IDENTIFICATION AND ASSESSMENT OF READING DISABILITY IN CHILDREN : AN INFORMATION PROCESSING APPROACH

THESIS SUBMITTED TO THE UNIVERSITY OF MYSORE FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PSYCHOLOGY

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DECLARATION

I, G. JAYARAMA, declare that this thesis entitled, " IDENTIFICATION AND ASSESSMENT OF READING DISABILITY IN CHILDREN - AN INFORMATION PROCESSING APPROACH, is the outcome of the research carried out by me under the supervision of Dr. P. PRAKASH, Reader and Chairman, The Post Graduate Department of Psychology, University of Mysore, Mysore. I further declare that the thesis has been composed by me and not formed the basis for any other degree or diploma.

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Place: Mysore

CERTIFICATE

I hereby certify that this thesis entitled, IDENTIFICATION AND ASSESSMENT OF READING DISABILITY IN CHILDREN - AN INFORMATION PROCESSING APPROACH, embodies the results of bonafide research work done by Mr. G.JAYARAMA, under my guidance and direct supervision. I further certify that the work is original and the thesis or part thereof has not formed the basis for the award of any other degree or diploma.

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CHAPTER - I

1.0.0. INTRODUCTION

The present investigation deals with the identification and assessment of reading disability among children. The study was carried out in the framework of information processing approach taking developmental aspects into consideration. The study adopted a quasi-experimental design. It consisted of two groups-nameiy Children with Reading Disability and Normal Reading of Grades II, III and IV. In addition, a group of children from Grade I was included in the study with the purpose of determining the variables that help in early identification of Reading Disability.

In order to understand the nature and the various factors influencing the Reading Disability, it is desirable to have a background knowledge of reading process and its normal course of acquisition.

1.1.0. What is Reading?

The definition of reading depends on the theoretical background with which one conceives the reading process. A review of enormous researches that have been carried out in

the field of reading and Reading Disability reveals that it is a field of interdisciplinary interest with researchers from as diverse disciplines as linguistics, eduoation, psychology, speech and language etc., working. In spite of different backgrounds there seems to be a general consensus that reading, essentially, is a process of extracting meaning from print.

1.1.1. How the Reading Skill ia Acquired?

Diversified views exist among the reading researchers regarding the manner in which the reading skill is acquired. Chall (1967) in her book "Learning to Read : The Great Debate" explains that most of the approaches on reading acquisition can be roughly grouped into two categories -Code emphasis' and 'meaning emphasis' groups.

'Code emphasis' approach argues that reading will be acquired when the individual gets mastery over the alphabet of the language and this decoding skill is most essential in reading. According to this approach, the differentiation of graphic symbols from one another is the primary stage of reading, followed by forming of associations between graphic symbols and sounds. Then, one learns to pay attention to the

syntactic and semantic aspects of sentences along with the decoding process (Gough, 1972; Gough & Hillinger, 1980; LaBerge & Samuels, 1974).

'Meaning emphasis' approach stresses the importance of comprehension skill in the reading process. Reader's prior knowledge of words contributes more information to reading than the visual symbols on the printed page. As children develop reading skills, they use increasingly fewer graphic cues (Smith, 1973; Goodman, 1972). The reader uses direct route to meaning by sampling the text in order to confirm or disconfirm the expected meanings.

Another approach emphasizes the interaction between the code and the meaning. According to this, reading primarily involves a 'bottom-up' prooess in the early stage. As one acquires fluency in reading, the reading becomes a thinking process and decoding is used only in case of unfamiliar text (Chall, 1983).

Bertleson (1986) classified all the researches into three major categories -

(i) Experimental analysis of skilled reading,
(ii) Neuropsychology of acquired dyslexia,
(iii) Study of reading acquisition

The first two research traditions follow the information processing approach which employ structural models' to explain reading. The skilled reading is explained by structural models'. Acoording to these structural models, the skilled reading consists of many separate but interacting components like letter identification unit, visual word recognition unit, grapheme-phoneme conversion unit, semantic unit etc. Comprehension in reading is treated at the lexical level. As a result, studies on the nature of lexical access and lexical code, lexical decision task, word reading, non-word reading etc. gained importance. Ellis (1985) gave a schematic representation of skilled reading on the basis of information processing models in which he described that, a skilled reader has two routes from print to lexicon namely a direct route (visual route) which operates through visual analysis system, visual word recognition system, semantip and phonemic word production system. The second route is called indirect route or phonic route. This route, operates through visual analysis system and grapheme-phoneme conversion system. The direct route is employed while reading familiar words and the phonic route is used while reading non-words and unfamiliar words. It is the direct route, which is faster than phonic route, that plays important role in skilled reading.

Since, earlier studies on dyslexia did not differentiate between acquired and developmental disorders a separate developmental approach has emerged in the last decade. There are three such developmental models available in the literature: Harris and Coltheart (1986); Firth (1985); and Marsh, Friedman, Welsh and Desberg (1981). All the three are stage models and more or less similar in the postulated stages of literacy acquisition. However, Firth's model for some reasons, has gained the prominence and is the most frequently referred developmental model.

According to Firth, literacy acquisition process consists of three stages: logographic, alphabetic and orthographic stages.

Logographic skills refer to the instant recognition of familiar words. The salient graphic features may act as important cues in the process. Here a child pronounces the word after he or she recognises it. The child often guesses on the basis of contextual or fragmatic cues. This refers to, essentially, sight-vocabulary stage.

In alphabetic skills, the child acquires the knowledge and use of individual phoneme and grapheme correspondences. Being an analytical skill it involves decoding grapheme by

grapheme. Here, the letter order and phonological factors play an important role.

Orthographic skills refer to the instant analysis of words into orthographic units without phonological conversion. Here the processing units coincide with morpheme. They are internally represented as abstract letter-by-letter strings.

There are a few salient features of above model :

1. The three strategies - logographic, alphabetic and orthographic follow each other in a strict sequential order. Break through' to the next phase of development could occur if there is a merging of the old and new strategy.

2. This model presents a sequence of holistic (logographic), analytic (alphabetic) and syntactic (orthographic) type of stages in the course of literacy acquisition process.

3. It integrates both reading and writing aspects of literacy in the developmental framework.

4. It clearly differentiates between developmental and acquired dyslexia. For e.g., in failure to acquire a new strategy all the previously acquired strategies remain intact in developmental dyslexia where as, in acquired dyslexia loss of a strategy may occur regardless of the order of acquisition.

One can theoretically think of as many types of developmental dyslexia as the postulated steps in acquisition. With this basic information about reading and its acquisition let us turn to Reading Disability.

1.2.0. Reading Disability

Despite an extensive literature, reading disability in children remains to be a highly controversial field. Starting from the definition and assessment, issues related to subtyping, remediation and prognosis still remain unresolved. A confusing variety of theoretical models, test procedures, and operational definitions are being used by different investigators and clinicians. Conclusions drawn by any investigation are influenced by the nature of operational definition, the method of identification, assessment procedures and the theoretical model one adopts in the study.

Therefore an attempt has been made below to give a comprehensive account of these issues.

1.2.1. Terminology

Rutter and Yule (1975) write - "The terminology used in referring to reading difficulties is chaoctic and confusing, with descriptive words such as backwardness, illiteracy, disability and impairment vying for a place with medical terms such as dyslexia or word blindness" (p.181). This chaos stems from two reasons. The first reason ia vagueness of definitions and a general looseness in the use of words. The second reason is the diaputes about nature of the reading problems.

Broadly, two types of reading difficulties have been differentiated about the use of terminology (Rutter & Yule, 1975). The first distinction is between a failure to acquire reading skills and a loss of these skills after the initial skills have been attained. The first one refers to developmental reading difficulties and the second refers to acquired reading difficulties (frequently called as acquired dyslexia). The present study is concerned with the first category.

The second distinction is between general reading backwardness and specific reading retardation. The general reading backgwardness refers to backwardness in reading associated with problem in other spheres (may be due to mental retardation, faulty teaching methods or impoverished environment). Specific reading retardation, on the other hand, refers to specific disability in reading-specific in the sense that the reading difficulties are not explicable in terms of child's general conditions. For instance one may have average or above average intelligence, good teaching methods, enriched environments and no evidence for neurological or psychiatric disorders but still exhibit reading difficulties.

Rutter and Yule (1975) using the data from five epidemiological studies attempted to test the traditional distinction between general reading backwardness and specific reading retardation. Reading retardation was shown to differ significantly from reading backwardness in terms of sex ratio, neurological disorder, pattern of neurodevelopmental deficits and educational prognosis. They concluded that the concept of specific reading retardation is valid, but the view of a genetically distinct syndrome of dyslexia is not valid. However, the validity of this distinction between dyslexic and generally backward reader is questioned by some

researchers (Fletcher, Francis, Rourke, Shaywitz & Shaywitz, 1992; Share, McGee, McKenzie, Williams & Silva, 1987).

Recently another term has emerged for poor readers of low I.Q. - namely Garden-Variety poor reader' (Hoover A Gough, 1990) who exhibit wide ranging deficits in linguistic and cognitive functions. In a recent study on verbal and visual problems in reading disability, Eden, Stein, Wood and Wood (1995) compared three groups namely reading disabled (poor readers with average or above average I.Q), backward reader (Garden-variety) and miscellaneous group (cannot be grouped in any of the other two). They showed that Garden-variety group performed significantly worse than the Reading Disability group.

However, under this circumstances, the present study adopted the term Reading Disability to describe the children studied and avoided the term like dyslexia - which has genetic and medical connotations. The garden variety poor reader group was not included.

1.2.2. Definition

What is Reading Disability? While discuasing the issues of definition, Jorm (1979) wrote "At present there is a

considerable disagreement concerning the most appropriate nomenclature and classification of chiidren with reading problems" (p.19). In a study conducted on the subtypes of developmental dyslexia, Siegel and Ryan (1989) concluded that the particular definition of Reading Disability employed within a study is a significant determinant of the conclusions drawn regarding the cognitive functioning of the reading disability and the existence of distinctive subtypes.

Torgesen (1975) while discussing the problems and prospects in the study of Learning Disabilities described the issues involved in the measurement of reading failure. He wrote "The conceptual definition of reading disability usually describes it as a failure to learn to read despite normal intelligence and adequate instructions" (p.415). According to Torgesen, problems in defining Reading Disability operationally result from difficulties in deciding on the level of deficit which can be called a disability and from variation in the measures used to assess reading level.

The levels of deficit are often measured by two methods : The first method is Reading Grade level measurement i.e. if the Reading Grade level is behind their actual grade level by a specified number of yearB (generally a discrepancy of two years) children will be called reading disabled. The

second method frequently being used is the use of deviation scores. Here those who score below one or two SDs from the group mean are arbitrarily designated as reading disabled.

Both the above methods have specific consequences. If the grade-level discrepancy is used to define the Reading Disability it results in a progressively larger population of children in each succeeding grade level who are identified as failures. Data reported by Gates and MaoGinitie (1965) indicated that, for a national sample of children, a two years discrepancy is found in 2X of III graders and 30% of IX graders. Uliman (1969) suggested that even if the grade-levels behind formula is adjusted for different age levels, the percentage of children identified at each grade level as reading disabled still fluctuates significantly. Thus, there is a danger that, at different age levels, the groups of children who are identified as having reading problems may be different from one another in many important aspects.

The second method namely, the use of deviation scores to identify poor readers overcome some of the problems found in first method. But still, the method faces another kind of problem. For e.g. even though the same proportion of problem readers will be identified at each age, the use of relative

standards of achievement can lead to differences between studies in the actual level of achievement that is associated with reading failure.

At present it is not possible to decide with certainty which of these methods is the best one. But, knowledge of the limitations of each method will help the researcher to highlight the limitations of the research one undertakes and also to make comparisons between two studies.

The next area of concern in operationalising the definition of Reading Disability refers to the differences in measures of reading skill. The range of indices used to assess reading skill is large. It varies from word recognition task to comprehension tests. Commonly used index is oral reading tests (words or sentences).

In an early study by Barrett (1965), certain measures of visual discrimination predicted Reading Disability poorly when paragraph reading rather than word recognition skills were used as the criterion of reading achievement. Further, each index suffers from certain methodological problems. For e.g. the typical measures of reading comprehension', in fact, measure memory, vocabulary, attention skill and oral reading speed. When a child reads a word in a sentence

correctly we do not know if he or she has actually read the word or is making a good guess from the surrounding context.

Siegel and Ryan (1989) argued that single word or non-word reading constitutes the purest measure of reading, because it overcomes some of the serious methodological problems mentioned above. In their study, it was found that when the reading disabled group was selected on the basis of word recognition and phonic deficit tests, the group showed deficits in language and memory processes. No such differences were found between Normal and Reading Disability groups while the criterion to select the Reading Disability group was comprehension teBts. Thus, differences in definition probably accounted for these differences.

The specific problems involved in operationalising Reading Disability by the use of different tests may be viewed as an expression of failure to conceptualise and classify different kinds of reading problems. If the Reading Disability is recognised in general terms and sub-classifications are made on the basis of the kinds of errors children make, then instead of creating confusion, different kinds of tests may actually bring an order to the study of reading failure. Further, the establishment of such

subtypes, if it were based on a theoretical orientation, would facilitate systematic study of specific relationships between types of reading failure and various psychological processes. In addition, such a classification soheme would contribute significantly to the comparability of diverse studies (Torgesen, 1975).

In view of present contraversies and confusion in the operational definition of Reading Disability, in the present study following operational definition has been adopted. The method of deviation scorea and rate of word reading were employed for identification of Reading Disability.

'Reading Disability' is a condition in which children exhibit difficulty in reading that fall two Standard Deviations below their grade norms and which cannot be explicable in terms of general intellectual retardation, inadequate schooling, severe emotional disturbance, general impairment of speech, language and demonstrable neurological conditions or psychiatric conditions.

The nature of Reading Disability can be studied by understanding related impairment of cognitive, linguistic and metalinguistic abilities. Even though, the cause and effect relationships are not well established in the literature,

knowledge of these factors and the way they influence or interact with each other is essential to understand the nature of Reading Disability.

1.3.0. Reading Disability and Cognitive Impairments

Within the hierarchy of information processing strategies the cognitive characteristics consist of attention and concentration, perception, and memory. Dyslexics' difficulties in the phonological recoding of written words and in the comprehension of text must be due to some deficiency in the basic cognitive abilities which are crucial to these processes (Jorm, 1979).

1.3.1. Attention

The concept of attention, according to Neisser (1967), refers to allocation of resources to a restricted region of stimulus field. This allocation is done by two systems of processes. They are pre-attentive processes and focal attention process.

Pre-attentive processes, according to Neisser, are preliminary and hence crude, global and holistic operations.

