllabic scripts simultaneously, it may be speculated that the exposure to alphabetic script at an early age might have led to the better performance on metaphonological skills in the semi-syllabic script.

The results suggest that early exposure to L2 English literacy promoted access to the phonemic structure of speech among the bilingual-biliterate children in English as well as in Kannada. These findings support the notion of Schwartz et al. (2007) who suggested that the actual mechanism of transfer of early literacy skills across alphabetic orthographies is the interaction between the generalized insight into the alphabetic principle and the specific benefits of knowledge of an orthography characterized by fully-fledged alphabet with letters representing consonants and vowels. In the present study, the interaction between the alphabetic principle of English and the knowledge of orthography deemed necessary in learning to read a semi-syllabic script like Kannada could be speculated to contribute to the cross linguistic transfer of literacy skills. This further explains the higher correlation of metaphonology with reading and writing

abilities in the bilingual biliterate TD children considered in the present study. This interaction may not be effective in children with DD to facilitate cross linguistic transfer and hence, the persisting reliance on metasemantic skills for reading and writing.

IV. Metalinguistic Skills that contribute to the acquisition of Reading and Writing Abilities.

A step-wise multiple regression analysis was performed separately for each subject group to determine the potential variables which contribute to the acquisition of reading and writing skills. The results of step-wise multiple regression for the TD group revealed a regression equation for the combined reading and writing abilities which was significant with $F\ (1, 18) = 9.641$, $p < 0.01$. The regression equation included only metaphonology whereas metasemantics and metasyntax were excluded. Of the metalinguistic skills, metaphonology was identified as the potential contributor to the acquisition of reading and writing in the TD group ($r^2=0.349$; Metaphonology: $\beta = 3.111$; $p < 0.01$) and constant was significant with value 124.237 ($p < 0.05$).

Step-wise multiple regression for the DD group resulted in a regression equation for the combined reading and writing abilities which was significant with $F\ (1, 18) = 17.736$, $p < 0.001$. The regression equation included only metasemantics whereas metaphonology and metasyntax were excluded. The results revealed that metasemantics was the potential contributor to the acquisition of reading in the DD group ($r^2=0.496$;

Metasemantics: β =6.119; $p < 0.001$) and constant was significant with value -251.337 ($p < 0.05$).

Muter and Snowling (1998) reported that phoneme awareness was found to be a very powerful predictor of reading accuracy, both in the short term (the first year at school) and in the long term (at age 9). Grammatical awareness has been also reported as a predictor of reading ability (Bohannon et al., 1984; Pratt et al., 1984; Tunmer et al., 1988; Bentin et al., 1990; Dermont & Gombert, 1996; Nation & Snowling, 2000) and reading comprehension in particular (Cairns et al., 2006). Some investigators have reported phoneme awareness and grammatical awareness to be concurrent predictors of reading accuracy in middle childhood (Tunmer, 1989; Muter & Snowling, 1998). These findings were based on investigations in English which follows an alphabetic script.

In the Indian context, Prema (1997) reported that the hierarchy of predictors of reading abilities in Kannada monolingual–monoliterates was found to be metasemantics, metasyntactic and metaphonology. In the present study, it was seen that the metalinguistic skills that significantly contributed to reading and writing abilities in bilingual-biliterate (Kannada- English) TD children was metaphonology. Metasemantic and metasyntactic abilities may not have a significant contribution to reading and writing in this population. Thus, the skills contributing to reading and writing in the native language are different in monolingual-monoliterate and bilingual-biliterate children. The exposure to an alphabetic script can be attributed to this finding in children who can speak as well as read and write in two languages.

Alternatively, the metalinguistic skill which contributed significantly to reading and writing Kannada in children with DD was found to be metasemantics, rather than metaphonology as was the case in TD children. The contribution of metaphonology and metasyntax was not found to be significant in this population. This finding in children with DD is similar to that reported by Prema (1997) on TD children for monolingual-monoliterate children. This might suggest that bilingual-biliterate children with DD perform similar to monolingual-monoliterate children and there may be no significant cross linguistic transfer of metalinguistic skills in this population. In addition, these findings further add to the abundant body of literature on significant metaphonological deficits in children with DD. Thus, the metalinguistic abilities that contribute significantly to reading and writing may be different in TD and DD groups.

V. Qualitative Analysis

In addition to the statistical analysis, qualitative analysis of the data was done. The types of errors in the metalinguistic, reading and writing tasks in the two groups of subjects are outlined below:

1. *Metaphonological Skills*

Of the six sub-domains under metaphonology, performance of both TD and DD groups was higher on rhyme recognition and syllable deletion compared to other sub-domains and lowest on phoneme deletion and phoneme oddity tasks. In the syllable

deletion task, it was observed that the initial syllable was the easiest followed by the final syllable and the medial being the most difficult. The scores for syllable oddity (words and non words) were lower than for syllable deletion with the performance being better for words than non words.

The scores for phoneme deletion were lower than for phoneme oddity, suggesting that the most difficult metaphonological task was phoneme deletion. The children found deletion of irregular phonemes 'Arka' and 'Anuswara' easier than the regular phonemes. Of particular difficulty was deleting the consonant portion of the CV syllable, especially in the medial position. The phoneme oddity tasks was found to be difficult especially when the oddity was signalled by varying consonants in the context of the same vowel, than when the vowels varied in the context of the same consonant.

These findings are in consonance to that reported by Prema (1997) for typically developing Kannada monolingual children, except that the present study on Kannada-English bilinguals revealed lowest scores for phoneme deletion and not for phoneme oddity. Regular phonemes without independent graphemes are treated as composite units whereas irregular phonemes with independent graphemes are treated as units of a syllable. The patterns of errors seen in children with DD were similar to that of TD children except for lower scores in the DD group.

2. *Metasyntactic Skills*

The performance of the two subject groups was found to be qualitatively different on the metasyntactic tasks in particular. The TD children were sensitive to the ungrammatical formulations and could identify the same, although the younger children in the group were unable to revise and produce the grammatically correct form. The younger children had few difficulties on case markers, conjunctions, comparatives and quotatives and also conditional clauses. On the other hand, children with DD had difficulties with most of the syntactic structures considered in the present study. They were unable to judge whether the given structure was grammatically correct or incorrect. Further, even on instances where they could identify that the given stimuli was ungrammatical, they were most often unable to identify the source of error and revise the same, thus performing similar to the younger TD children.

The performance on the metasyntactic tasks was found to be highly influenced by the spoken form of the language. The differences in the colloqial and pedantic forms of Kannada, particularly with the minute morphosyntactic violations being acceptable in the colloqial form, could be attributed to the inability of the subjects to identify certain grammatical violations in the pedantic form.

3. *Metasemantic Skills*

The performance of TD children almost reached the maximum possible scores on all the sub-domains of metasemantics, except for the generation of homonyms. Children with DD were found to perform better on metasemantic tasks when compared to the other

domains under study. However, they performed poorer than the TD children especially on semantic contiguity, semantic similarity, paradigmatic relationships, homonyms and semantic anomaly detection tasks. While the TD children were able to easily explain the relationship between the groups of words presented, children with DD were unable to understand the same. The most common error observed on these tasks was substitution of an associated word rather than the contextually correct word (e.g., when presented with the stimuli /benDekaai/[*] : /tarakaari/* :: /draakSi/* : -------; the most common response was /gooDambi/* rather than /haNNu/* i.e. the stimuli 'grapes/raisins' was associated with 'cashew' rather than the category 'fruit'). They also had difficulties in naming certain objects (e.g. confusions between 'lock' and 'key'; 'thread' and 'needle').

4. *Reading and Writing Skills*

The results of qualitative analysis of the reading and writing tasks are in consonance to that reported by Prema (1997). A summary of the error patterns in both the subject groups on these tasks are as follows:

a. Syllable inventory

Majority of the TD children were fluent in reading the CV and the CCV syllables but were slow on CCCV syllable. On the other hand, children with DD were able to read the CV syllables better than either CCV or CCCV. They often ignored the vowel

[*] Transcription based on Schiffman (1979)

diacritics or had visual based errors like substitutions for all types of syllables. The same trend was followed for writing to dictation in both the subject groups.

b. CVCVCV

Performance was slightly better for words compared to non words in both groups of subjects. Reading words and non-words with CVCVCV was found to be easier than the other structures in both groups. Children with DD most often read both the words and non-words slowly in a syllable-by-syllable fashion, mostly trying to vocalize the syllable loudly. The most frequent errors include omission of vowel diacritics other than /a/, generalizing all vowel diacritics as /a/, substitution of short vowels for long vowels and substitution of visually similar meaningful words, especially while reading nonwords. It could thus be speculated that the DD group exhibited a persisting logographic type of whole word reading, relying on semantic cues when non-word stimuli are presented. However, they also tended to ignore the semantic cues while reading words resulting in erroneous reading of words. The errors on writing were similar to those observed for reading including substitution of unaspirated sounds for aspirated sounds and auditorily similar sounds.

c. Polysyllables

The older TD children were able to read both polysyllabic words and non words accurately while the younger ones did not attempt the task. On the other hand, children

with DD read only the base syllables ignoring the complex consonant structure thus leading to simplification errors. Regularization of non words was observed in both groups. Similar patterns of error were observed in writing the polysyllabic words and non words.

d. Geminates

The TD group were able to read both geminated words and non words correctly, although the accuracy was reduced while reading non words. The DD group tended to ignore the geminated consonant and read as CVCVCV syllables, especially for non words (eg: /najigo/* for /najjigo/*). However, owing to the familiarity of certain words, they were able to correctly utter the geminated words despite ignoring the geminated structure while attempting the word in a syllable by syllable fashion (eg: /a/ /pa/ /Ne/ /appaNe/*). Omission of the geminate and substitution of anuswara was more conspicuous in the writing task.

e. Arka

As in polysyllabic words, the younger children in the TD group did not attempt to read the arka stimuli. The errors in reading included omission of the arka grapheme (eg: /kaamika/* for /kaarmika/) and transposition (eg: /antarlaja/* for /antalarja/*). An interesting fact observed was that even though the children were unable to read the other arka words, most of them produced the word /karnaaTaka/* correctly which could be

attributed to the higher familiarity of the word rather than the concept of arka. They, however, failed to apply the same rule for the other words. In writing, the errors included omission of arka grapheme, transposition and also regularization of arka (eg: /karama/* for /karma/*).

f. Anuswara

The patterns of errors for anuswara were similar to those seen for arka words which included omission of the special grapheme, transposition and regularization of anuswara grapheme as /m/ (eg: /cimtane/* for /cintane/*). Another pattern of error seen was reading the special grapheme separately as /sonne/*, meaning ‘zero’ which describes the visual form of the anuswara grapheme (eg: /bh/ /sonne/ /ga/ for /bhanga/*).

Thus, on the whole, no significant qualitative differences were observed on these tasks between TD children and children with DD. However, the performance of children with DD was found to be similar to the younger TD children on most of the tasks. These findings are in agreement with that of Ramaa (1985), Karanth (1990) and Share (1996) who reported that the error patterns of older poor readers suggest that they use the same strategies as younger, normally achieving children. Children with DD were found to have greater problems on non words and also a general delay along the developmental sequence of reading and writing. Their errors ranged from inability to identify syllables and words to misreading, slow reading, substitution of visually and/or auditorily similar syllables and words.

SUMMARY AND CONCLUSIONS

The aims of the study was to compare the metalinguistic skills (metaphonology, metasemantics and metasyntax) between bilingual-biliterate (Kannada-English) children with developmental dyslexia and language age matched typically developing children. It also aimed to study the correlation of reading abilities and different metalinguistic skills (metaphonology, metasemantics and metasyntax) that contributes significantly to the acquisition of reading and writing abilities in the two groups of children.

Twenty bilingual-biliterate (Kannada-English) children with developmental dyslexia and twenty language-ages matched typically developing children were administered metalinguistic tasks (metaphonology, metasemantics and metasyntax) and reading and writing tasks. The tasks to assess metaphonology, reading and writing were taken from sections of Reading Acquisition Profile in Kannada (Prema, 1997) and tasks for the assessment of metasemantics and metasyntax were taken from Linguistic Profile Test in Kannada (Karanth, 1980). All the tasks were administered individually.

The data was treated statistically (Mixed ANOVA, Repeated measure ANOVA, Bonferroni's multiple comparisons, independent '*t*' test, Pearson's Correlation and Step-wise multiple regression) and analyzed. Qualitative analysis of the data was also carried out to compare the patterns of errors in the two groups of subjects.

The salient findings that emerged after the analyses are as follows:

- Children with developmental dyslexia performed poorer than the language age matched typically developing children on metalinguistic, reading and writing tasks.
- Children with developmental dyslexia performed poorer than the language age matched typically developing children on all the sub-domains of metalinguistics, reading and writing tasks.
- The reading and writing skills were significantly correlated with metaphonology and metasemantics in typically developing children whereas the correlation in children with developmental dyslexia was in the order of metasemantics, metaphonology and metasyntax.
- The metalinguistic skill that significantly contributed to reading and writing skills in typically developing children was metaphonology whereas metasemantics was identified as the skill that contributed significantly to reading and writing in children with developmental dyslexia.
- The pattern of errors on all tasks of metalinguistics, reading and writing was similar in the two groups of children. However, the performance of children with DD was found to be similar to the younger TD children on most of the tasks.