They construct figural units and direct the next processing of focal attention. The preliminary aspect of reading such as chunking the figural units of word is basically performed by these processes. The pre-attentive processes send some signals in and operate automatically. In the focal attention process first the sensory input reaches long-term memory. Then, these inputs activate their representations in the long-term memory. The appropriate meaning associated with this representations come to short-term memory and the selection of proper signal for focal attention will be determined by grammatical and meaningful cues available. So, the printed symbols may be recognised at the levels of morphemes or words. The integration of these basic units into a meaningful structure is done through the higher cognitive processes (Norman, 1968).

One aspect of the focal attention is selective attention. In selective attention, people are confronted with two or more simultaneous tasks and are required to focus their attention, on one while disregarding the others (Hawkins & Presson, 1986). The selective attention task that has been most extensively studied demonstrates the difficulty of selective visual attention. For e.g., a recent review article by Macleod (1991), examined a variety of explanation for the Stroop effect. Stroop effect refers to the

observation that people take much longer time to name the colour of a stimulus when it is used in printing an incongruent word than when it appears as a solid colour square. Macoleod reported that the most promising account is provided by a parallel distributed processing approach. According to this explanation, the Stroop task activates two pathways at the same time. Interference occurs when two competing pathways are active simultaneously (Cohen, Dunbar A McClelland, 1990). Among the theories of attention, however, Treisman and Gormican (1988) emphasized that there is a continuum between pre-attentive processing and focussed attention. Many tasks lie somewhere between these two extremes, rather than involving exclusively pre-attentive processing or exclusively focussed attention.

Based on clinical and classroom observations, psychologists and educators have frequently described the children with Reading Disability as having difficulty in controlling and sustaining attention. But, early investigation on attentional deficits in children with Reading Disability produced mixed results. For e.g. in two separate studies that required to perform the letter detection task (Mclntyre, Murray, Cronin & Blackweli, 1978) and a speeded classification task (Pelham, 1979) no

significant difference between children with Reading Disability and Normal Reading were reported. Katz and Wicklund (1972) showed that dyslexics performed as well as normals on a task requiring to visually scan a row of letters for the presence or absence of a predetermined target letter. On the other hand, if the task required was to learn new words while the presence of distracting pictures were varied the performance of children with Reading Disability was poorer than normals (Samuels, 1967).

Thus, in conclusion, it is evident that if the task involves reading, the group difference does exist and if the task consists of simple processing of pictures or isolated letters the group difference was not found.

1.3.2. Perception

Perception involves interpreting stimuli registered by the senses by using previous knowledge (Matlin, 1995). Perception combines aspects of both, the outside world (the stimuli) and our own inner world (our previous knowledge). Pattern recognition - the identification of a complex arrangement of sensory stimuli - plays an important role in reading letters or words.

Different theories of pattern recognition have been proposed. According to Template-Matching theory a stimulus will be compared with a set of templates - specific patterns that are stored in memory. Pinker (1984) showed that this theory works only for isolated letters and other simple objects presented in their complete form. Prototype models on the other hand, state that, we store prototypes which are abstract, idealized patterns in memory. Here, a stimulus will be compared with a prototype. A number of studies have demonstrated the usefulness of prototype in perceiving geometric designs, letters of the alphabet and cartoon like drawings (Franks & Bransford, 1971; Rhodes, Brennan & Carey, 1987). Distinct features models state that we make discriminations among letters on the basis of a small number of characteristics called distinctive features. This distinctive features remain constant whether the letter is handwritten, printed or typed. Gibson (1969) demonstrated that people require relatively long time to decide whether some letters are different from one another when the letters share a large number of critical features. The Computational approach, which contains the components of both the prototype approach and distinctive features approach, aimed to develop computer-based theories to explain some of the cognitive tasks that human can achieve, e.g. recognition of three

dimensional objects (Biederman, 1987, 1990; Marr, 1982). All these theories of pattern recognition discussed so far have emphasize bottom-up processing or data-driven processing which stresses the importance of the stimulus in pattern recognition.

The other important process in pattern recognition is called top-down processing or conceptually driven processing. This process stresses how a person's concepts and higher-level processes influence pattern recognition. There are extensive researches carried out on influence of context and past experience. Researches on context and pattern recognition focus on identifying ambiguous objects. Palmer (1975) found that people were more likely to recognise an ambiguous figure when it was located in an appropriate context. Most of the researches on this topic examine how context enhances the recognition of letters of alphabet. One of the most widely demonstrated phenomena in pattern recognition is the word superiority effect. It states that, we can identify a single letter more accurately and more rapidly when it appears in a word than when it appears in a string of unrelated letters (Cattell, 1986; Reicher (1969).

The involvement of visual perception in Reading Disability remains a controversial factor. The argument for

the influence of visual perceptual defect on Reading Disability has been justified by some early studies (Orton, 1937; Bender, 1957). In oontrary to this argument some studies showed that there is no involvement of visual peroeptual defect in Reading Disability. For e.g. Morrison, Giordani and Nagy (1977) found that dyslexic children could report visual information presented for less than 300 msec, as efficiently as normals. In a study by Vellutino, Steger and Kandel (1972) required children to reproduce single designs, numbers or letters presented. No difference was found between dyslexics and normals.

1.3.3. Memory

When the researches on memory is examined, the Reading Disability group seems to show impaired performance on some memory tasks and normal performance on others.

If the concept of memory performance is viewed in terms of short-term memory and long-term memory, it seems that children with Reading Disability have a definite deficit in auditory (verbal) and visual short-term memory. They find a difficulty in retaining both types of information with fast presentation rate. For e.g. Reading Disability group tends

to perform poorly on the digit span sub-test of the W.I.S.C. (Rugei, 1974) and similar measures (Stanley, 1975). Similarly reading disabled showed poor performance as compared to normals at retaining auditorily presented digits (Corkin, 1974) and letters (Bakker, 1972; Jorm, 1977).

On the other hand a contrary evidence comes from Perfetti and Goldman (1976), who reported that a group of retarded readers did not differ from a group of I.Q. matched good readers on an auditory digit memory task. However, two groups did differ on a task requiring memory for words in a passage. This indicates that memory for words in a sentence is a better correlate of Reading Disability than memory for digits. This may be because memory for the words of discourse is solely dependent on the auditory-verbal short-term store whereas digit span is only partly dependent on this store (Baddeley & Hitch, 1974). Waller (1976) showed that dysleiics could remember the semantic content of sentences like normal readers but were worse at remembering aspects of specific wording of the sentences.

It has been reported that dyslexics make greater phonological confusions than normal readers in the short-term retention of words (Mark, Shankweiler, Liberman & Fowler, 1977) and letters (Liberman, Shankweiier, Liberman, Fowler

& Fischer, 1977). This finding further supports the auditory-verbal short-term store deficit of Reading Disability. This deficit may be responsible for the frequent temporal order errors noted in the short-term memory of dyslexics.

Similar effects of short term memory deficit have been demonstrated with visually presented items such as digits (Spring A Capps, 1974), letters (Morrison, et ai. 1977) and simple pictures (Cummings & Faw, 1976). This visual short-term memory deficit could also be associated with spatial order errors of dysiexics (Noelker & Schumsky, 1973; Morrison, et al. 1977).

But how these impairments (auditory-verbal and auditory visual short-term memory) produce problems in the phonological recoding of written words and in reading comprehension? The individual differences in short-term memory storage could produce differences in both these aspects of reading. For e.g. when a child recodes a written word into a phonological representation he must be able to remember the phonemes which result from applying each grapheme-phoneme correspondence rule and the order in which the phonemes are to be arranged in the output. Again, he

must remember which letters of the word he has already analysed so that he will avoid going over letters which have already been analysed. Similarly it is also possible that the visual short-term store has a role in holding the information about the reader's current position in the text.

Recent studies related to working memory, a oomponent in short-term-memory, showed that, the central component of the processing system that serves language is a working memory that holds linguistic material momentarily, pending analysis of the input. Of special significance are findings that whenever the processing of a sequence of letters or words places demands on temporary memory, the information is encoded into some kind of silent speech' or phonological representation. This is equally true for users of English as well as non-alphabetic scripts (e.g. Chinese) suggesting that phonetic coding in working memory is essential for verbal information (Mann, 1986b). Although memory impairment has been recognised as one of the characteristics of children with Reading Disability, the nature of impairment has been understood better only recently. The memory impairment in such cases seems to be specific to verbal memory processes in both visual and auditory modes.

1.4.0. Reading Disability and Language Deficiencies

The language domain has become the centre of present research interest in Reading Disabilities. The initial studies were done in visual domain. Hundred years ago Hinshelwood (1895), an opthalmologist, concluded that outstandingly poor reading ability was probably due to impaired visual memory for words and letters. Orton (1925) spoke of an impairment of the viBual processes such as a tendency to reverse letters or sequences of letters. The linguistic explanation now offers a more adequate account of the type of these errors commonly observed.

Some theories have regarded poor reader's problems as the consequence of poor cross-modal integration or a general intellectual deficit. Careful investigations have shown that the cross-modal integration difficulties are almost always accompanied by intramodal integration problems. Both of this integration difficulties are now regarded as symptoms of poor reader's problems with linguistic codings (Vellutino, 1979).

The crucial link between deficient language processes and reading disability becomes evident by two observations. Firstly, children with delay/retardation in speech and

language encounter reading problems at least six times more often than control subjects (Ingram, Mason & Blackburn, 1970). This was not found between reading and other sorts of handicaps (Rutter, 1978).

Secondly, a telling pattern of cognitive strengths and weaknesses for poor readers has emerged from a variety of studies. It has been showed that, poor readers' linguistic skills are consistently poor when compared to good readers whereas their other cognitive/non-linguistic skills are comparable with good readers (Mann & Brady, 1988). Further, 70% variance observed in reading behavior of both normals and poor readers could be accounted for by certain language related tests (Mann, 1984; Stanovich, Cunningham & Freeman, 1984).

The diverse nature of the problems causing Reading Disability has been recognised by several researchers in the linguistic domain. Eden, Stein and Wood (1993) compared the phonological and visuospatial abilities of non-disabled and reading disabled. The results showed that, there are several visual tasks that are almost as good as phonological tests in discriminating between good and poor readers.

One cannot talk accurately about Reading Disability without a discussion of its language based nature (Wallach & Butler, 1994). It will be understood better when we review the various components of two language systems namely spoken language and written language. On the one hand, practitioner know that normal language learning and literacy learning are connected and reciprocal (Kamhi & Catts, 1989; Sawyer, 1991). On the other hand, language specialists also understand that spoken and written language can be quite different (Scott, 1994). How does one begin to sort out these continuities and discontinuities between the two?

There are three overlaping and intersecting themes which may clarify the issue (Wallach & Butler, 1994).

1. The reciprocal nature of spoken and written language.
2. Reconsideration of some of the differences between two systems.
3. Interaction between content knowledge and structure knowledge.

1. In the process of becoming literate the reader connect written language to oral language that is already known. Even though the specific relation of all aspects of the spoken-to-written connection are unknown at this time, the notion that learning to read and write is part of, not

separate from learning to speak and comprehend language is accepted (Kamhi & Catts, 1989; Sawyer, 1991). In order to understand the acquisition and development of written language one requires understanding of the acquisition and development of spoken language. Researches in reading and writing, suggest that the relationship between oral and written languages is bidirectional and multiievelled (Wallach & Butler, 1994). Kamhi and Catts (1989) remind that "the relationship between spoken and written language is dynamic ... (it) changes throughout the developmental period and the direction of the causality can go both ways" (p.xiii). But, one should be cautious that this idea of reciprocity may not get translated into classroom recommendations. The practitioners follow the same sequence of steps for facilitating written language as they do for spoken language (Blachman, 1994).

2. Spoken and Written systems are not exactly the same. Learning to read and write a language differs somewhat from learning to understand and speak (Scott, 1989). Similarly, beginning reading differs from proficient and adult reading. Children require some strategies for getting into print" before they can apply inferencing, integration and other discourse level strategies on written text (Bashir & Scavuzzo, 1992; Chail, 1983;

Thomson, 1992). The reading ments an unsegmented auditory stream (Blachman, 1994^ For oung children, understanding speech-to-print differences is an abstract concept that unreveals after at least a few years practice with written lang e (Van Kleeck, 1994). Accessing print requires different strategies from accessing spoken stream. Thus, applying those concepts applicable to adults, to literacy acquisition ignoring the realities of spoken and written language differences may not be of much use.

3. Researches suggest that there is a strong interaction between content knowledge and structure knowledge. Structural cues and the structural organisation of text seem to be particularly facilitative to comprehension when content is moderately unfamiliar (Roller, 1990). the other hand, proficient readers use linguistic clu in text to absorb critical points. That is, if the text is difficult, adults seem to use their structure schema. On the other hand, if the text is well-structured they use the content strategy (Ohlhausen & Roller, 1988).

From this brief analysis of the relationship between of spoken and written systems, it is evident that, they are dependent on each other. It is not that all the contents of

written and spoken systems are similar and exactly the same principle is operating in both, particularly at the initial stage of literacy acquisition. Instead, the strategies involved in both are complimentary. Therefore the content knowledge and structure knowledge in language processing takes complementary role.

Thus, written language is not a completely independent communication system but is based on spoken language. It employs linguistic processes that the reader already possesses. Both written and spoken systems require accessing the words of the vocabulary, analysing the phrases and sentences, and comprehending the message.

Before, reviewing the characteristics of Reading Disability in terms of this spoken and written systems of language, it is essential to explore the nature and acquisition of these two systems.

1.4.1. Spoken Language

The spoken language is a broad area. A close look at this system reveals that there are various sub-processes involved in interpreting the meaning of the speech signal. Such subprocesses include articuiatory factors of the speaker

(generation of speech signal), physical properties (how it gets transmitted), and perceptual factors (how it is perceived) (Garman, 1994).

The most relevant area within the spoken language system, from the point of view of the present study, is what is known as metalinguistic awareness. Metalinguistic awareness refers to one's ability to reflect consciously on the nature and properties of language (Van Kieeck, 1994). Bloom and Lahey (1978), defined language as a code whereby ideas about the world are represented through a conventional system of arbitrary signals for communication". Using this definition one can conceive of metalinguistic skills as falling into two broad categories.

A. Those that reflect an awareness that language is an arbitrary, conventional code.

B. Those manifesting an awareness that language is a system of elements that are combined in systematic way.

A. Language as an Arbitrary Conventional Code

The human capacity to represent - to have one thing standing for another absent thing - is manifested in many ways. Language is one among them. There is no systematic relationship between words and the objects, events and

relationships they encode. Hence, the language ia arbitrary. But these arbitrary symbols are effective because their meanings are shared by the linguistic community. So, they are conventional. Because of the arbitrary quality of linguistic symbols, words are separable from the things and this leads to the several properties of language that are related to metalinguistic awareness. Four such properties are recognised: Word consciousness, Ambiguity, Synonymy and Figurative language.