Thus, the present study revealed significant differences between bilingual-biliterate typically developing children and children with developmental dyslexia on metalinguistic and literacy skills. The significant contribution of metaphonology to the acquisition of reading and writing and also a higher correlation between the two in a

semi-syllabic script in typically developing children exposed to an alphabetic script simultaneously, implies the cross linguistic transfer of these skills across different orthographic systems (alphabetic and semi-syllabic in the present study). In contrast, the contribution of metasemantics was higher in children with developmental dyslexia leading to the speculation of persistent logographic type of reading in this population. Thus, the metalinguistic skills were found to have a significant role in the acquisition of reading and writing in both the groups of children. Overall, the performance of children with developmental dyslexia resembled that of younger typically developing children on all tasks of metalinguistics, reading and writing.

Recommendations for Future

- The metalinguistic abilities can be studied in various subgroups of developmental dyslexia to facilitate comprehensive understanding of the nature of metalinguistic deficits in this population.
- The study can be replicated in bilingual-biliterate children in different languages using similar tools (E.g., Malayalam-English, Hindi-English etc) which would help in understanding the cross linguistic transfer of metalinguistic skills and orthographic principles in the other semi-syllabic scripts.
- Investigations can also be carried out in both languages for bilingual biliterate children using parallel tools to assess metalinguistics, reading and writing skills (E.g. Assessments in both Kannada and English).

REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge MA: MIT Press.

Adams, M. J., Treiman, R., & Pressley, M. (1998). Reading, writing, and literacy. In I. E. Sigel, & K. A. Renninger (Eds.), *Handbook of child psychology* (5th ed., Vol. 4, pp. 275–355). New York: Wiley.

Alexander, A., Anderson, H., Heilman, P. C., Voeller, K. S., & Torgesen, J. K. (1991). Phonological awareness training and remediation of analytic decoding deficits in a group of severe dyslexics. *Annals of Dyslexia, 41*, 193-206.

Anitha, N. (1995) *Orthography and learning to read: A comparative study of English and Kannada*. Unpublished Master's Dissertation submitted to the University of Mysore, Mysore.

Applebee, A., Langer, J., Mullis, I., & Jenkins, L. (1990). The writing report card, 1984–88. Findings from the nation's report card. *The National Assessment of Education Progress*. Princeton, NJ: Educational Testing Service.

Ball, E. W., & Blachman, B. A. (1991). Does phoneme awareness training in kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly, 24*(1), 49-66.

Bartlett, T. (2003, January 3). Why Johnny can't write, even though he went to Princeton. *Chronicle of Higher Education, 49,* A39.

Bentin, S., Deutsch, A., & Liberman, I. Y. (1990). Syntactic competence and reading ability in children. *Journal of Experimental Child Psychology, 48*, 147-172.

Bentin, S., & Leshem, H. (1993). On the interaction between phonological awareness and reading acquisition: It's a two way street. *Annals of Dyslexia, 43,* 125-148.

Ben Zeev, S. (1977). The influence of bilingualism on cognitive strategy and cognitive development. *Child Development, 48*, 1009-1018.

Berninger, V. W. (2006). A developmental approach to learning disabilities. In W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 4: *Child Psychology in Practice*, pp. 420-452). New York, NY: John Wiley & Sons, Inc.

Bernstein, D. K., & Tiegerman-Faber, E. (2002). *Language and communication disorders in children* (5th ed.). Boston, MA: Allyn & Bacon.

Bertelson, P., Morais, J., Alegria, J., & Content, A. (1985). Phonetic analysis capacity and learning to read. *Nature, 313*, 73-74.

Bialystok, E. (1986). Factors in the growth of linguistic awareness. *Child Development, 57*, 498–510.

Bialystok, E. (1991). Letters, sounds, and symbols: Changes in children's understanding of written language. *Applied Psycholinguistics, 12*, 75–89.

Bialystok, E. (2001a). *Bilingualism in development: Language, literacy, and cognition*. New York: Cambridge University Press.

Bialystok, E. (2001b). The metalinguistic aspects of bilingual processing. *Annual Review of Applied Linguistics, 21*, 169–181.

Bialystok, E. (2007). Acquisition of literacy in bilingual children: A framework for research. *Language Learning 57* (s1), 45–77.

Bialystok, E., Shenfield, T., & Codd, J. (2000). Languages, scripts, and the environment: Factors in developing concepts of print. *Developmental Psychology, 36*, 66–76.

Blackmore, M. A., Pratt, C., & Dewsbury, A. (1995). The use of props in a syntactic awareness task. *Children Language, 22*, 405-421.

Bohannon, J. N., Warren-Leubecker, A., & Hepler, N. (1984).Word order awareness and early reading. *Child Development, 55*, 1541–1548.

Boudreau, D., & Hedberg, N. (1999). A comparison of early literacy skills in children with specific language impairment and their typically developing peers. *American Journal of Speech-Language Pathology, 8*, 249-260.

Bowey, J. A. (1986a). Syntactic awareness and verbal performance from preschool to fifth grade. *Journal of Psycholinguistic Research, 15* (4), 285-308.

Bowey, J. A. (1986b). Syntactic awareness in relation to reading skill and ongoing reading comprehension monitoring. *Journal of Experimental Child Psychology, 41* (2), 282-299.

Bowey, J. A. (1994). Grammatical awareness and learning to read: A critique. In E. M. H. Assink (Ed.), *Literacy acquisition and social context* (pp. 122-149). London: Harvester-Wheatsheaf.

Bowey, J. A., & Tunmer, W. E. (1984). Word awareness in children. In W. E. Tunmer, C. Pratt, & M. L. Herriman (Eds.), *Metalinguistic awareness in children: Theory, research, and implications* (pp. 73–91). New York: Springer-Verlag.

Bradley, L., & Bryant, P. E., (1983). Categorizing sounds and learning to read: A causal connection. In B. Gelder, & J. Morais (Ed.) *Speech and reading - A comparative approach* (pp. 249-264). Erlbaum, U.K. 1994.

Bradley, L., & Bryant, P. E. (1985). *Rhyme and reason in reading and spelling*. Ann Arbor: University of Michigan Press.

Brady, S., & Shankweiler, D. (1991). *Phonological processes in literacy*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Byrne, B. (1981a). Reading disability, linguistic access and short-term memory: Comments prompted by Jorm's review of developmental dyslexia. Australian *Journal of Psychology, 33* (1), 83-95.

Byrne, B. (1981b). Deficient syntactic control in poor readers: Is a weak phonetic memory code responsible? *Applied Psycholinguistics, 2*, 201-212.

Byrne, B. (2001). Reading acquisition. In N. E. Jackson, & M. Coltheart (Eds.). *Routes to reading success and failure* (pp. 93-124). USA: Taylor and Francis, 2001.