Word consciousness refers to the knowledge of the arbitrary nature of words and the separability of them from their referents. Word consciousness is explored using the experimental procedures called word-referent differentiation task in which the child is required to define a word or give example of words with certain properties (e.g. long, short, etc.,), make judgements about whether sound sequences qualify as words, ask about the characteristics of objects when conventional names are changed to related words or nonsense words (Bowey & Tunmer, 1984). Children do not consistently count articles and other functors as words until the age eleven (Berthoud-Papandropoulou, 1978). The word consciousness is sometimes demonstrated in langauge play and second-language development and is believed to be important

in early reading. In early reading children must focus on the words in isolation, attend to their form in both recognizing right words and decoding words. Even though it is suggested that metalinguistic ability like word consciousness helps in the reading acquisition, the exact nature of their relationship is not clear (Ehri, 1979; Francis, 1973; Ryan, 1980).

Ambiguity is one of the semantic properties of the language. It is possible that, the same sound sequence can have very different meanings both across and within languages. Ambiguity can occur at various levels of linguistic form, like lexical, phonological, deep struoture, surface structure and morpheme boundary. The development of the ability to deal with ambiguity in language has frequently been studied in the context of humor development. Children's ability to resolve the various types of ambiguity in humor emerges over a number of years. For e.g. the lexical ambiguity emerges at around six to seven years, the deep structure ambiguity at around eight to nine years (Van Kleeck, 1994). In the other three types of ambiguity - phonological, surface structure and morpheme boundary the child requires to combine two aspects of language namely arbitrateness and the language elements that are combined in a systematic way. These three

types of ambiguity skill develops approximately at twelve years of age (Wallach & Butler, 1994).

In the synonymy tasks, one must first determine that the linguistic forms differ but the meaning of the sentences is essentially same. The form may vary in word order and inclusion or exclusion of functor words. Hakes (1980), studied the developmental changes in children's performance on synonymy judgements. He found that the children younger than 6 years of age, made judgements on the basis of form alone whereas children older than 6 year judged on the basis of form and meaning. The synonymy skill may seem of little relevance to a child's general ability to function well with language in the classroom (Hakes, 1980). However, as children learn to string sentences together to create either oral narratives or written text, the use of synonymy is seen as critical for achieving coherence within the text (Van Kleeck, 1994).

In Figurative language, the new meaning will be added to the conventional meaning of an existing word or phrase resulting in a literal meaning. This use of conventional forms in new contexts to convey subtle variations or extensions of meaning underlies the creation of literacy devices like metaphor,

simile, proverbs, personification etc. The development of figurative langauge comprehension is strongly correlated with receptive vocabulary (Nippold & Sullivan, 1987).

Both synonymy and figurative language might be fostered from a very early age by reading to children, because both are modeled in stories. As the input of this nature increases children will be using such devices in their own productions.

B. Language as a System of Elements

Language consists of a finite set of elements and a set of rules to combine these elements to yield a potentially infinite number of sentences. The awareness that language is systematic gives rise to related metalinguistic skills which can be used for reading, writing, vocabulary development, etc. Elements of language can broadly be grouped into two levels - one related to sounds and the other related to word (Van Kleeck, 1994).

The ability to segment language into sounds that involve syllables, subsyllabic units of onset and rime and phonemes together is called phonological awareness. Here, a child gets awareness that a word in the sentence can be

further segmented into finite elements. The most important application of this phonological awareness is in reading acquisition. Rhyming and alliteration skills are also involved in phonological awareness. It is important to note that phonological awareness is dependent on the spoken language but all the units of sound are not equally accessible in speech that children hear. As Chaney (1989), pointed out, the speech that children hear consists of a steady stream of sound with overlaping acoustic features. So, words and phonemes which are abstract entities have no simple physical correlates. This phenomenon of overlaping of sounds is called coarticulation' (Liberman & Shankweiler, 1991). The advantage of this phenomenon is that it allows speech to proceed at a pace that matches our perceptual mechanism for understanding (Liberman, Cooper, Shankweiier & Studdert-Kennedy, 1967). But the same phenomenon remains as a disadvantage for a reader because, the sound one hears and the underlying phonological structure lacks direct correspondence. Therefore learning the word reading, specially phonemic structure, is not necessarily a natural outgrowth of exposure to spoken language.

Experimental evidences show that in the developmental sequence first comes the segmentation of sentences into

propositions or phrases and then into words. This process is followed by segmentation of words - first into syllables and then subsyllabic units namely onset and rime and finally individual phonemic segmentation ability develops (Chaney, 1989; Ehri, 1975; Treiman, 1986, 1991; Tunmer, Bowey & Grieve, 1983).

Dividing the sentence into proposition is basically done by semantic way and this ability develops around three years and six months to seven years of age (Karpova, 1966). Segmenting the sentence into words is partly carried out semantically because words are individual units of meaning and partly phonologically because this skill requires separating out individual words in the acoustic stream of speech. Word segmentation is first carried out at syllabic level which is based solely on phonological awareness, because syllables do not carry meaning (except single syllable words). This skill develops at around first grade of schooling (Liberman, Shankweiler, Fischer & Carter, 1974).

Next process in the word segmentation is dividing the word at sub-syllabic level into 'onset' and 'rime'. The initial consonant or consonant cluster of a syllable is called onset and the remaining part of that syllable consisting of a vowel nucleus and an optional final consonant

or consonant cluster is called rime'. It has been found that initial phonemes are easier for children to segment than final one (Rosner & Simon, 1971). Phoneme segmentation is the last skill to emerge and hardest to achieve, because, individual sounds are not perceptually available in the acoustic signal of speech. In learning an alphabetic system, children actually must learn to ignore what they hear (a syllable) and begin to think of words as if they are composed of strings of phonemes (Sawyer, 1987).

Rhyming and Alliteration constitute another evidence for children's phonological awareness that manifest in the spontaneous play with language. Both rhyming and alliterative words share some component sounds. In rhyming the onset is changed in the two words and the rime remains the same. E.g. for informing a word that rhymes with 'Pen' the child must isolate the onset /p/ and then delete it and then replace it with another onset /h/. The rime is retained to form 'hen'. Rhyming play starts at one and half years age of the child (Van Kleeck & Bryant, 1984). But coascioua awareness of rhyming and alliteration process has been noticed only at around 2 years 8 months. MacLean, Bryant and Bradley (1987) found high correlation between knowledge of nursery rhymes and success on phonological awareness task.

Both of these abilities are related to early reading skills at four and a half years of age (Van Kleeck, 1994).

Linguistic Regularities or Knowledge of Rules are generally divided into phonology (rule governing the sound system) morphology (rules for combining free and bound morphemes) syntax (rules governing the word order, among other things) and semantics (rules governing the semantic rules of words and word co-occurrence) (Van Kleeck, 1994). For the most part the knowledge of linguistic rule remains unconscious. Researchers have attempted to tap children's knowledge of the rules system directly by gramaticality judgement task i.e., by judging the grammatical correctness of sentences presented to them.

In grammaticality judgement tasks, the investigators present children with grammatically acceptable or unacceptable sentences and ask them to judge them. These sentences may be either accurately produced or they may violate phonological, morphological, semantic or syntactic rules.

In a study by Blodgett and Cooper (1987), on children of ages four to six years, a clear developmental trend of this skill was reported. The pattern that emerged revealed

that phonological repairs were easiest. Semantio selection restriction violations and morphological errors were somewhat harder and word order corrections (syntax) were the most difficult task. Similar trend was observed in some earlier studies (Carr, 1979; Howe & Hillman, 1973).

1.4.2. Written Language

Depending on the units of spoken language that are represented in a given script, the written language places a special demand on language processing abilities. Therefore, before exploring the relationship between beginning reading and metalinguistic awareness it is very much relevant to have a brief discussion on writing systems and specific demands they make on the language processing.

Henderson (1984), while discussing the written system and reading processes, mentioned that appraisal of the variety of writing systems obliges us to consider which aspects of the reading process may be universal and which may be specific to a type of script, or even to a mode of reading tuition. It provokes speculation about the processing strategies that a particular soript permits and encourages.

Conventionally, the orthographic system is classified into three groups (Garman, 1994; Henderson, 1984) -

a. Ideographic system
b. Syllable - based system (syllabaries)
c. Alphabetic system

The first group consists of logographic/ideographic type i.e. Chinese, Japanese Kanji. This is a nonphontic system. The second and third groups are phonetic systems. These writing systems are briefly discussed below :

a. Ideographic (Chinese)

Chinese orthographic system is the only example we have for the idiographic type of script. The spoken language (dialect) of Chinese include Mandarin, Cantonese, Hokkien and other mutually unintelligible languages (Garman, 1994). Ail these can be written in the same traditional script called mandarin. Mandarin basically consists of 3 characters Simple character, Compound character, and Character sequences.

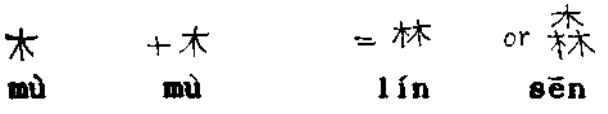
Simple character:

人	木	其
rén	mù	qí/tɕʰi/
person	tree	his, her, its, etc.

Here, the first two symbols illustrate the simplest sort of meaning-based symbols which can be called as ideiographic. But, the third example is much more abstract and complex in terms of the component strokes and so may be called as logographic. In this example, there is no hint of any kind about the nature of word except that it acts as a distinct symbol for the word itself. With this example it is evident that in this simple character, nothing marks the tone or phonemic sequence and so, phonemic-graphemic correspondence is almost absent.

Compound Character

Here simple characters are graphically combined. There are two major types. In the first type quite clear graphological compositionality is present but it is not linked to any phonological relationship. Here the simple characters are not reduced but the resulting compound character is distinct from the sequence of simple characters. E.g.



In some cases it is possible that the compound characters may involve reduced forms of simple characters called radical'. Once again, here also symbol-to-sound relationship is abstract.

E.g.

人	+ 木	= 休
rén	**mù**	**xiōu/ɕiəu/**
person	tree	rest

In the second type of compound character clear phonographic aspect can be seen.

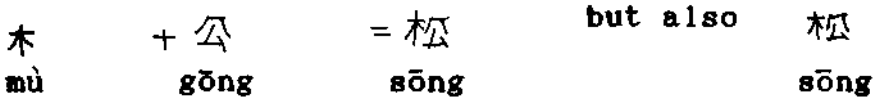
E.g.

木	+ 卜	= 朴
mù	**bo**	**pò**
tree	(final particle with no inherent tone)	species oak tree

Here the radical is not represented in the pronunciation of the word but is representative of the meaning of the compound. The radical, graphically smaller or abbreviated than its full form, has the graphological statua of a diacritic. The remaining element of the compound character is full graphic symbol and serves the function of phonological function of the word.

Character Sequence

The following case consists of a radical plus a



phonetic character. A beginning reader, would interpret it as "sort of tree and pronounce as gong'. For a fluent reader, the character as a whole map on to the lexical item (song 'pine tree') and into its homophone (song = 'loose').

In total 214 radicals and 1585 compound characters are listed in the largest Chinese dictionary. It should be noted that in Chinese orthographic system, there is an evidence for phonographic aspect which requires a skillful interplay of both sound and meaning dimensions of the script. But phonographic aspects tend to be related to full word form; the individual component strokes of the written characters do not represent the phonological pattern. That means a character captures the sound similarity rather than the components of sound structure.

b. Syllabaries

This is one of the important type of writing systems which is fundamentally phonographic in nature. So, the components of sound structure is represented in the system. Syllabary is based on the syllable unit of the spoken language. Under this system two types of orthographic systems will be discussed: Japanese - an example for mixed type script; and Kannada - a Dravidian language which is an example for semi-syllabic script.

Japanese (Syllabary)

This writing system consists of two varieties (Morton and Sasanuma, 1984) namely, Kanji characters derived from Chinese idiographic/ logographic systems and Kana - based on the syllabary elements. There are two types of kana : Hiragana - cursive kana. Katakana -sequave Kana. The main characteristic of this mixed system is the interplay of meaning - symbolic and sound - symbolic elements.

The Kanji characters are used for the major lexical items (noun, verb, adjectives), and hiragana is used for grammatical morphemes - particles, auxiliary verbs etc.

Katakana, on the other hand, is used for representing loan words and foreign names. Both Hiragana and Katakana systems have 71 characters each. Both the Kana systems were derived from Kanji characters and hence share some similarities.

Kana system is typical of syllabaries and has two fundamental types of sound syllables; the vowel type (v), without preceding or following consonant and open syllable type (CV), - which consists a consonant followed by a vowel. In Japanese Kana, there are 5 vowel characters a, i, u, e and o. There are some other symbols representing CV sequences with a restricted range of vowels : ya, yu, yo, wa and wo. There is also a symbol for a pure nasal consonant. Thus there are 71 symbols in total.

How far those syllabaries are radically distinct from the alphabetic system in which individual consonant and vowel segments are possible? It is crucial to know the nature of the relationship in character composition between V and CV symbols. In both the Kana systems this relationship is fundamentally obscure. Kana systems, by and large, are highly syllabic, and the internal structure will not permit for segmentation of constituent consonant and vowel shapes.

Kannada

Kannada is one of the major Dravidian languages of South India and is the state language of Karnataka. It has a long history of about 1500 years (Prakash A Joshi, 1994). The language has undergone a number of changes in phonology and morphology over the years. Geographical and political factors have resulted in at least seven clearly identifiable dialects and all of them can be written in a 'Standard Kannada' script.

Kannada langauge is possessed of a syllabary that has distinctly alphabetic implications. The present investigation has been carried out in this language, hence a detailed explanation of the nature of this writing system is given below :

Basic alphabets : Modern Kannada alphabet (Akshara) has 50 basic letter symbols. It consists of 16 vowels (swara) and 34 consonants (vyanjana). Out of the 16 vowels 6 are short (hrisva) vowels, 6 long vowels (dirgha), 2 dipthongs (ai and au) and 2 yogavaha (one anusvara - o; and one visarga - : a fricative). The consonants are of two types - grouped and ungrouped. Under the grouped there are five sub-categories

of symbols (consonant class) viz., velar, palatal, retroflex, dental and labial and there are five symbols in each class (hard/soft, aspirated/non-aspirated and nasal). The ungrouped consonants are 3 semivowels (ya, ra, va) 2 laterals, (la and la) 3 (sa, sa and sa) sibilants and one fricatives (glottal, wa).