Butler, K., & Silliman, E. (2002). *Speaking, reading and writing in children with language learning disabilities*. Mahwah NJ: Erlbaum.

Cairns, H. S., Schlisselberg, G., Waltzman, D., & McDaniel, D. (2006). Development of a metalinguistic skill: Judging the grammaticality of sentences. *Communication Disorders Quarterly, 27*(4), 213-221.

Cairns, H. S., Waltzman, D. E., & Schlisselberg, G. (2004). Detecting the ambiguity of sentences: Relationship to early reading. *Communication Disorders Quarterly, 25(*2), 68–78.

Cardoso-Martins, C. (2001). The reading abilities of beginning readers of Brazilian Portugese: Implications for a theory of reading acquisition. *Scientific Studies of Reading, 5*, 289–317.

Carlisle, J. F. (1987). The use of morphological knowledge in spelling derived forms by learning-disabled and normal students. *Annals of Dyslexia, 37*, 90-108.

Catts, H. W., & Kamhi, A. G. (1986). The linguistic basis of reading disorders. *Language, Speech and Hearing Services in Schools, 17*, 329-334.

Catts, H. W., & Kamhi, A. G. (1999). Causes of reading disabilities. In H. W. Catts, & A. G. Kamhi (Eds.), *Language and reading disabilities* (pp. 95-127). Boston, MA: Allyn & Bacon.

Cazden, C. B. (1972). *Child language and education*. Holt, Rinehart and Winston: N.Y.

Chandrika, S. (1990). *Metaphonological awareness and reading acquisition in Kannada.* Unpublished Master's Dissertation submitted to the University of Mysore, Mysore.

Chard, D. J., & Dickson, S.V. (1999). Phonological awareness: Instructional and assessment guideline. *Intervention in School and Clinic, 34*, 261-270.

Chesnick, M., Menyuk, P., D'Agostino, R., & Belanger, A. (1992). *Development of metalinguistic skills in children of varying language abilities*. Paper presented at the American Speech-Language and Hearing Association Convention, November, 1992.

Clark, E. V. (1978). Awareness of language: Some evidence from what children say and do. In A. Sinclair, R. J. Jarvella, & W. J. Levelt (Eds.), *The child's conception of language* (pp. 17–43). New York: Springer-Verlag.

Cossu, G., Shankweiler, D., Liberman, I. Y., Katz, L., & Tola, G. (1988). Awareness of phonological segments and reading ability in Italian children. *Applied Psycolinguistics, 9*, 1-16.

Critchley, M. (1970). *The dyslexic child* (2nd ed.). London: Hienemann Medical.

Cutinho, J. (2000). *Early metalinguistic skills: A comparative study between normal and learning disabled children*. Unpublished Master's Dissertation submitted to the University of Mangalore, Mangalore.

Dash, U. N., & Mishra, H. C. (1992). Bilingualism and metalinguistic development: Evidence from Kond tribal culture. *Psychological Studies. 37*, 81-87.

Deacon, S. H., & Kirby, J. R. (2004). Morphological awareness: Just ''more phonological''? The roles of morphological and phonological awareness in reading development. *Applied Psycholinguistics, 25*, 223–238.

de Manrique, A. M. B., & Gramigna, S. (1984). Cited in Ibrahim, R., Eviatar, Z., & Aharon-Peretz, J. (2007). Metalinguistic awareness and reading performance: A cross language comparison. *Journal of Psycholinguistic Research, 36*(4), 297-317.

Dermont, E., & Gombert, J. E. (1996). Phonological awareness as a predictor of recoding skills and syntactic awareness as a predictor of comprehension skills. *British Journal of Educational Psychology, 66*, 315–332.

Donaldson, M. (1976). The development of conceptualization. In V. Hamilton, & M. D. Vernon (Eds.), *The development of cognitive processes* (pp. 277-303). London: Academic Press.

Doyle, A., Champagne, M., & Segalowitz, N. (1978). Some issues on the assessment of linguistic consequences of early bilingualism. In M. Paradis (Ed.), *Aspects of bilingualism* (pp. 13-20). Colombia, SC: Hornbeam Press.

Edwards, D., & Christophersen, H. (1988). Bilingualism, literacy and metalinguistic awareness in preschool children. *British Journal of Developmental Psychology, 6*, 235-244.

Ehri, L. C. (1978). Beginning reading from a psycholinguistic perspective: Amalgamation of word identities. In F.B. Murray (Ed.), *The development of the reading process*, International Reading Association Monograph (No. 3). Newark, Del.: International Reading Association, pp. 1-33.

Ehri, L. C., Nunes, S. R., Willows, D. M., Schuster, B. V., Yaghoub-Zadeh, Z., & Shanahan, T. (2001). Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panels' meta-analysis. *Reading Research Quarterly, 36*, 250–287.

Flavell, J. H. (1985). *Cognitive development*. Englewood Cliffs, NJ: Prentice-Hall.

Fletcher, J. M., Foorman, B. R., Shaywitz, S. E., & Shaywitz, B. A. (1999). Conceptual and methodological issues in dyslexia research: A lesson for developmental disorders. In H. Tager- Flusberg (Ed.), *Neurodevelopmental disorders* (pp. 271–306). Cambridge, MA: MIT Press.

Fowler, A. E. (1991). How early phonological development might set the stage for phoneme awareness. In S. A. Brady, & D. P. Shamkweiler (Eds.), *Phonological processes in literacy*. Hillsdale, NJ: Lawrence Erlbaum.

George, N. (2001). *Language skills in Malayalam speaking learning disabled children*. Unpublished Master's Dissertation submitted to the University of Mangalore, Mangalore.

Geva, E., & Wade-Woodlley, L. (1998). Component processes in becoming English-Hebrew biliterate. In A. Y. Durgunoglu, & L. Verhoeven (Eds.), *Literacy development in a multilingual context: Crosscultural perspectives* (pp. 85–110). Mahwah, NJ: Lawrence Erlbaum Associates.

Gleitman, L. R. (1985). Orthographic resources affect reading acquisition if they are used. *Remedial and Special Education, 6*, 24–36.

Gleitman, H., & Gleitman, L. R. (1979). Language use and language judgement. In C. J. Fillmore, D. Kempler, & W. S. Wang (Eds.), *Individual differences in language ability and behaviour* (pp. 103–126). New York: Academic Press.

Gombert, J. E. (1992). *Metalinguistic development*. Chicago: University of Chicago Press.

Gonzalez, M. R. O., Espinel, A. G., & Rosquete, R. G. (2002). Remedial interventions for children with reading disabilities: Speech perception- An effective component in phonological training? *Journal of Learning Disabilities, 35*(4), 334-342.

Goodman, K. S. (1969). Reading: A psycholinguistic guessing game. In H. Singer, & R. B. Ruddell (Eds.), *Theoretical models and processes of reading.* Newark Del, IRA, 1976 (c).