Additional CV Syllables : Each symbol of kagunitha' represents a particular combination of consonant and a vowel. So, a consonant can combine with any of the 15 vowels to form a corresponding syllable. That means, each of the vowel in addition to its primary syllabic form, has a secondary or intrasyllable form which is used in writing a CV syllable. This intrasyllabic forms are attached to the consonant in a particular fashion-right, above and below of the consonant. In total (34 x 15) 510 additional symbols are there in the script.

Conjunct Consonants : In addition to their primary form all the consonants have a conjunct form which are their truncated forms. There is a general rule of writing thia conjunct. Exception is for the writing of conjunct that involves initial /r/ which will be written with a separate zign "Arka*.

Grammar : Grammatical rules that applies to Kannada language can be broadly grouped into -

1. Vibhakti - It refers to case markers that denote the relationship of nouns and pronouns with others in a sentence context. There are eight suoh cases mentioned in the grammar book. So, the Kannada language is highly inflected and the word order is not affected by the type of the sentence. For e.g. active and passive forms can follow the same order s-o-v by attaching appropriate cases in each of the categories. Word order generally depends on the usage and intentional emphasis on a particular point.

2. Sandhi - Is another grammatical rule in which two or more words/morphemes fuse together, as a result of which a single 'compound' word will be formed. Here, morphophonemic changes occur at junctural point. That is, the ways in which v and c combine or get modified in the formation of new compound word will be explained by 'sandhi' rules.

3. Sanasa - This explains the semantic relation of agglutives to their component words.

4. Tense markers - There are three main tense markers : Present tense represented by utta' Past tense represented by 'da' and future tense represented by va'

These markers will occur in between verb (root form) and its inflexions.

Script : The script is written from left to right and it is curved and of round shape. Punctuation marks are exactly like in English. No letter types exists (Italios, upper case or lower case etc). The emphasis in writing is often conveyed by larger print, thick print or underlines. Any sound which do not have natural graphemic correspondence are represented with the nearest phoneme symbols existing with a diacritical mark below them.

Teaching Methods of Kannada : Generally, in primary schools, Kannada is taught syilabically. But elaboration of phonemic arrangement of the script, articulation principle, linguistic characteristics of V and C, classification of consonants and phoneme-grapheme correspondence etc. are not included in teaching. Reading and writing are simultaneously taught in earlier grades. So, the child start to trace the vowel forms and consonants along with learning to identify the syllables. Then, starts reading words with pictures which will be

followed by studying the phrases and simple sentences. Thus, throughout syllabic strategy is emphasised.

At the end of the Grade I the child is expected to learn all the forms of basic syllabary and some other syllables. By the end of the Grade II decoding of all syllables are required. In the Grade III teaching of grammar starts along with the decoding of conjunct words. Morphophonemic principles starts at Grade V along with sandhis. The introduction of English starts at this stage if Kannada is taken as medium of instruction. Salient Features of kannada Writing System are listed below :

1. The script is semi-syllabic, agglutinative and polysyllabic.
2. There exists precedence of grammar over the script. Historically oral recitation of phonetic analysis was first and the writing system is relatively very recent and thus, a systematic arrangements of letters in script can be observed.
3. The basic letters are arranged according to the phonetic order - vowels, followed by consonant groups on the basis of articulation.
4. The phonological system has retroflex consonants, long and short vowels, inherent 'a' in consonants.
5. There exists almost one to one graphophonological equivalents and each syllable components can be segmented into its consonant and vowel components.
6. There are many inflections and almost all homophones are homographs.

c. Alphabetic System (English)

Garman (1994) surveyed the various features that English makes use of as an alphabetic writing system. They are

1. Non-alphabetic elements
2. Alphabetic elements
3. Upper and lower case
4. Phoneme-Grapheme correspondence
5. Phonemic principle
6. Spelling patterns
7. Problems in these parameters

English orthography has too many non-alphabetic or non-phonographic forms. The extent of use of these forms is highly variable depending on the nature of text or style, but the fluent reader makes effortless transitions between radically distinct forms of character, particularly when they scan a representative sample of print through eyes and disambiguate such confusing symbols like +, ", and /, dB, Hz, etc.

It is well known that there are 26 alphabetic but if we combine upper case and lower case types, it becomes 52. The use of upper case letters in the standard lower case text in its initial position of a sentence has a similar function of

full stop punctuation marks. So, the 26 letters only are considered basic alphabetic elements.

A considerable degree of variations between upper case and lower case forms of same letters can be noticed. Out of 26 letters, only for 8 letters direct relationship is present between upper and lower cases.

Another point to be noted about this alphabetic system is that, the phoneme-grapheme correspondence of elements are not transparent. For e.g. among the consonants no ready symbols are available for /ʃ/, /θ/, /ɸ/ and the 5 vowels a, e, i, o, u are not adequately representing the contrasts of the phonological vowel system. There is a considerable body of evidence for the view that English spelling is phonographic only postlexically. That means, grapheme-phoneme mappings become apparent after the word in question has been identified and are not an adequate data to achieve their identity.

Spelling patterns of English is perverse and complex and involves positionally restricted grapheme-phonemes mapping. It violates spelling-to-sound correspondence. But at the same time, these special relationship of phonemes-graphemes

has a number of advantages like capturing of positional effect, environmental constraints and abstract representations. These advantages are applicable only to those who already have mastery of the language.

It is apparent that the basic unit of English orthography is word. Alphabetic character of orthography exists in how to spell the word but not how to say the syllables. The word-forms are highly resistant to variability. Once again the spelling pattern of these units depends on the spelling pattern of their constituent words Marking of word in the alphabetic sequence is by spaces and hyphen (another character at word level).

All known alphabetic systems are said to be derived from some relatively recent development representing the high water mark of orthographic development. Further, it is argued that no refinement with feature-based notations is possible in the alphabetic system because, it would worsen the praticality and efficiency of language with the inorease in the ratio of graphic information to perceived speech distinctions.

With the above brief survey of the writing systems following points may be highlighted :

1. Language scripts are not falling into watertight categories. For e.g. Chinese character are fundamentally meaning - representative, but they also have phonographic character. Japanese Kana that was derived from Chinese logography shows that once a word is represented by a written symbol, the symbol is interpreted as consisting of phonological form and meaning. Whereas in Kannada (semi-syllabary) the phonemic principle is straight forward. But in alphabetic system, phonographic aspects and compositionality of the word are not enough to explain the full system.

2. Scripts vary in the balance and variety of cues that they provide and these variations should be considered in the light of the differences of linguistic structure between languages.

3. The basic task, in reading is to relate the marks on the page to what we know of our language which makes use of strategies based on grammatical knowledge, word knowledge, sound-meaning based cues in the script.

4. It is possible that different types of writing system may affect the perceptual and reading processes differently, but the precise relationship between the script type and processing strategies is difficult to determine.

1.5.0. Metalinguistic Awareness and Reading - How they interact?

In English (alphabetic system) the written unit represents phonemes and so any word or possible word can be represented by combining a relatively small number of characters. So, the reading requires learning of this phonemic segmentation and then learn the grapheme-to-phoneme conversion rules. Unless he or she appreciates the fact that words are composed of ordered sequence of phonemes, the alphabet will make no sense as a transcription of utterances and reading will not be mastered (Liberman, Liberman Mattingly & Shankweiler, 1980).

The role of phonological awareness and word awareness has been found to be critical in the early stages of reading acquisition (Bowey & Tunmer, 1984; Evans, Taylor & Blum, 1979; McNich, 1974) . One of the tasks in learning to read is to discover that written words correspond to spoken words by noting the systematic correspondences between their respective subunits of grapheme (letters) and phonemes (represented by sounds). At this stage, the child begins to recognise printed words one-by-one but still may not be able to comprehend the overall meaning conveyed at the sentence or text level (Weaver & Shonkoff, 1978). Thus, researchers

claimed that the ability to decode is necessary but not sufficient for reading comprehension (Cromer, 1970; Goodman, 1973).

Several studies have showed that, letter sound knowledge is intimately related to the acquisition of basic reading skills (Backman, Bruck, Herbert & Seidenberg, 1984; Manis & Morrison, 1985; Perfetti & Hogaboam, 1975). An early study by Tunmer and Nesdale (1985), showed that some minimal level of explicit phonological awareness is necessary for being able to learn to read. In their study, a scatterplot was presented in which the relationship between phonemic segmentation ability and pseudoward recognition (a measure for letter sound knowledge) was displayed. The scatterplot showed that there were many children who performed well on phoneme segmentation but poorly on pseudoword decoding. There were no children who performed poorly on phoneme segmentation but well on pseudoword decoding.

In an alphabetic system, children require at least two skills in order to start to read and write. They are phonemic segmentation and grapheme-phoneme conversion (Bali & Blachman, 1991; Stuart & Coltheart, 1988). In their study on the role of letter names in children's learning of phoneme-grapheme relations (Trieman, Weatherston & Berch, 1994),

showed that these two skills are cloaely connected. To master the English writing system, children must learn the mappings between the unit of spoken words and the units of printed words. They argued against the assumption that, children learn these phoneme-grapheme correspondences in a rote, paired associate manner. Instead, children use the skills that they possess before they begin to read (knowledge of letter names and their phonological segmentation abilities) to learn the link between phoneme and graphemes. Letter name knowledge helps children to spell phonemes like /b/ which occur at the beginning of the name of letter that typically represents the phoneme. Thus, in certain cases this letter naming knowledge cause errors on phoneme e.g. /w/ where children misspell /w/ as y. Their findings suggested that, given the equal exposure to phoneme-grapheme correspondences, children will not learn them equally well and the knowledge that children bring with them to the task helps explain why some correspondences are harder to master than other.

The role of syntactic awareness in learning to read has become the area of interest among the researchers in recent years. In a study using reading-level match design (good and younger readers were matched with poor and older readers on

reading ability and verbal intelligence) it has been found that the good readers scored significantly better than the poor readers on two measures of syntactic awareness, with the possible causal connection between syntactic awareness and learning to read (Tunmer, Nesdale & Wright, cited in Tunmer, Herriman & Nesdale, 1988). They had proposed two possible ways in which syntactic awareness may influence the reading development. One way is by enabling readers to monitor their ongoing comprehension processes more effectively (Bowey, 1986) and the second is by helping children aoquire word recognition skill.

Bowey (1986) found that measures of syntactic awareness correlated more strongly with context-free decoding than with reading comprehension, but still the possibility that syntactic awareness directly facilitates the acquisition of decoding skill was not stressed by these studies.

Another kind of metalinguistic skill viz., pragmatic awareness, may influence reading development, by enabling the readers to monitor their comprehension of text at the intersentence level. For e.g. Good readers, are better able to detect between sentence inconsistencies in written text than poor readers (Garner, 1980). Unlike other metalinguistic skills there seems to be little theoretical

justification for supposing that this will facilitate the acquisition of phonological reooding skill (Tunmer, Herriman & Nesdale, 1988).

A two-year longitudinal study was conducted to examine the role of metalinguistic abilities in the initial stages of learning to read by Tunmer, Herriman and Nesdale (1988). Several conclusions were drawn from the study which are as follows:

1. All the three metalinguistic measures - namely phonological, syntactic and pragmatic awareness were significantly intercorrelated at the beginning and end of the first grade and each was more strongly related to operativity (a test of concrete operational thought in Piagetian term) than to verbal intelligence.

2. In support of the cognitive capacity view of metalinguistic development, preliterate children with low levels of phonological awareness at school entry but above average levels of operativity showed significantly greater improvement in phonological awareness during the school year than similar children with below-average levels of operativity at school entry.

3. Phonological and syntactic awareness were found to play more important roles in beginning reading than pragmatic awareness. Scatterplots of relationship of each skill to phonological recoding suggested that both abilities may be essential for acquiring grapheme-phoneme correspondence and a minimal level of phonological awareness is also necessary for letter-name knowledge.

During the past two decades, many studies have uncovered associations between early difficulties in learning to read and impairment in one or more aspects of spoken language processing. There are four such research areas of language processing namely linguistic working memory, phonetio perception, the mental lexicon and sentence comprehension.

Liberman and Shankweiler (1985) hypothesized that the linguistic memory difficulties of poor readers might reflect a problem with the use of phonetic representation. This has been supported by many experiments. For e.g. Shankweiler, Liberman, Mark, Fowler and Fisher (1979) showed that poor readers are less sensitive to manipulations of certain phonetic properties like rhyme. In another study, Brady, Mann and Schmidt (1987) analysed the errors that poor readers make when attempting to recall a list of spoken words. Poor readers tend to recombine the phonetic information from

adjacent items in the list particularly when items have phonetic features in common like good readers. Even though, this confirms the use of phonetic coding, the more errors suggest that poor readers have less effective coding processes. Thus, these results in general indicate that poor readers' difficulty in working memory is not limited to the task of reading and it is related to phonetic coding ability. Further, the differences between good and poor readers' use of phonetic representation in memory can be documented before they learn to read (Mann & Liberman, 1984).

It is appropriate to note that, some attention has been devoted to the possibility that poor readers' working memory deficits are based on poor perception. Many studies have reported inferior performance by poor readers in speech perception task (Brady, 1986; Snowling, Goulandris, Bowlby & Howell, 1986). But, experiments examining performances on verbal and nonverbal auditory perception, have revealed that the difficulties of poor readers lie only in the linguistic stimuli (Brady, Shankweiler & Mann, 1983). Thus, these results indicate that the working memory problem is related to linguistic processes but not to general auditory processes.

Byrne (1981) studied the syntactic ability related to comprehension of adjectival constructions and center-embedded relative clause constructions among good and poor readers of II Grade. The study was carried out to know whether the deficient syntactic control in poor readers is due to weak phonetic memory code. The results were interpreted as casting doubt on the assertions that deficient use of a phonetic memory code underlies the syntaotic inferiority that often seen in poor readers. He suggested that failure to develop the necessary linguistic representation goes hand in hand with a more general lag in language acquisition.

It has been demonstrated that poor readers have more trouble retrieving the sound structure of words than do good readers, even if they know the meaning of the word (Katz, 1986). This implies that, phonological information for words in the lexicons of poor readers may be less accurately represented or less easily accessed.

It is very much likely that differences observed between good and poor readers in experiments involving sentence repetition (Mann, Liberman & Shankweiler, 1980), sentence comprehension and listening comprehension problems (Berger, 1978) may be due to the lower level difficulty with phonetic representation in working memory. By carefully controlling

for both sentence length and syntactic complexity, it has been found that reading groups do not appear to differ in their syntactic knowledge so much as in their ability to use that knowledge when the sentence stress memory limitations (Mann, Shankweiier & Smith, 1985; Smith, Mann A Shankweiier, 1987).

Thus, in short poor readers have been found to have a wide range of language deficits. Although the language deficits may be multifacited, evidences point to a difficulty with phonological representation as the basis for many instances of poor reading (Wagner & Torgesen, 1987).