Goswami, U. (1999). The relationship between phonological awareness and orthographic representation in different orthographies. In M. Harris & G. Hatano (Eds.), *Learning to read and write: A cross-linguistic perspective* (pp. 134–156). Cambridge, Massachusetts: Cambridge University Press.

Goswami, U., & Bryant, P. (1990). *Phonological skills and learning to read*. East Sussex, UK: Lawrence Erlbaum Associates.

Gottardo, A., Yan, B., Siegel, L., & Wade-Woolley, L. (2001). Factors related to English reading performance in children with Chinese as a first language: More evidence of cross-language transfer of phonological processing. *Journal of Educational Psychology, 93,* 530–542.

Grieve, R., Tunmer, W. E., & Pratt, C. (1983). Language awareness in children. In M. Donaldson, R. Grieve, & C. Pratt (Eds.), *Early childhood development and education*. Oxford: Blackwell.

Hakes, D. T. (1980). *The development of metalinguistic abilities in children*. Berlin: Springer-Verlag.

Hatcher, P. J., Hulme, C., & Ellis, A. (1994). Ameliorating early reading failure by integrating the teaching of reading and phonological skills: The phonological linkage hypothesis. *Child Development, 65*, 41-57.

Hickmann, M. (1985). Metapragmatics in child language. In E. Mertz, & R. J. Parmentier (Eds.), *Semiotic mediation: Sociocultural and psychological perspectives* (pp. 177–201). New York: Academic Press.

Hodgson, J. (1992). The status of metalinguistic skills in reading development. *Journal of Learning Disabilities, 25*(2), 96-101.

Homer, B. D., & Olson, D. R. (1999). Literacy and children's conception of words. *Written Language and Literacy, 2*, 113–140.

Hornberger, N. H. (1994). Continua of biliteracy. In B. M. Ferdman, R. Weber, & A. G. Ramirez (Eds.), *Literacy across languages and cultures* (pp. 103-139). Albany, NY: State University of New York Press.

Jackson, N. E., & Coltheart, M. (2001). *Routes to reading success and failure: Toward an integrated cognitive psychology of atypical reading*. New York, NY: Psychology Press.

Jannuzi, C. (1998). Key concepts in FL literacy: Phonemic awareness. *Literacy Across Cultures, 2*(1), 7-12.

Jarmulowicz, L., Hay, S. E., Taran, V. L., & Ethington, C. A. (2008). Fitting derivational morphophonology into a developmental model of reading. *Reading and Writing: An Interdisciplinary Journal*, *21*, 275–297.

Jayaram, M. (1986). Sound and syllable distribution in written Kannada and their application to Speech and Hearing. *Journal of All India Institute of Speech and Hearing, 16-17*, 19-30.

Jayaram, G. (1998). *Identification and assessment of reading disability in children: An information processing model*. Unpublished Doctoral Thesis submitted to the University of Mysore, Mysore.

Kamhi, A., Lee, R., & Nelson, L. (1985). Word, syllable, and sound awareness in language disordered children. *Journal of Speech and Hearing Disorders, 50*, 207-212.

Karanth, P. (1980). *Linguistic Profiles Test in Kannada*. Indian Council of Medical Research Project, India.

Karanth, P. (1981). Pure alexia in a Kannada English bilingual. *Cortex, 17*, 187-198.

Karanth, P. (1985). Dyslexia in a Dravidian language. In K. E. Patterson, J. C. Marshall, & M. Coltheart (Eds.), *Surface Dyslexia* (pp. 251-259). London: Lawrence-Erlbaum Associates.

Karanth, P. (2008). Learning disability and language learning. In K. Thapa, G. M. Aalsvoort, & J. Pandey (Eds.), *Perspectives on learning disabilities in India* (pp. 80-96). Los Angeles: Sage.

Karanth, P., Gandhi, R., & Usha, K. R. (1984). *Language disorders in Indian neurological patients: A study in neurolinguistics in the Indian context*. Project No 5/8/101 (oto)/84-NCD-IRIS Cell. New Delhi: Indian Council of Medical Research.

Karanth, P., Kuduva, A., & Vijayan, A. (1995). Literacy and linguistic awareness. In B. de Gelder, & J. Morais (Eds.), *Speech and reading: A comparative approach*. London: Erlbaum.

Karanth, P. & Prakash, P. (1996). *A developmental investigation of onset, progress and stages in the acquisition of literacy*. Project funded by NCERT, India.

Karanth, P., & Suchitra, M. G. (1993). Literacy acquisition and grammaticality judgement in children. In R. J. Scholes (Ed.), *Literacy and language analysis* (pp. 143-155). London: Lawrence - Erlbaum Associates.

Karmiloff-Smith, A. (1986). From meta-processes to conscious access: Evidence from children's metalinguistic and repair data. *Cognition, 23*, 95-147.

Karmiloff-Smith, A. (1992). Beyond modularity: A developmental perspective on cognitive science. Cambridge, MA: MIT Press/Bradford books.

Katz, L., & Frost, R. (1992). Reading in different orthographies: The orthographic depth hypothesis. In R. Frost, *Prelexical and post lexical strategies in reading. Evidence from a deep and shallow orthography*, Status Report on Speech Research, SR-113, Haskins Lab, 153-170.

Koda, K. (1997). Orthographic knowledge in L2 lexical processing: A cross-linguistic perspective. In J. Coady, & T. Huckin (Eds.), *Second language vocabulary acquisition* (pp. 35-52). New York: Cambridge University Press.

Koda, K. (2008). Impact of prior literacy experience on second-language learning to read. In K. Koda, & A. Zehler (Eds.), *Learning to read across languages: Cross-linguistic relationships in first- and second-language literacy development* (pp. 68-96). New York, NY: Cambridge University Press.

Kolers, P. A. (1975). Three stages of reading acquisition. In M. Mason, From print to sound in mature readers as a function of reader ability and two forms of orthographic regularities. *Memory and Cognition, 6*(5), 1978, 568-581.

Kurland, B. F., & Snow, C. E. (1997). Longitudinal measurement of growth in definitional skill. *Journal of Child Language, 24*, 603–625.

Layton, A., Robinson, J., & Lawson, M. (1998). The relationship between syntactic awareness and reading performance. *Journal of Research in Reading, 21*, 5-23.

Lewis, F. M., Murdoch, B. E., & Woodyatt, G. C. (2007). Communicative competence and metalinguistic ability: Performance by children and adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 37*, 1525–1538.

Liberman, I., Liberman, A. M., Mattingly, I. & Shankweiler, D. (1980). Orthography and the beginning reader. In R. L. Venezky, & J. F. Kavanagh (Eds), *Orthography, reading, and dyslexia* (pp. 137–153). Baltimore, MD: University Park Press.

Liberman, I. Y., & Shankweiler, D. (1985). Phonology and the problems of learning to read and write. *Remedial and Special Education, 6* (6), 8-17.

Liberman, I. Y., & Shankweiler, D. (1991). Phonology and beginning reading: A tutorial. In L. Rieben, & C. A. Perfetti (Eds.), *Learning to read: Basic research and its implications*. Hillsdale, NJ: Lawrence Erlbaum.

Liberman, I. Y., Shankweiler, D., Fischer, F. W., & Carter, B. (1974). Explicit syllable and phoneme segmentation in the young child. *Journal of Experimental Child Psychology, 18,* 201–212.

Liberman, I. Y., Shankweiler, D., Liberman, A. M., Fowler, C, & Fischer, F. W. (1977). Phonetic segmentation and recoding in the beginning reader. In A. S. Reber, & D. L. Scarborough (Eds.), *Toward a psychology of reading: The Proceedings of the CUNY Conferences* (pp. 207-225). Hillsdale, NJ: Erlbaum

Liow, S. J. R., & Lee, L. C. (2004). Metalinguistic awareness and semi-syllabic scripts: Children's spelling errors in Malay. *Reading and Writing: An Interdisciplinary Journal, 17,* 7–26.

Lundberg, I. (1978). Aspects of linguistic awareness related to reading. In A. Sinclair, R. J. Jarvella, & W. J. M. Levelt (Eds.), *The child's conception of language* (pp. 83-96). Berlin: Springer-Verlag.

Lyon, R., Shaywitz, S., & Shaywitz, B. (2003). A definition of dyslexia. *Annals of Dyslexia, 53,* 1–14.

Mattingly, I. (1972). Reading, the linguistic process, and linguistic awareness. In J. Kavanagh, & I. Mattingly (Eds.), *Language by ear and by eye*. Cambridge, Massachusetts: MIT Press.

Menyuk, P. (1993). Children with specific language impairment (developmental dysphasia): Linguistic aspects. In G. Blanken, J. Dittmann, H. Grimm, J. Marshall, & C. Wallesch (Eds.), *Linguistic disorders and pathologies: An international handbook* (pp: 606-625). Berlin: de Gruyter.

Menyuk, P., Chesnick, M., Liebergott, J. W., Korngold, B., D'Agostino, R., & Belanger, A. (1991). Predicting reading problems in at-risk children. *Journal of Speech and Hearing Research, 34* (4), 893-903.

Metsala, J. L., & Walley, A. C. (1997). Spoken vocabulary growth and the segmental restructuring of lexical representations: Precursors to phonemic awareness and

early reading ability. In L. Ehri & J. L. Metsala (Eds.), *Word recognition in beginning literacy* (pp. 89–120). Mahwah, NJ: Erlbaum.

Miller, L. (1990). The roles of language and learning in the development of literacy. *Topics in Language Disorders, 10*, 1-24.

Mohanty, A., & Goel, S. K. (1990). *Relationship of reading comprehension with metalinguistic skills in children*. I.J.D.R, 95-102.

Mora, J. K. (2001). Learning to spell in two languages: Orthographic transfer in a transitional Spanish/English bilingual program. In P. Dreyer (Ed.), *Raising scores, raising questions: Claremont Reading Conference 65th yearbook*, (pp. 64-84). Claremont, CA: Claremont Graduate University.

Morais, J. (1991 a). Constraints on the development of phonemic awareness. In S. A. Brady, & D. P. Shankweiler (Eds.), *Phonological process in literacy: A Tribute to I.Y. Liberman* (pp. 5-27). Hillsdale, N.J: Erlbaum.

Morais, J. (1991b). Phonological awareness: A bridge between language and literacy. In D. Sawyer & B. Fox (Eds.), *Phonological awareness in reading: The evolution of current perspectives*, (pp. 31-71). New York: Springer-Verlag.

Morais, J., Alegria, J., & Content, A. (1987). The relationship between segmental analysis and alphabetic literacy: An interactive view. *European Bulletin of Cognitive Psychology*, *7*, 415–438.

Morrison, F. J. (1993). Phonological processes in reading acquisition: Toward a unified conceptualization. *Developmental Review*, *13*, 279–285.

Muter, V., & Snowling, M. (1997). Grammar and phonology predict spelling in middle childhood. *Reading and Writing, 9*, 407–425.

Muter, V., & Snowling, M. (1998). Concurrent and longitudinal predictors of reading: The role of metalinguistic and short-term memory skills. *Reading Research Quarterly*, *33*(3), 320–337.

Nagy, W. (2007). Metalinguistic awareness and the vocabulary-comprehension connection. In R. K. Wagner, A. E. Muse, & K. R. Tannenbaum (Eds.), *Vocabulary acquisition: Implications for reading* (pp. 52-77). New York: Guilford.

Nation, K., & Snowling, M. J. (2000). Factors influencing syntactic awareness skills in normal readers and poor comprehenders. *Applied Psycholinguistics*, *21*, 229–241.

Ninio, A., & Snow, C. E. (1996). *Pragmatic development*. Boulder, CO: Westview Press.

Nippold, M. A., & Rudzinski, M. (1993). Familiarity and transparency in idiom explanation: A developmental study of children and adolescents. *Journal of Speech and Hearing Research, 36*(4), 728–737.

Odlin, T. (1989). *Language transfer: Cross-linguistic influence in language learning*. New York, NY: Cambridge University Press.

Olson, D. R. (1994). *The world on paper*. Cambridge: Cambridge University Press.

Padakannaya, P., Rekha, D., Vaid, J., & Joshi, M. (2002). *Simultaneous acquisition of literacy skills in English and Kannada: A longitudinal study*. Paper presented at 13th World Congress of Applied Psycholinguistics (AILA), Singapore (December).

Patel, P. G. & Soper, H. V. (1987) Acquisition of reading and spelling in a syllabo-alphabetic writing system. *Language and Speech, 30*, 69-81.

Pathak, R. S. (1988). Error analyses of an Indian corpus. *Indian Journal of Applied Linguistics, 14*(2), 59-72.

Pennington, B. & Olson, R. (2005). Genetics of dyslexia. In M. Snowling, & C. Hulme (Eds.), *The science of reading: A handbook*. Malden, MA: Blackwell.

Perera, K. (1986). Language acquisition and writing. In P. Fletcher, & M. Garman (Eds.), *Language acquisition: Studies in first language acquisition* (2nd ed., pp. 494–519). Cambridge, UK: Cambridge University Press.

Perfetti, C. A. (1986). Cognitive and linguistic components of reading ability. In B. R. Foorman, & Siegel, A. W. (Eds.), *Acquisition of reading skills: Cultural constraints and cognitive universals* (pp. 1-40). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Ponnumani. S., & Prema K.S. (2008). *Remediation manual in Malayam (Rem-Mal).* Student Research at AIISH, Mysore, Vol 1: 2002-2003. AIISH, Mysore, pp. 168-179.