The relationship between reading difficulty and difficulties with phonological awareness can be inferred by the nature of reading errors. Both poor and beginning readers in general, tend to be correct about the pronunciation of the first letter in a word but to have increasing difficulty with subsequent letters and a particular problem with vowels as opposed to consonants aa seen in English writing system (Fisher, Liberman & Shankweiier, 1977). Further, the children who are poor readers perform poorly on variety of tasks that require spoken words to be broken down into syllables or phonemes.

Such tasks include syllable and phoneme games (Liberman, et al. 1974) detection of rhyme (Bradley & Bryant, 1978) and phoneme or syllable manipulation (Calfee, Ltndamood & Lindamood, 1973).

The view that one's level of phonemic awareness determines the reading ability has been supported by at least three lines of evidences. First, phonological awareness skills have been found to predict later success in reading. Bradley and Bryant (1985) showed that when the metalinguistic skills of 4 and 5 year old were measured and 3 year later their reading achievement was measured, a significant portion of variance was accounted for by prior phonoiogicai awareness. Secondly, research evidences are there to show that training in phonological awareness facilitates reading acquisition (Williams, 1980). Thirdly, the use of path analysis techniques has shown that phoneme segmentation skills are directly related to reading performance (Lundberg, Oloffson & Wall, 1980).

But, there is a group of research findings according to which phonological awareness is a consequence of reading experience in an alphabetic system. It has been found that phoneme segmentation is lacking among adults who oannot read an alphabetic script (Morais, Cary, Alegria & Bertelson,

1979; Read, Zhang, Nie & Ding, 1986). Further, it has been demonstrated that phonios-oriented reading instruction was strikingly more effective in developing phoneme awareness than was sight-word instruction (Alegria, Pignot & Morais, 1982). However, the experience of learning to read an alphabet is not the only determinant of phonological awareness. For e.g. some children without being taught to read an alphabet, could develop phonemes awareness (Mann, 1986a).

Thus, the relation between phonological awareness and reading ability may best be viewed as a complex, two-way street (Mann & Brady, 1988). On the one hand, awareness of the phonological elements in spoken words clearly facilitates the task of learning what letters symbolise and on the other hand, reading instructions - phonic approach, generally augment metalinguistic awareness. However, for some there seems to be some fundamental difficulty in achieving phonological awareness.

In a study on dyslexia in Kannada language (Ramaa, Miles & Lalithamma (1993) compared varieties of cognitive and verbal labelling skills of three groups namely dyslexics, non-dyslexic poor readers and normal readers. The results

showed partial support to the view that non-dyslexic poor readers would perform like normal readers and not like the dyslexics on verbal labelling skills. In ail other skills no significant difference between three groups was observed.

In conclusion, there is a great deal of consensus regarding the view that reading difficulty is language based and it includes language processing and the awareness of phonological structure.

1.6.0. Reading Disability - Disorder of a homogenous type or a number of distinct sub-types?

It has already been mentioned that, the definition adopted in a study is a significant determinant of the conclusions drawn and the existence of distinctive sub-types (Siegel & Ryan, 1989). The disorder was first discussed intensively under the term congenital word blindness at the turn of the century (Hinshelwood, 1917; Pringle & Morgan, 1896). Subsequently for many more years, there was a tendency to treat the disorder as a unitary syndrome, with a single underlying cause. Numerous attempts were made to isolate single factors which could account for the symptoms of the entire disordered population (Denckia & Rudel, 1976; Orton, 1937). But these attempts were largely unsuccessful.

Increasing support was gained later, for the view that persons with Reading Disability do not form a homogenous population, but rather they fall into a number of distinct subgroups (Border, 1973; Mattis, French & Rapin, 1975; Mitterer, 1982). While there is still some controversy about the nature of grouping it is generally agreed that there are several different types of Reading Disability or developmental dyslexia (Marshall, 1984).

Border (1973), proposed subtypes of reading disabled based on patterns of reading and spelling errors. He proposed 3 subtypes of children namely; dysphonetic-with the deficit in word analysis and word attack skills, dyseidetic with the deficit in visual memory and visual discrimination and combined type - dysphonetic and dyseidetic. Although there have been numerous replication and validation studies of these subtypes, their results have provided only limited support for this classification.

Myklebust (1978), while attempting to define childhood dyslexia, said that, childhood dyslexia can be further defined by delineating its major types. He categorised 4 types of dyslexia : Inner language dyslexia auditory dyslexia, Visual dyslexia and Inter modal dyslexia.

The inner language dyslexia is characterised by deficits in both auditory and visual verbal processing. Here, the child perceives graphemes and transduces them into their auditory equivalents. For e.g. such children can 'read' aloud. But, they cannot become proficient readers because cognitively the level of meaning is bypassed. The input and output aspects of information may be intact but the information cannot be coded because of which meaning cannot be accessed. This type is common in autistic and educable mentally retarded children. Its existence, however, cannot be overlooked in children who are otherwise less handicapped.

The auditory dyslexia is characterised by the inability to relate phonemes to graphemes in the formation of words. Kinsbourne (1976) for e.g. in evaluating the deficits, breaks auditory functions into ability to repeat words, match phonemes to whole words, hold three phonemes in mind and synthesize a three letter word. In beginning reading the primary task is to decode visuals symbols into their auditory-verbal referents. By factor analysis Kinsbourne (1976) found the primary components to be auditory discrimination, visual discrimination, and visual recognition skills. According to Myklebust, the primary disturbance in

most dyslexic children is in these processes and it is exceedingly difficult to learn to read unless the auditory form has been acquired.

In visual dyslexia, the ability to discriminate among letters by its differentiating characteristics like sezel form, straight or curved lines, angle of slant, vertical or horizontal etc. will be impaired. They cannot attain symbolic meaning because letters are not recognised as letters. The difference between inner language dyslexia and this type is that, in the first type they can recognise the letters but are unable to attribute the meaning for the word. Children who have visual dyslexia usually can identify the letters by name. Often they write profusely but what they write is jargon and non-readable. They are capable of discriminating the letters visually but cannot read them as meaningful words. That is, the difficulty is not at discriminating the visual components of words (such difficulty is present in some children), but in visualization of them for coding.

In intermodal dyslexia, both auditory and visual processes are achieved, but one cannot transform visual information to auditory mode and vice-versa. Those in whom the deficits are principally due to auditory involvements are

designated as auditory intermodal dyslexia and those in whom the principle involvements are visual are designated as visual-intermodal dyslexia. These are subtypes of auditory and visual dyslexia. The point here is that, dyslexia occurs because of disturbances in cross-modal processing, not because of deficits in within-modal processes.

On the basis of developmental model with neuro-psychological orientation Bakker (1979, 1984) proposed a classification. According to this, a child who ia learning to read must first utilise the visual-spatial perceptual processes of right hemisphere but must then switch to the linguistic processing strategy of left hemisphere to become a fluent reader. In this system, a child who does not switch from a visual-spatial perceptual strategy to a linguistic strategy is classified as P-type child and the who does not begin with the visual spatial strategy is classified as in L-type.

Lyon (1982, 1985) used neuro-psychological and cognitive testa to identify the subtypes described by Mattis (1978) and Denckla (1972). Using cluster analysis and common internal validity studies, a group of children with Reading Disability was analysed and found groups of children with language

impairments, visuo-spatial impairments mixed impairments and no identified impairments. Further, using the treatment studies for validation, Lyon (1985) showed a significant subtype and remediation interaction. For e.g. the subtype showing little cognitive impairment or specific visual-spatial deficits showed significantly greater word recognition improvement following a phonetic remediation approach compared to other subtypes.

Castles and Coltheart (1993) reviewed and evaluated the evidence for the existence of distinct varieties of developmental dyslexia, which are analogous to those found in the acquired dyslexic population. According to these two authors developmental dyslexia can be distinctively grouped into two distinctive categories namely developmental surface dyslexia in which the child can read aloud regular words and non-words but has difficulty with irregular words. The errors are characterised by regularisation errors - irregular words are pronounced according to traditional grapheme-phoneme conversion rules. This pattern occurs because the child is unable to utilise lexical procedure for reading aloud.

The other category is known as phonological dyslexia in which the child can read aloud both regular and irregular

words but cannot read nonwords. Here the child is unable to use nonlexical procedures. In terms of Firth's model of reading development, the phonological dyslexia corresponds to failure to acquire alphabetic skills and surface dyslexia to problems with orthographic strategy.

Temple (1985) demonstrated developmental phonological dyslexia in a ten year old boy. His non-word reading was significantly poorer than word reading with more error responses of paralexic type such as visual, morphoiogical and visuo semantic. This is similar to the case of phonological dyslexia demonstrated by Castles and Coltheart (1993).

In their concluding remark Cartles and Coltheart (1993) reported "close examination of the symptom patterns displayed by a large group of developmental dyslexic children and the assessment of these patterns according to a model of the normal reading process, has helped to resolve many of the questions surrounding the issue of varieties of developmental dyslexia. That there do exist distinct varieties of developmental dyslexia, and that these varieties are relatively prevalent in the developmental dyslexic population, seems difficult to refute" (p.176).

The existence of pure' dyslexia of either surface type or phonological type is not common because the distinctions are often blurred and the process of drawing dividing lines is somewhat arbitrary However, neither of the disorders types observed in the deveiopmentai dyslexics can be attributed to a general language deficit. That meant children who have particular difficulty in reading certain words do not generally have the same difficulty comprehending those words when the same words are presented to them auditorily.

Recently, Watson and Willows (1995) in their study on information-processing pattern in specific Reading Disability showed that the reading disability group can be distinctively classified into three sub-types. The sub-type I is characterised by better visual processing. But in comparison with successful readers, this group showed relative weaknesses on measures of short-term auditory memory (digit span) and decoding/encoding (reading symbols, spelling and visual form of sounds). The sub-type II showed low scores on five of the seven visual processing tasks and particularly in Temporal Visual Processing System - visual memory and TVPS-visual sequential memory. So, this group is characterised by poor visual processing/memory. The sub-type III showed the lowest attainment on most of the variables with pervasive

symbolic processing/memory problems than other two types. The point to be noted is that, this study had a reading level match research design and so normal first grade readers were compared with the older disabled reader of same reading age.

These subtypings of Reading Disability are observed in languages with alphabetic orthography. Based on this observation one may ask whether we expect the same kind of subtypes in other type of writing systems also such as syllabaries where the phonemes-grapheme correspondence is regular? Wimmer and Goswami (1994) compared reading acquisition in English and German. In German, the mapping between graphemes and phonemes is largely consistent. The results of this study suggest a much more precacious and efficient resort to phonological decoding in German than in English. Therefore, it may be argued that in a writing system which is orthographically regular certain types of dyslexia such as surface dyslexia is unlikely to appear.

There are not many studies except one or two in Kannada in which subtyping of reading disability was attempted. Karanth (1985) in her paper 'Dyslexia in a dravidian language' presented data from both traumatic and developmental dyslexia in Kannada and discussed the implications for current classifications of dyslexia. Among the two patients one case was characterised by the problem in

the visual analysis with the difficulty in letter identification (visual dyslexia) and the other case was characterised by the total damage of phonological route and reading was possible only through semantic route. Based on Newcombe and Marshall's model (1981), these two oases were explained. According to this model there are five types of acquired dyslexia namely visual dyslexia, surface dyslexia, phonological dyslexia, deep dyslexia and global dyslexia. Among these five types the surface dyslexia and phonological dyslexia are not possible to occur in Kannada language. However, she concluded stating that studies on both acquired and developmental dyslexia in Indian languages have only recently begun.

Another study was carried out in Kannada by Ramaa, Miles and Lalithamma (1993) with stringent exclusion and inclusion criteria. The study was carried out with three groups namely normal readers, non-dyslexic poor readers, and specific dyslexics and they were tested on both verbal and non-verbal measures including visual and auditory memory tests. The results showed that, the generally accepted classification of dyslexia such as visual-auditory (Johnson & Myklebust, 1967), dyseidetic - dyssphonetic (Border, 1973) surface - phonological (Castles & Coltheart, 1993) may not be apt to describe dyslexics of Kannada language.

1.7.0. Synthesis

So far we have reviewed the existing relevant literature on two aspects namely Normal Reading and Reading Disability. Even though, basic issues related to Normal Reading, such as its definition, nature and acquisition are not directly related to the present study these issues were reviewed in brief in order to have a theoretical background.

With regard to Reading Disability, the controversies related to definition, nominclature were reviewed first, followed by the characteristics of Reading Disability. In order to get a comprehensive picture of the concept of Reading Disability, the characteristics were reviewed under two headings - namely impairment in cognitive functions, and language deficiency. Under the cognitive impairment, studies related to attention, perception and memory were reviewed. Review of studies related to language deficiencies were carried out with reference to metalinguistic awareness on two lines - i.e. spoken language and written language involving writing system and their impact on reading. This was followed by the issues related to classification or subtyping of Reading Disability.

PRESENT STUDY

CHAPTER II

CHAPTER II

2.1.0. The Rationale

The Introduction and Review' chapter presented a comprehensive account of Normal Reading and Reading Disability. The present senerio, it may be noted, is still not without confusions and contradictions. There are many issues which are still debatable and unresolved. These issues are related to - application of Western models developed in the context of a particular orthographic system to other systems of script such as syllabary; universal and script specific featues of reading acquisition and developmental dyslexia; specific roles of cognitive and language related skills in reading disabled; and classification of developmental dyslexia. The present investigation was planned to probe some of these questions in an attempt at gaining a better understanding of the phenomenon.

The knowledge of the cognitive, linguistic and metalinguistic processing skills in reading disability will help us to come up with a guideline for the individualised, area based remedial measures with the goal of utilisation of non-deficit processes in improving the deficit area.

There is a great need for studies which enhance such knowledge, especially in non-alphabetic scripts. From the practical point of view, any step at an early idemtification and remediation of reading disability is of paramount importance.

2.2.0. Aims

With the above rationale, the present investigation was designed to compare the children with Reading Disability and children with Normal Reading on cognitive, linguistic and metalinguistic processes. It also intended to come up with a profile of Reading Disability which may help in the remedial programs. In addition, the study was planned to identify some measures that help in early detection of Reading Disability.

2.3.0. Objectives

1. The main objective of the present study was to assess and compare the cognitive, linguistic and metaiinguistic processing skills of children with Reading Disability and Normal Reading.

2. To make a cross sectional comparison between the children with Reading Disability and Normal Reading on the developmental pattern of cognitive, linguistic and metalinguistic skills.

3. To derive a profile of children with Reading Disability and to classify them on the basis of their performance in cognitive, linguistic and metalinguistic tests.