Prakash, P. (1987). *Reading development, metalinguistic awareness and cognitive processing skills*. Unpublished Doctoral dissertation submitted to the University of Utkal, Utkal.

Prakash, P. (1999). Reading disability and knowledge of orthographic principles. *Psychological Studies, 44*, 59-64.

Prakash, P. (July, 2002). *Reading and writing in non alphabetic and non ideographic orthography: The case of Kannada*. Paper presented at the Symposium on Learning to read and write in nonalphabetic script. International Applied Psychology Conference 2002 (July), Singapore.

Prakash, P., Chandana, M. V., & Suma, S. (2001). *Orthographic awareness, phonemic awareness and developmental dyslexia.* Paper presented at the Society for Scientific Study of Reading (SSSR) conference (May 29-June 3), Colorado, U.S.

Prakash, P., & Joshi, R. M. (1989). Language representation in Kannada - a south Indian language. In P. G. Aaron, & R. M. Joshi (Eds.), *Reading and writing disorders in different orthographic systems*. London: Kluwer Academic Publishers.

Prakash, P., & Rekha, B. (1992). Phonological awareness and reading acquisition in Kannada. In A. K. Srivastava (Ed.), *Researches in child and adolescent psychology* (pp. 47-52). New Delhi, India: NCERT.

Prakash, P., Rekha, D., Nigam, R., & Karanth, P. (1993). Phonological awareness, orthography, and literacy. In R. J. Scholes (Ed.), *Literacy and language analysis* (pp. 55–70). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Pratt, C., Tunmer, W. E., & Bowey, J. A. (1984). Children's capacity to correct grammatical violations in sentences. *Journal of Child Language, 11*, 129-41.

Prema, K. S. (1997). *Reading Acquisition Profile in Kannada*. Unpublished Doctoral dissertation submitted to the University of Mysore, Mysore.

Prema K. S. & Jayaram M. (2002). *Investigation of reading skills in children with reading disability: Indian perspective.* Unpublished project report. Project funded by AIISH Research Fund (ARF/Sp. Path-2/KSP/15-09-2001 to 26-07-2002), All India Institute of Speech and Hearing, Mysore, India.

Purushothama, G. (1988). Sequencing and orientation difficulties in reading Kannada. *Perceptual and Motor Skills, 66*, 10-11.

Purushothama, G., Jagadish, A., Kumar, P. J. (1986). Distinctive features of Kannada alphabet. *Journal of All India Institute of Speech and Hearing, 16-17*, 87-98.

Ramaa, S. (1985). *Diagnosis and remediation of dyslexia- An attempt.* Unpublished Doctoral dissertation submitted to the University of Mysore, Mysore.

Rekha, D. (1987). *A Study on development of reading and phonological awareness in Kannada speaking children*. Unpublished Master's Dissertation submitted to the University of Mysore, Mysore.

Rekha, D. (1996). *Reading acquisition and metaphonological awareness: A longitudinal study*. Unpublished Doctoral dissertation submitted to the University of Mysore, Mysore.

Reynolds, A. (1991). The cognitive consequences of bilingualism. In A. G. Reynolds (Ed.), *Bilingualism, multiculturalism, and second language learning: The*

McGill conference in honor of Wallace E. Lambert (pp. 145–182). Hillsdale, NJ: Erlbaum.

Rubin, H., Patterson, P. A., & Kantor, M. (1991). Morphological development and writing ability in children and adults. *Language, Speech, and Hearing Services in Schools, 22*, 228-235.

Rutter, M., & Yule, W. (1975). The concept of specific reading retardation. *Journal of Child Psychology and Psychiatry, 16*, 181-197.

Scarborough, H. S. (1998). Early identification of children at risk for reading disabilities: Phonological awareness and some other promising predictors. In B. K. Shapiro, P. J. Accardo, & A. J. Capute (Eds.), *Specific reading disability: A view of the spectrum* (pp. 77–121). Timonium, MD: York Press.

Schiffman, H. (1979). *A Reference Grammar of Spoken Kannada*. Final report, U.S. Department of Health.

Scholl, D. M., & Ryan, E. B. (1980). Development of metalinguistic performance in the early school years. *Language and Speech, 23*, 199–211.

Schwartz, M., Leikin, M., & Share, D. L. (2005). Bi-literate bilingualism versus mono-literate bilingualism: A longitudinal study of reading acquisition in Hebrew (L2) among Russian-speaking (L1) children. *Written Language and Literacy, 8*, 179–207.

Schwartz, M., Geva, E., Share, D. L., & Leikin, M. (2007). Learning to read in English as third language: The cross-linguistic transfer of phonological processing skills. *Written Language & Literacy, 10*, 25-52

Schwartz, M., Leikin, M., Share, D. L., & Kozminsky, E. (2008). On the benefits of bi-literacy: Just a head start in reading or specific orthographic insights? *Reading and Writing: An Interdisciplinary Journal, 21*(9), 905-927.

Scribner, S., & Cole, M. (1981). *The psychology of literacy*. Cambridge, MA: Harvard University Press.

Shankweiler, D. (1999). Words to meaning. *Scientific Studies of Reading, 3*, 113–127.

Sharma, M. (1995). *Linguistic Profile Test (Hindi) - Normative data for children in grades I to X*. Unpublished Master's Dissertation submitted to the University of Mysore, Mysore.

Sharma, M. (2000). *Language skills in children with learning disability*. Unpublished Master’s Dissertation submitted to the University of Mangalore, Mangalore.

Sheung, T. K. (1998). *Syntactic awareness and language development of Cantonese-speaking children.* Unpublished Bachelor's Dissertation submitted to the University of Hong Kong.

Shilpashree H.N., & Prema K.S. (2008). *Children with reading disability: A Remedial manual on metaphonological skills in Kannada (Rem-Kan)*. Student Research at AIISH, Mysore, Vol 1I: 2003-2004. AIISH, Mysore, pp. 194-206.

Siegel, L. S., & Ryan, E. B. (1988). Development of grammatical-sensitivity, phonological and short-term memory skills in normally achieving and subtypes of learning disabled children. *Developmental Psychology, 24*, 28-37.

Sinclair, A. (1981). Thinking about language - An interview study of children aged 8-11. In D. G. Doehring, P. G. Patel, R. L. Trites, & C. A. M. Fiedorowicz (Eds.), *Reading disabilities -The interaction of reading, language and neuropsychological deficits*. New York: Academic Press.

Smith, F. (1971). *Understanding reading.* N.Y: Holt, Rinehart and Winston Inc.

Snow, C. E., (1990). The development of definitional skill. *Journal of Child Language, 17*, 697–710.