4. To suggest a good predictor variable for early identification of Reading Disability.

5. To bring out a test battery for evaluation of children with Reading Disability in a clinical set-up.

2.4.0. Hypotheses

To fulfill the first two objectives, the following null hypothesis were framed :

1. There is no significant difference between children with Reading Disability and Normal Reading in the following cognitive processes:

   (a) Attention
   (b) Perception
   (c) Short-term memory

2. There is no significant difference between children with Reading Disability and Normal Reading in the following linguistic processing :

   (a) Letter recognition
   (b) Word recognition
   (c) Non-word recognition

3. There is no significant difference between children with Reading Disability and Normal Reading in the following metaiinguistic skills :

   (a) Rhyme recognition
   (b) Phoneme oddity
   (c) Phoneme deletion
   (d) Syllable deletion
   (e) Phoneme reversal
   (f) Syllable reversal
   (g) Grammaticality judgement
   (h) Synonymy judgement

4. There is no significant improvement on the above cognitive, linguistic and metalinguistic skills across the grades for both children with Reading Disability and Normal Reading.

No hypotheses were formulated with regard to the remaining objectives since they were not amenable for the same.

METHODOLOGY

CHAPTER III

CHAPTER III

3.1.0. Design and Sample

The present study used a quasi-experimental design.

The study consisted of there groups -

Group I : Children with Reading Disability (N=60)
Group II : Children with Normal Reading (N=60)
Group III : Children of Grade I (N=32)

Group I : Children with Reading Disability

Inclusion criteria :

1. Intellectually normal or above normal as measured on Raven's Coloured Progressive Matrices (Rao & Reddy, 1968).
2. Age is between 7 to 11 years.
3. Grades II to IV
4. Mother tongue and Medium of Instructions at school should be Kannada
5. Presence of difficulty in reading as measured on oral reading test (Jaya Bai, 1958).
6. Middle or near middle class socio-economic status of family as measured by Socio-Economic Status Scale (Shah, 1986).
7. Emotional disturbance within the normal limits as measured on Rutter's Proforma-B (Rutter, 1967).

Exclusion criteria :

1. Mental retardation '
2. Diagnosed mental illness which is psychotic in nature
3. Major neurological/medical conditions like cerebral palsy, epilepsy, meningitis, head injury, etc.

4. Psychiatric conditions such as autistic disorders, attentional deficit disorders etc.

5. Hearing, visual and speech problems.

Group II : Children with normal reading (N=60)

Inclusion criteria

1. Intellectually normal or above normal as measured on Raven's Coloured Progressive Matrices (Rao & Reddy, 1968).

2. Age is between 7 to 11 years.

3. Grades II to IV

4. Mother tongue and Medium of Instructions at school should be Kannada

5. Normal reading as measured on oral reading test (Jaya Bai, 1958).

6. Middle or near middle class Socio-Economic Status of family as measured by Socio-Economic Status Soale (Shah, 1986).

7. Emotional disturbance within the normal limits as measured on Rutter's Proforma-B (Rutter, 1967).

Exclusion criteria :

1. Mental retardation

2. Diagnosed mental illness which is psychotic in nature

3. Major neurological/medical conditions like cerebral palsy, epilepsy, meningitis, head injury, etc.

4. Psychiatric conditions such as autistic disorders, attentional deficit disorder etc.

5. Hearing, visual and speech problems.

Group III : Children of I standard (N=32)

Inclusion criteria

1. Inteliectualiy normal or above normal as measured on Raven's Coloured Progressive Matrices (Rao A Reddy, 1968).
2. Age between 6 to 8 years.
3. Mother tongue and medium of Instructions at school should be Kannada.
4. Middle or near middle class Socio-Economic Status of family as measured by Socio-Economic Status Scale (Shah, 1986).
5. Emotional disturbance within normal limits.

Exclusion criteria

1. Mental retardation
2. Diagnosed mental illness which is psychotic in nature
3. Major neurological/medicai conditions like cerebral palsy, epilepsy, meningitis, head injury, etc.
4. Psychiatric conditions such as autistic disorders, attentional deficit disorder etc.
5. Hearing, visual and speech problems.

3.2.0. Sample characteristics

The sample of present study was characterised in terms of sex distribution, age, intelligence, oral reading, socio-economic status, emotional aspects as follows:

1. Sex : Table 3.1 shows the distribution of sex for the three groups.

Table-3.1: The distribution of subjects acoording to sex.

Sex	Reading Disability Group				Normal Group			
	Grade				Grade			
	II	III	IV	Total	II	III	IV	Total
M	10	10	8	28	12	11	10	33
F	10	10	12	32	8	9	10	27
Total	20	20	20	60	20	20	20	60

2. Age : The distribution of sample in terms of age is shown in Table-3.2.

Table-3.2: The distribution of sample in terms of age

Age	Reading Disability Group			Normal Group		
	Grade			Grade		
	II	III	IV	II	III	IV
Mean	7.45	8.15	9.4	7.7	8.15	9.6
SD	0.50	0.48	0.49	0.46	0.36	0.58

From the Table, it is evident that the two groups viz., reading disabled and normal readers were comparable within the grades.

3. Intelligence - The purpose of utilising intelligence as one of the parameters in the sample selection was to screen them for mental retardation. The mean raw scores and percentiles as measured on RCPM are given in the Table-3.3. Though, the SD scores were a bit high in some cases, both the groups were comparable (Comparison between the groups in RCPM percentile score yielded no significant 't' values) in terms of their level of intellectual functioning and the group as a whole fail above average level.

Table-3.3: Distribution of Raw scores and percentile points on Raven's Coloured Progressive Matrices of reading disabled and normal readers of Grade II, III and IV

Group	Intelli-gence	Grade II		Grade III		Grade IV	
		RS*	P**	RS	P	RS	P
Reading Di-ability	Mean	16.6	72.75	17.85	70.5	21.15	70.00
	SD	2.03	16.62	2.26	14.57	5.92	16.28
Normal	Mean	18.3	79.5	18.9	73.75	21.85	74.00
	SD	2.30	15.07	3.25	15.48	15.78	10.00

* RS = Raw score; ** P = Percentile

4. Reading ability - The purpose of using this parameter was to group the subjects in terms of their reading ability. On the basis of oral reading assessment (Jaya Bai, 1958) the two groups were identified. The criterian of 2 SD below the grade norm was adapted in the present

investigation to identify the children having reading disability. Those children whose score fell around the grade norms were included in the normal group. The Table-3.4 shows that the 2 groups - namely children with Reading Disability and Normal Reading differ significantly in terms of their reading ability.

Table-3.4: Distribution of scores on oral reading test

Oral Reading	Reading Disability Group II	III	IV	Normal Group II	III	IV
Mean	11.7	18.9	22.65	22.8	33.3	42.5
SD	3.98	6.55	5.32	2.38	2.98	2.56

5. Emotional disturbances - One of the major perpetuating factors of reading difficulty is emotional disturbance. In order to rule out this factor a screening test, Rutter's Proforma-B (Rutter, 1967) was adminsitered. Table 3.5 presents the test scores. It is clear from the scores that both the groups fall within normal limits, the cutoff score being 9.

Table-3.5: Distribution of mean and SD values on Rutter's Proforma-B performance.

Emotional disturbance	Reading Disability Group II	III	IV	Normal Group II	III	IV
Mean	6.65	5.75	5.85	5.5	4.85	4.25
SD	0.91	1.48	1.62	1.12	1.65	1.64

6. Socio Economic Status

Another factor which influences the reading is socio-economic status. Hence, in the present study an attempt was made to compare and control the children with Reading Disability and Normal Reading in terms of their socio-economic status.

From the Table-3.6, it is evident that both the groups fall at lower middle socio-economic status and both the groups were comparable.

Table-3.6: Distribution of scores on the socio-economic status scale.

Socio-economic status	Reading Disability Group			Normal		
	II Grade	III Grade	IV Grade	II Grade	III Grade	IV Grade
Mean	34.55	32.85	36.08	35.21	36.03	35.6
SD	4.44	5.24	5.31	5.01	5.07	5.8

3.3.0. Tools used in the study

The tools used in the present study can be divided into two groups: (a) Tests for the purpose of screening or selection of the samples. (b) Tests for the main study. The rationale, description, and the scoring of various tests are described below :

3.3.1 Tools Used for the Screening/Selection of Sample:

a. Rutter's Proforma A and B for Teachers (Rutter, 1967)

Both are screening instruments to be completed by teachers. Both scales are in the form of questionnaire, seeking descriptions of students' classroom behaviour and academic achievements.

Form-A : Pertains to scholastic ability and achievements. This scale cannot be scored as they only indicate the presence or absence of a scholastic problem and this scale served as an initial step in the selection of the sample.

Form-B : This deals with the behavioral problems of psychological nature consisting of 26 items. The teacher was to indicate whether each description "does not apply", "applies somewhat , definitely applies" to the child in question.

Scoring: The ratings are 0, 1 and 2. The scores of each item are added together to make a total score. A cutoff score of 9 or more indicates presence of emotional disturbance. The test-retest-reliability for 8 months period was found to be 0.89 and inter-rater reliability was 0.72.

b. Raven's Coloured Progressive Matrices with Indian norms (Rao & Reddy, 1968).

The original Raven's Coloured Progressive Matrices was standardized to Indian set-up with 1050 population, including urban, semi-urban and rural areas. The test-retest reliability was 0.857. The population consisted of elementary school pupils from Grade I to V and both the sexes. This test was developed with the rationale that an individual's level of inteilectual functioning can be assessed on the basis of his reasoning and thinking ability. The test does not involve verbal tasks. Maximum score: 36

c. Oral Reading Test (Jaya Bai, 1958).

This test consists of 150 Kannada words that cover all the possible characteristics of Kannada orthographic rules. Here, the task of the child was to read these words as fast as possible for one minute.

Scoring - the total number of words read by the child within one minute will be the score. The test has the norms for Grade II, III and IV. Scores below two SD from the respective grade norms were treated as cutoff scores to identify Reading Disability.

d. Socio-Economic Status Scale (Shah, 1986).

This Socio-economic status measure is an improved scientific scale among the existing Socio-Economic Status Scales, because of following reasons :

(1) Identifies correct categories of social economic status.

(2) More accurate measurement of social economic status is achieved with the help of 6 variables namely (a) caste, (2) occupation (c) education (d) income (e) possession (f) social participation.

(3) Occupational status is measured as the average score of two basic indicators of family occupation (occupation of parents and main occupation of family).

(4) Educational status of family is considered by taking the average score of educational level of father, mother and sibling.

(5) Economic status is measured by total income of family divided by family size. For this score, income tax and property tax payment are also considered.

(6) Weightage to different articles possession has been assigned according to the cost and quality of material.

Test-retest-reliability was 0.92 for 20 days and 0.89 for 30 days time interval. Validity for 6 component variable

with composite socio-economic scores were as follows - Caste :0.72; occupation :0.82; education :0.86; income :0.83; possession :0.78; social participation :0.69.

Scoring : The total score from all the categories were then converted into Stanine scale. The social economic status was classified into five categories - Lower status (LS), Lower-middle status (LMS), middle status (MS), upper middle status (UMS), and Upper status (US) depending on the distribution of scores.

e. General Information and Data Sheet :

This was prepared by the investigator which includes the information regarding (a) personal details such as name, age, date of birth, class, address, history of special coaching, mother tongue, other languages being used in the family. Information regarding type of the family - Joint/nuclear, socio-economic status, parental and sibling history was also included. The purpose of this sheet was to organise and record the relevant information and the data individually.

3.3.2. Tools Used for the Main Study :

Since, the main purpose of the study was to assess and compare the reading disabled and normal reading children

across all the relevant oognitive, linguistic and metalinguistic processing skills, tools were selected accordingly. It should be noted that there is a scarce for well standardised tools, in Kannada language. In order to measure certain subprocessing skills the investigator had to undergo the exercise of deletion, inclusion and modification of items in existing semistandardized tools through Pilot study.

a. Colour Cancellation Test (CCT)

This test consists of dots of 5 colours namely black, blue, red, yellow and gray. There were 30 dots of 1/2" size in diameter for each colour (total 150 dots). The task of the subject was marking on red and yellow dots within one minute. This test has been successfully used by many researchers and is still being used in Institutes such as NIMHANS, Bangalore. The task taps child's attention and concentration ability. The test does not require the verbal skills unlike letter cancellation and number cancellation task.

Scoring : The total number of yellow and red dots correctly cancelled was taken as individual's score. Maximum Score = 60.

b. Minnesota Percepto - Diagnostic Test (MPD) (Fuller & Laird, 1963).

This test consists of six gestalt designs which the subject needs to copy. The reproduced designs are scored for degrees of rotation. The test is a culture free one. The MPD test provides a rapid and objective method of identifying children with Reading Disability who suffer from peroeptuai impairment.

The test-retest-reliability reported in the literature ranged from 0.89 to 0 71. With regard to validity, the authors reported that 85X of the Reading Disability and 92% of normal children were identified with the help of this test. The cutoff scores for Reading Disability group was 25 to 55 degrees of rotation. For normals the cutoff score was 20 and below. In the present study this test was used with the purpose of knowing whether Reading Disability and normal group differ on Visuo-spatial perceptual ability.

The subject was provided with 8 1/2 x 11 inch white paper, pencil and erasers. After placing the sheet in front of child he was told "I am going to show you six cards, one at a time. Each card contains a figure. Copy the figure on this paper. Number each figure as you draw it".

Scoring : The scoring for the degrees of rotation was done with the help of a protractor and a ruler as described in the manual. Maximum Score = 150.

c. Serial Recall Test (SR - Investigator made) :

This test was translated from Oriya (Das, 1982). This test consisted of twelve set of words which began with a four word series and progressed to six word series. There were four sets for each of the four, five and six word series.

The child was instructed I am going to read a few words, listen carefully. After I read, you have to repeat the words in the same order . There was no time limit. The purpose of using this test was to assess the child's short-term memory (verbal) through auditory mode.

Scoring : The number of words reproduced in correct order was scored. Each correct word carried one score. Maximum score = 60.

d. Letter Recognition Test (LR)

This test was selected from Kannada Reading Test (Purushothama, 1986). The test consisted of all the 50 basic

letters of Kannada script. The children were required to read these letters. The test items were presented to the subject in the form of flash cards of 3" x 5" size on which letters with .3 inch size were pasted. No time limit was given to read. The testing started with the following instructions:

Instructions : I am going to show you some cards one after another. On each card you see something written. You are required to read it loudly".

Scoring : Correctly read letters carried one score each. Maximum score = 50.

e. Word Recognition Test (WR)

This test was also selected from Kannada Reading Test (Purushothama, 1986). On the basis of a pilot study conducted by the investigator the word reading test, originally having 118 items, was reduced to 60 items. The correlation between this selected 60 items and the original 118 items were found to be 0.96.

The selected set of 60 words covered ail the orthographic rules of Kannada. The method of administration and scoring was same as that of letter recognition test. Maximum score = 60.

f. Non-word Recognition Teat (NWR).

The items for this test were selected from the Coitheart Karanth word list (Karanth, 1984). A total of twenty items of non-words were selected and retained in the present study. The suitability and number of items were finalised through a pilot study.

The subject was required to read the non-words. No time limit was given to complete the task. Just like in the case of letter recognition and word recognition test, here also the flash cards were used for the adminsitration. The testing started with the following instructions :

Instructions : "I am going to show you some cards one after another. On each card you see something written. You are required to read it loudly".

Scoring : Correctly read items fetch one score. Maximum score = 20.

g. Tests for the Assessment of Metalinguistic Awareness

The following battery of tests selected from previous studies - Karanth, Ahuja, Nagaraja, Pandit and Shivashankar (1991); Prakash and Chandrika, (in press); Prakash, Rekha, Nigam and Karanth, (1993).

(i) Rhyme Recognition Test (RR).

The test material consisted of 12 pairs of stimulus words - 6 rhyming and 6 nonrhyming. Here task of the child was to judge whether a given pair of words sound similar (rhyme) or not.

Example : Rhyming - Javali - Bavali;

Non-rhyming - Javali-Hesaru.

Instructions : I am going to present some words in pairs. Listen carefully both the words in the pair. You have to tell me whether two words in the pair rhyme or not".

Scoring : Every right answer carried the soore of one. Maximum score = 12.

(ii) Phoneme Oddity Test (PO)

This test consisted of 12 items. The items selected were similar to one employed by Bradley & Bryant (1979). Each item contained 4 non-meaningful words. Of these four words three shared a common sound and one was odd. The child was required to tell which the odd one was.

Example : Choti-Bika-Chema-Chuli.

Here Bika is the odd one.

Instructions : I am going to present you a set of four words. Three of them shared a common sound and the one is different. Listen carefully and tell me which odd one is .

Scoring : The right answer carried one score. Maximum Score = 12.

(iii) Phoneme Deletion Test (PD)

This test consisted of 24 test items of two or three syllable words. Here the task of the subject was to strip a particular sound from the stimulus word and say what remained. The target phoneme could be at initial, middle and final position. The procedures and Instructions were the same as followed by Bruce (1964).

Example : gouda - ouda

Instructions : I am going to tell you a word. Listen carefully. I will ask you remove a part of it. You should tell me what remains afterwords?"

Scoring : Each correct answer carried one score. Maximum score = 24.

(iv) Syllable Deletion Test (SD)

The test material consisted of 12 items. The words consisted of simple CVCVCV combinations to complex words consisting of CCV consonant cluster strings. The subjects were required to tell what remained when a syllable was deleted from a word. The target syllable could be at initial, middle or final position.

Example - In a word neyalu', the syllable ne' should be removed and the remainder is yalu'.

Instructions : "I am going to present a word. Listen carefully and then I will ask you to remove a particular syllable from that. You are required to repeat the reminder of the word".

Scoring - Each correct response carried one score. Maximum score = 12.

(v) Phoneme Reversal Test (PR)

This is relatively a complex metalinguistic task. Here, the subject should have the knowledge of phonemes in Kannada and the rules of their usage to constitute a word.

The test consisted of 12 test items. Each item was made up of one vowel (first letter) and one C+V blend. The subject was required to reverse the order of phonemes and then say the resultant word.

Example : uri -> iru

Instructions : I am going to present a word. Listen carefully. You are required to repeat the word in the reverse order of sounds".

Scoring - Each correct word gets one score. Maximum score : 12

(iv) Syllable Reversal Test (SRT)

The test consisted of 12 meaningful words. The subject was instructed, I am going to present a word. Listen carefully. You are required to reverse the order of syllable in the word and tell me the resultant word.
Example : geleya -> yaiege

Scoring - Each correct response carried one score. Maximum Score = 12.

(vii) Grammaticality Judgement Test (GJ)

The items were originally selected from a Language Profile Test (Karanth, 1986). The original test consisted of 11 sub-categories of items. Out of these, seventy-four items in total were retained following a pilot study. There were equal number of right or wrong words. The subject was instructed "I will be presenting a list of sentences one at a time. The sentences maybe correct or incorrect. Listen carefully and indicate whether the sentence is correct or not".

Scoring - Each correct answer carried one score. Maximum Score = 74.

(viii) Synonymy Judgement Teat (SJ)

This test consisted of 10 items. Each item had two sentences, which may or may not convey same meaning.

Example - 1. Teacher calls the students

2a. The students are called by teacher

or

2b. The students met teacher.

Instructions - I am going to present two sentences one after another. Listen carefully. Both the sentences may give same meaning or not. After listening both of the sentences you have to tell me whether two sentences mean the same or different".

Scoring - One score was given for each correct answer. Maximum score = 10.

In all the above tests, instructions were followed with a number of illustrations to ascertain that the subjects understood the nature of the task. Only then the test proper was administered.

3.4.0. Procedure

The entire procedure of study can be divided into three parts : Pilot study, Screening and main study.

3.4.1. Pilot study :

Since we did not have well standardized tools, it was necessary to try out a few tools with the similar group. As a result, some of the tests originally planned had to be eliminated and a few required modifications. For this purpose two groups of children were drawn namely children with Normal Reading (N=7) and Reading Disability (N=8). These two groups were administered following tests :

1. Word recognition test - original items were 118. Selected items were 60.
2. Visual recognition test (Prasad & Wing, 1983).
3. Grammaticality Judgement Test - Original items were 174 and selected items were 74.

It was found that the correlation between original and the selected items in word recognition test was high (Pearson Product Movement Correlation) r = .985. The correlation between full set and selected items were also found to be high r = 0.947 with regard to grammaticality judgement test.

Hence, on the basis of the findings only selected items in each test were retained for final study. Since, there was no difference between two groups on the visual retention test, this test was not included in the study proper.

3.4.2. Screening

This part of the study was carried out in four steps.

Step-1 - It was planned to conduct the study on the children of standard Kannada medium schools. Hence, as a first step two such schools were identified.

Step-2 - From such identified schools two groups of children, namely children with Normal Reading and children with Reading Disability among Grades II to IV were selected by administering the screening tools.

Step-3 - Screening tools : Rutter's proforma A' and B' were supplied to the respective class teachers. Here the teachers were required to assess each student individually on the basis of the child's scholastic, performance school attendance, reading and writing ability and behaviour at school. This individually assessed proforma were collected from the teachers and on the basis of this assessment a 'general pool'

of children was made, such children whose total score on proforma B was below 9 were retained for further screening.

Step-4 To this group of students other screening tests were administered individually by the researcher. Firstly Oral Reading Test (Jaya Bai, 1957) was administered. Depending on the scores on this test, the students were divided into two groups. Secondly, in order to exclude the mental retardation, RCPM was administered. Based on the scores, only the normal and above normal children were retained. Thirdly, such selected groups were administered the Socio-Economic Status Scale. Only those children who fell in the category of lower middle class and middle class were retained. In the last stage of screening, the exclusion criteria mentioned in the sample selection were considered and finally two groups of children were selected from Grades II, III and IV. The total number of students tested for screening was 440 (160, 120 and 160 from Grade IV, III and II respectively). The final selected group consisted of 20 children with Normal Reading and 20 children with Reading Disability from each of the Grades (Total = 120).

3.4.3. The Main Study

Every test was administered individually. Proper care was taken to develop rapport with each child and thus their cooperation, motivation were maintained throughout the assessment session. Whenever required sufficient interval between one test to another was provided. The exact procedure of testing and scoring has already been described in the previous section. The testing was carriedout in the beginning months of academic year.

In addition to this, 32 children from Grade I were administered cognitive and metalinguistic tests in the beginning months of academic year. The next year when they reached Grade II their reading achievements were assessed.

RESULTS

CAHPTER IV

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CHAPTER IV

4.0.0. RESULTS

The aim of the present investigation was to assess the children with Reading Disability on cognitive, linguistic and metalinguistic processing measures in comparison to normal readers. It was also aimed to draw a profile of Reading Disability that would help in planning the appropriate remedial measures. A parallel investigation was also carried out in order to know which of the cognitive-language related tests are good predictors of Reading Disability.

The results obtained were subjected to both quantitative and qualitative analyses. The descriptive statistics such as mean, SD and mean percentages were obtained for the data of children with normal reading and Reading Disability. These are presented in Tables, 4.1 and 4.2 respectively. A careful observation of Tables 4.1 and 4.2 reveals following salient features :

1. Almost on all the tests children with Reading Disability, when compared to normal group showed poor performance. The exception was the performance on colour cancellation

Table 4.1: Showing the means, and SDs of children with Reading Disability and Normal Reading of Grades II, III and IV on various cognitive, linguistic and metalinguistic tests.

Sl.No. Tests	Grade II		Grade III		Grade IV	
	RD	Normal	RD	Normal	RD	Normal
Cognitive Tests						
1. Perception (MPD)	116.75 (25.19)	99 (42.06)	96.65 (40.16)	67.05 (40.90)	93.75 (34.90)	44.55 (30.28)
2. Colour Cancellation (CC)	25.9 (8.79)	23.6 (4.67)	28.75 (4.88)	29.6 (5.57)	37 (9.61)	40.95 (9.35)
3. Serial Recall (SRT)	20.9 (5.67)	22 (4.51)	21.7 (4.14)	28.9 (6.71)	22.85 (5.96)	30 (5.11)
Linguistic Tests						
4. Letter Recognition (LR)	45.2 (3.75)	47.55 (1.53)	47.8 (.95)	49.25 (1.20)	47.2 (1.64)	49.55 (.83)
5. Word Recognition (WR)	22 (7.86)	43 (7.11)	39.3 (8.42)	50.45 (4.32)	38.85 (8.48)	54.85 (2.08)
6. Non-word Recognition (NWR)	7.0 (2.19)	12.45 (2.42)	11.3 (2.43)	14.75 (2.17)	10.65 (2.64)	17.5 (2.39)
Metalinguistic Tests						
7. Rhyme Recognition (RR)	5.35 (1.46)	8.7 (1.81)	10.5 (1.07)	12.0 (0)	11.1 (1.80)	11.95 (.22)
8. Phoneme Oddity (PO)	.3 (.92)	1.8 (1.51)	3.55 (1.61)	4.85 (1.53)	5.3 (1.75)	7.8 (1.44)
9. Phoneme Deletion (PD)	0 (0)	.35 (.59)	1.2 (1.77)	9.15 (2.46)	2.65 (3.70)	13.15 (5.07)
10. Syllable Deletion (SD)	1.95 (2.09)	8.6 (1.54)	8.65 (2.25)	12 (0)	9.4 (2.60)	12 (0)
11. Phoneme Reversal (PR)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.95 (1.70)
12. Syllable Reversal (SR)	1.95 (1.05)	7.35 (1.84)	5.5 (3.93)	11.65 (.88)	4.8 (2.55)	11.75 (.44)
13. Grammaticality Judgement (GJ)	39.8 (2.80)	44.25 (4.66)	45.1 (4.13)	52.65 (5.53)	53.35 (6.61)	63.75 (5.32)
14. Synonymy Judgement (SJ)	4.684 (.67)	5.1 (.79)	6.4 (1.73)	6.65 (1.49)	6.6 (1.35)	8.75 (1.02)

*RD - children with Reading Disability ** Normal - children with Normal Reading.

Table 4.2: Showing the mean percentage values of chidlren with Reading Disability and Normal Reading in Grades II, III and IV based on the performance on various tests.

Sl. No.	Test	Grade II		Grade III		Grade IV	
		RD	Normal	RD	Normal	RD	Normal
	Cognitive Tests						
1.	MPD	77.83	66	64.43	44.70	62.50	29.70
2.	Colour Cancellation	43.17	39.33	47.92	49.33	61.67	68.25
3.	Serial Recall	34.83	36.67	36.17	48.17	38.08	50.00
	Linguistic Tests						
4.	Letter Recognition	90.4	95.10	95.6	98.85	94.4	99.1
5.	Word Recognition	36.67	71.67	65.5	84.08	64.75	91.42
6.	Non-word Recognition	35	62.25	56.5	73.75	53.25	87.5
	Metalinguistic Tests						
7.	Rhyme Recognition	44.58	72.5	87.5	100	92.5	99.58
8.	Phoneme Oddity	2.5	15.0	29.58	40.42	44.17	65
9.	Phoneme Deletion	0	1.46	5.0	38 13	11.04	54.79
10,.	Syllable Deletion	16.25	71.67	72.08	100	78.33	100
11.	Phoneme Reversal	0	0	0	0	0	24.58
12.	Syllable Reversal	16.25	61.25	45.83	97.08	40.0	97.92
13.	Grammaticality Judgement	53.78	59.80	60.95	71.15	72.09	86.15
14.	Synonymy Judgement	46.84	51.0	64.0	66.5	66.0	87.5

* RD - children with Reading Disability

** Normal- children with Normal Reading.

test (In Grade II, mean of RD group = 25.9 and mean of normal group = 23.6). 2. By and large, children with Reading Disability and Normal Reading exhibited developmental progression in their performance.

3. Performance on phoneme reversal test was very poor when compared to other metalinguistic tasks. Except a few in normal group of Grade IV none of the subjects got any score on phoneme reversal task.
4. The performance on other phonemic test was also (phoneme oddity, phoneme deletion) relatively poor in comparison with syllabic (syllable reversal and syllable deletion) and rhyme tests.

In order to see the deveiopmental progression within the groups, cross-sectionally, over the grades, a one way ANOVA was employed. Wherever the F-vaiue was found to be significant, it was further analysed using Scheffe's Multiple Comparison Test. The results are summarised in Table 4.3a and 4.3b respectively for reading disabled and normal group. Table 4.3a reveals the following :

With respect to children with Reading Disability, there were no significant changes in the development of perceptual (F-value = 2.716, EL <.75) and short-term memory (F-value =

Table 4.3a: Summary of one way ANOVA and Scheffe's multiple comparison test (children with Reading Disability)

Sl. No.	Tests	F(2,57)	P	Scheffe's Test Grade II v/s Grade III	Grade II v/s Grade IV	Grade III v/s Grade IV
	Cognitive Test					
1.	MPD	2.716	.75	-	-	-
2.	Colour Cancellation	10.302	.0002	.629	9.548*	5.275
3.	Serial Recall	.678	.5115	-	-	-
	Linguistic Tests					
4.	Letter Recognition	6.296	.0034	5.741*	3.397*	.306
5.	Word Recognition	28.534	.0001	21.957*	20.83*	.015
6.	Non-word Recognition	17.974	.0001	15.465*	11.143*	.353
	Metalinguistic Tests					
7.	Rhyme Recognition	91.596	.0001	61.504*	75.203*	.688
8.	Phoneme Oddity	59.495	.0001	24.4*	57.762*	7.076*
9.	Phoneme Deletion	6.278	.0034	1.284	6.259*	1.874
10.	Syllable Deletion	62.217	.0001	41.497*	51.308*	.52
11.	Phoneme Reversal	-	-	-	-	-
12.	Syllable Reversal	9.221	.0003	8.216*	5.295*	.319
13.	Grammaticality Judgement	40.776	.0001	6.141*	40.142*	14.88]
14.	Synonymy Judgement	12.039	.0001	8.055*	10.043*	.11:

* p < .05

.678, p_ <5115) skills. However, there was a significant changes in the development of attention processes, (between Grade II and Grade IV Scheffe's Test value = 9.548 and between Grade III and Grade IV Scheffe's Test value = 5.275).