Snow, C. E., Cancini, H., Gonzalez, P., & Shriberg, E. (1989). Giving formal definitions: An oral language correlate of school literacy. In D. Bloome (Ed.), *Classrooms and literacy* (pp. 233–249). Norwood, NJ: Ablex.

Snowling, M., & Hulme, C. (1994). The development of phonological skills. *Transactions of the Royal Society, B346*, 21–28.

Snyder, L., & Downey, D. (1991). The language-reading relationship in normal and reading-disabled children. *Journal of Speech and Hearing Research, 34*, 129-140.

Srivastava, R.N. (1979). *The teaching of reading- Studies in education and teaching techniquies*. N.D. India: Bahri Publications Pvt. Ltd.

Stahl, S. A., & Murray, B. A. (1998). Issues involved in defining phonological awareness and its relation to early reading. In J. L. Metsala, & L. C. Ehri (Eds.), *Word recognition in beginning literacy* (pp. 65–89). Mahwah, NJ: Erlbaum.

Stanovich, K. E. (1993). A model for studies of reading disability. *Developmental Review, 13*, 225–245.

Stanovich, K. E. (2000). *Progress in understanding reading: Scientific foundations and new frontiers.* New York: Guilford Press.

Stein, C. L., Cairns, H. S., & Zurif, E. B. (1984). Sentence comprehension limitations related to syntactic deficits in reading-disabled children. *Applied Psycholinguistics, 5* (4), 305-322.

Sunitha, N. (1995). *A study on reading disability in Kannada*. Unpublished Master's Dissertation submitted to the University of Mysore, Mysore.

Tabors, P. O., Snow, C. E., & Dickinson, D. K. (2001). Home and schools together: Supporting language and literacy development. In D. K. Dickinson, & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and school* (pp. 313–334). Baltimore: Paul H. Brookes.

Tunmer, W. E. (1989). The role of language related factors in reading disability. In D. Shankweiler & I. Y. Liberman (Eds.), *Phonology and reading disability: Solving the reading puzzle, International Academy for Research in Learning Disabilities Monograph, (6)* (pp. 91–132). Ann Arbor, MI: University of Michigan Press.

Tunmer, W. E. (1991). Phonological awareness and literacy acquisition. In L. Rieben, & C. Perfetti (Eds.), *Learning to read: Basic research and its implications*. Hillsdale, NJ: Lawrence Erlbaum.

Tunmer, W. E. & Bowey, J. A. (1980). The development of word segmentation skills in children. In A. R. Nesdale, C. Pratt, R. Grieve, J. Field, D. Fillingworth, & J. Hogben (Eds.), *Advances in child development: Theory and research*. Perth, W. A: NCCD.

Tunmer, W. E., & Bowey, J. A. (1984). Metalinguistic awareness and reading acquisition. In W. E. Tunmer, C. Pratt, & M. L. Herriman (Eds.), *Metalinguistic awareness in children: Theory, research, and implications* (pp. 144-168). Berlin: Springer-Verlag.

Tunmer, W. E., & Cole, P. G. (1985). Learning to read: A metalinguistic act. In C. S. Simon (Ed.), *Communication skills and classroom success: Therapy methodologies for language-learning disabled students* (pp.293-312). London: Taylor and Francis.

Tunmer, W. E., & Hoover, W. (1992). Cognitive and linguistic factors in learning to read. In P. B. Gough, L. C. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 175-214). Hillsdale, NJ: Erlbaum.

Tunmer, W. E., Herriman, M. L., & Nesdale, A. R. (1988). Metalinguistic abilities and beginning reading. *Reading Research Quarterly, 2*, 134–158.

Tunmer, W. E., & Nesdale, A. R. (1986). Phonemic segmentations kill and beginning reading. *Journal of Educational Psychology, 77*, 417-427.

Tunmer, W. E., Nesdale, A. R., & Wright, A. D. (1987). Syntactic awareness and reading acquisition. *The British Journal of Developmental Psychology, 5* (1), 25-34.

Tunmer, W. E., Pratt, C., & Herriman, M. L. (1984). *Metalinguistic awareness in children*. New York: Springer – Verlag.

Valtin, R. (1984). Awareness of features and functions of language. In J. Downing, & R. Valtin (Eds.), *Language awareness and learning to read.* N.Y: Springer-Verlag.

Van Kleeck, A. (1982). The emergence of linguistic awareness: a cognitive framework. *Merrill-Palmer Quarterly, 28*, 237-65.

Van Kleeck, A. (1984). Assessment and intervention. Does "meta" matter? In E. Wallach, & K. G. Butler (Eds.), *Language learning disabilities in school-age children* (pp. 179-199). Baltimore: Williams & Wilkins.

Van Kleeck, A. (1994). Metalinguistics development. In E. Wallach, & K. G. Butler (Eds.), *Language learning disabilities in school-age children and adolescents* (*2nd ed.).* New York: Merrill/Macmillan.

Vellutino, F. R. (1979). *Dyslexia: Theory and research*. Cambridge Massachusetts: MIT Press.

Vellutino, F. R., & Scanlon, D. M. (1987). Linguistic coding and reading ability. In S. Rosenberg (Ed.), *Advances in Applied Psycholinguistics* (2) (pp. 1-69). New York: Cambridge University Press.

Vellutino, F. R., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2004). Specific reading disability dyslexia: What have we learned in the past four decades? *Journal of Child Psychology and Psychiatry, 45,* 2–40.

Wagner, R. K., & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, 192-211.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1999). Comprehensive Test of Phonological Processes. Austin, TX: PRO-ED Publishing, Inc.

Wallach, G., & Butler, K. (1994). *Language learning disabilities in school-age children and adolescents: Some principles and applications*. Heights, MA: Allyn & Bacon.

Wallach, G. P. (2007). *Language intervention for school-age students: Setting goals for academic success* (pp.103-213). St Louis MO: Mosby/Elsevier.

Waltzman, D. E., & Cairns, H. S. (2000). Grammatical knowledge of third grade good and poor readers. *Applied Psycholinguistics, 21* (2), 263-284.

WHO Ten Questions Screen. Cited in Singhi, P., Kumar, M., Prabhjot, M, & Kumar, R. (2007). Utility of the WHO Ten Questions Screen for Disability Detection in a rural community—the north Indian experience. *Journal of Tropical Pediatrics, 53*(6): 383-387.

Wiig, E. H., & Secord, W. (1989). *Test of language competence: Expanded edition*. New York: The Psychological Corporation.

Willows, D., & Ryan, E. (1986). The development of grammatical sensitivity and its relationship to early reading achievement. *Reading Research Quarterly, 21*, 253–266.

APPENDIX 1

WHO- A TEN QUESTION DISABILITY SCREENING TEST

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

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