The children with Reading Disability showed developmental changes on all the linguistic processes across the grades. The changes were statistically significant between Grade II and Grade III (Scheffe's Test value = 5.741, 21.957 and 15.465 respectively for letter recognition, word recognition and non-word recognition skills). But it was not significant between Grade III and Grade IV (Scheffe's Test value .306, .015 and .353 respectively for letter recognition, word recognition and non-word recognition tasks). This indicates that no further progression was attained by children with Reading Disability from Grade III onwards, particularly for word recognition and non-word recognition skills. On the other hand development of letter recognition process was almost at the ceiling level at the Grade III (Mean percentage = 95.6).

In the metalinguistic processes the children with Reading Disability showed an improvement in the development upto the Grade III. The developmental increase was noticed

from Grade III to IV in two of the metalinguistic processes viz., phoneme oddity (Scheffe's Test value = 7.076) and grammaticality judgement (Scheffe's Test value = 14.881). In case of phoneme deletion task the differences in the development from Grade II to Grade III was not statistically significant (Scheffe's Test value = 1.284). Thus, the overall picture that emerges from this analysis suggests that by and large from the Grade III level onwards no further developmental progression was achieved by the children with Reading Disability in cognitive, linguistic and metalinguistic processes. A reexamination of the mean values and the graphs on the other hand, shows a trend towards the regression in some of these skills.

From the Table 4.3b, following features can be noticed: A clear cut progression in the development of cognitive processes were seen in the children with normal reading. The group showed developmental increments between the Grade II, III and IV. A steady but significant increments in the development of linguistic and metalinguistic processes were seen in the children with normal reading between the grades. It may be noted that Scheffe's Multiple Comparison Test values were found to be not statistically significant between the Grade III and IV on letter recognition (Scheffe's Test

Table 4.3b: Summary of one way ANOVA and Scheffe's multiple comparison test (children with Normal Reading)

Sl. No.	Tests	F(2,57)	P	Scheffe's Test Grade II v/s Grade III	Grade II v/s Grade IV	Grade III v/s Grade IV
Cognitive Tests						
1.	MPD	10.304	.002	3.513*	10.202*	1.742
2.	Colour Cancellation	33.193	.0001	3.848*	32.173*	13.769*
3.	Serial Recall	12.321	.0001	7.799*	10.484*	.198
Linguistic Tests						
4.	Letter Recognition	15.484	.0001	9.616*	13.31*	.299
5.	Word Recognition	29.27	.0001	11.319*	29.637*	3.948*
6.	Non-word Recognition	23.083	.0001	4.776*	23.023*	6.827*
Metalinguistic Tests						
7.	Rhyme Recognition	64.552	.0001	49.147*	47.669*	.011
8.	Phoneme Oddity	80.827	.0001	20.884*	80.814*	19.537*
9.	Phoneme deletion	80.182	.0001	36.202*	76.592*	7.48*
10.	Syllable deletion	98.054	.0001	73.54*	73.54*	0
11.	Phoneme reversal	6.181	.0001	0	45.136*	45.136*
12.	Syllable reversal	86.824	.0001	63.605*	66.597*	.034
13.	Grammaticality Judgement	71.284	.0001	13.143*	70.829*	22.94*
14.	Synonymy judgement	51.628	.0001	9.24*	51.24*	16.962*

P < .05

value = .299) rhyme recognition (Scheffe's Test value = .011), syllable deletion (Scheffe's Test value = 0) and syllable reversal (Scheffe's Test value = .034). It is because the group had already attained these skills to the ceiling level in the Grade III level itself (See Table 4.1 and Table 4.2).

These observations highlight that, the developmental patterns of children with Reading Disability and Normal Reading are not the same. The Reading Disability group seemed exhibiting a lag in certain skills.

Next, in order to compare the performance between the children with Reading Disability and Normal Reading on each of the tests an unpaired t-tests were performed. The summary of 't' test analysis is given in Table 4.4. Observation of this table reveals following :

In general, at Grade II level ho statistically significant difference was found on the cognitive tests, between children with Reading Disability and Normal Reading. However, in terms of perceptual and short-term memory tasks, statistically significant differences were found between the two groups at Grade III and Grade IV levels.

Table 4.4: Results of unpaird t-test on various cognitive, linguistic and metalinguistic tests (df. = is 38 in each grade).

Tests	Grade II t-value	Prob. (2 tail)	Grade III t-value	Prob. (2 tail)	Grade IV t-value	Prob. (2 tail)
Cognitive Tests						
MPD	-1.619	.1137	-2.309	.0265*	-4.761	.0001**
Colour Cancellation	-1.033	.3082	.513	.6111	1.318	.1955
Serial Recall	.678	.5018	4.082	.0002**	4.07	.0002**
Linguistic Tests						
Letter Recognition	2.593	.0134**	4.216	.0001**	5.72	.0001**
Word Recognition	8.862	.0001**	5.27	.0001**	8.199	.0001**
Non-word Recognition	7.28	.0001**	4.732	.0001**	8.592	.0001**
Metalinguistic Tests						
Rhyme Recognition	6.442	.0001**	6.097	.0001**	2.092	.0432*
Phoneme Oddity	3.794	.0005**	2.621	.0125**	4.938	.0001**
Phoneme Deletion	2.666	.0112**	11.757	.0001**	7.478	.0001**
Syllable Deletion	11.469	.0001**	6.646	.0001**	4.466	.0001**
Phoneme Reversal	0	0	0	0	7.758	.0001**
Syllable Reversal	11.384	.0001**	6.836	.0001**	12.024	.0001**
Grarmat ical ity Judgement	3.663	.0008**	4.894	.0001**	5.481	.0001**
Synonyny Judgement	1.769	.0851	.489	.6277	5.675	.0001**

Note : * - Probability at .05 level;

** - Probability at .01 :Level

Performance on all linguistic tests showed that Reading Disability group was significantly inferior to normal group at all the three grades.

On ail the other metalinguistic skills except on phoneme reversal and synonymy judgement tasks, reading disability group's performance was poor than normal group at all the three grade levels. At Grade level IV, however, the children with Reading Disability showed poor performance on phoneme reversal and synonymy judgement tasks.

At the outset, it may appear that the children with Reading Disability, as a whole, exhibited significantly poor performance than normals in all the cognitive, linguistic and metalinguistic skills implying a general backwardness or developmental lag on the part of children with Reading Disability. In order to check this notion and get a clear picture, some of the Grade IV children with Reading Disability were matched on reading achievement level with Grade II children with Normal Reading. The performance of these two groups (N=13 in each group) was compared on all the tests. The results in general were presented in the Table 4.5 and 4.6. The results revealed that when the reading age was matched, the differences between the groups were only on some metalinguistic tasks (see Table 4.5).

Table 4.5: Means and SDs. of children with Reading Disability and Normal Reading (Reading level matched)

Sl. No. Tests	Normal Reading Mean	SD	Reading Disability Mean	SD
Cognitive Tests				
1. MPD	104.85	37.37	84.92	37.09
2. Colour Cancellation	23.08	5.56	37.54	10.74
3. Serial Recall	22.08	5.02	22.54	6.89
Linguistic Tests				
4. Letter Recognition	47.54	1.56	47.54	1.13
5. Word Recognition	41.77	6.71	41.23	5.45
6. Non-word Recognition	12.46	2.99	10.62	2.29
Metalinguistic Tests				
7. Rhyme Recognition	8.77	1.88	10.92	2.1
8. Phoneme Oddity	2.15	1.57	5	1.78
9. Phoneme Deletion	.54	.66	2.62	3.53
10. Syllable Deletion	8.77	1.30	10.00	2.04
11. Phoneme Reversal	0		0	
12. Syllable Reversal	7.15	2.08	5.08	2.31
13. Grammaticality Judgement	45.85	4.43	53.15	5.97
14. Synonymy Judgement	5.23	.73	6.46	1.33

Table 4.6 revealed that on the seven tests the differences between children with Reading Disability and Normal Reading were significant. The following were the t-

Table 4.6: Results of unpaired t-test on various cognitive, linguistic and metalinguistic tests (df 24) (reading level matched)

Sl. No.	Tests	t-value (unpaired)	Prob. (2-taii)
Cognitive Tests			
1.	MPD	1.36	.1851
2.	Colour Cancellation	-4.313	.0002**
3.	Serial Recall	-.195	.8471
Linguistic Tests			
4.	Letter recognition	0	0
5.	Word recognition	.225	.8242
6.	Non-word recognition	1.77	.09
Metalinguistic Tests			
7.	Rhyme recognition	-2.757	.011*
8.	Phoneme oddity	-4.32	.0002**
9.	Phoneme deletion	-2.088	.0476*
10.	Syllable deletion	-1.83	.0792
11.	Phoneme reversal	0	0
12.	Syllable reversal	2.402	.0244*
13.	Grammaticality judgement	-3.544	.0017**
14.	Synonymy judgement	-2.929	.0073**

* P < .05 ** P < .-1

values on these tasks : rhyme recognition (t= -2.757 p=.011), phoneme oddity (t= -4.32 p=.0002), phoneme deletion (t= -

2.088 p=.0476), syllable reversal (t= +2.402 p=.0244), grammaticality judgement (t= -3.544 p=.0017), synonymy judgement (t= -2.929 p=.0073) and colour cancellation (t= -4.313 p=.0002) tasks. The negative t' value indicates that the mean value of the children with Reading Disability is greater than the Normal Reading, showing that the performance of the children with Reading Disability was significantly better than the Normal Reading on the six of the above tasks. Whereas the performance of children with Normal Reading was significantly better than the children with Reading Disability on syllable reversal tasks. On other seven tasks, both the group did not differ significantly. They are perception, short-term memory, letter recognition, word recognition, non-word recognition, syllable deletion and phoneme reversal tasks.

In order to see whether the performance of children with Reading Disability show any definite patterns, next, a careful profile analysis was attempted. This analysis consisted of -

a) Examining performances of all the reading disabled ones test-wise (columns) and individual performance across the tests (rows). By column-wise analysis, information regarding number and percentage of cases who had severe

difficulty on particular tests were inferred. Row-wise analysis helped to have an individual profile of reading disabled.

b) Error analysis - The errors committed were classified into various categories and the percentage of error for each category was computed.

For the purpose of obtaining profiles those who scored one SD below the mean (on a particular test) were treated as having severe problem in the respective test. The percentage of very poor performers in each test was thus calculated. This is presented in Table 4.7a, 4.7b and 4.7c. The horizontal total refers to the number of tests in which a given individual was showing severe problems.

Table 4.7a indicates that, in general, the metalinguistic tasks - rhyme recognition (35%), phoneme oddity (75%), phoneme deletion and phoneme reversal (100%), syllable deletion (30%), and synonymy judgement (45%) - were found to be most difficult to this group. The linguistic tasks - letter recognition (25%), word recognition (35%), non-word recognition (25%) - were found to be relatively easy. The cognitive tasks - attention and concentration (10 %) , perception (25%) and short-term memory (20%) - were found to be easiest.

Table 4.7a: Individual profile and test profile of children with Reading Disability of Grade II with the % of children showing poor performances on each of the tests.

Indivi-duals	Tests														
	MPD	CC	SR	LR	WR	NWR	RR	PO	PD	SD	PR	SR	GJ	SJ	Total
1.		*			*			*	*		*		*		6
2.			*						*		*			+	4
3.			*						*	*	*			*	5
4.								*	*		*				3
5.								*	*		*	*		*	5
6.				*				*	*		*	*			5
7.	*		*					*	*	*	*			*	7
8.	*							*	*	*	*	*			6
9.								*	*		*				3
10.								*	*		*			*	5
11.	*				*				*		*			*	6
12.						*			*		*				3
13.							*	*	*		*				4
14.							*	*	*		*				4
15.	*				*		*	*	*	*	*	*		*	9
16.					*	*		*	*		*		*		6
17.					*	*	*	*	*	*	*		*	*	9
18.				*				*	*	+	*				5
19.			*	*	*	*	*	*	*		*			*	10
20.				*			+	*	*		*		*		8
Total	5 25	2 10	4 20	5 25	7 35	5 25	7 35	15 75	20 100	6 30	20 100	4 20	4 20	9 45	113

Note: * - Indicates presence of severe problem

When we examine the row-wise total it is evident that there were quite a few children who were very poor in almost all the tasks (10 out of the 14 tests). But, certain children had severe difficulty only on some tests. For e.g. subject 11-4 was very poor in letter recognition, phoneme deletion and phoneme reversal tasks. Subject-11-9 was very poor only one three phoneme tasks - viz., phoneme oddity, phoneme deletion and phoneme reversal.

Examination of Table 4.7b reveals that, by and large the metalinguistic tasks - rhyme recognition (50X), syllable deletion (30X), phoneme reversal (100X) and synonymy judgement (40X) - were found to be most difficult for Grade III. The linguistic tasks - letter recognition (40X), word recognition (25X), non-word recognition (30X) -were found to be less difficult. The cognitive tasks -attention and concentration (30X), perception (25X) and short-term memory (15X) - were found to be relatively easy. But the phoneme reversal task was the most difficult task for ail the 20 subjects of Grade III. The same was true for the Grade II subjects. It is interesting to note that, for the subject 111-16 none of the tasks was found to be very difficult except the phoneme reversal task, yet his performance was not on par with the average performance of normal group of the same grade.

Table 4.7b: Individual and test profile of children with Reading Disability of Grade III with the % of children showing Door performances on each tests.

Indivi —auais	Tests														
	MPD	CC	SR	LR	WR	NWR	RR	PO	PD	SD	PR	SR	GJ	SJ	Total
.						*	*			*	*				4
2.					+	*					*				3
3.							*			*	*		+		4
4.		*	*							*	*				6
5.					*	*					*	*	+		8
6.	*	*									*	*			7
7.											*				2
8.			*							*	*				7
9.		*						*			*				5
10.	*	*									*				4
11.				*							*			*	3
12.											*	*		*	5
13.					*		*				*	*			5
14.	*					*					*				3
15.								*			*				2
16.											*				1
17.	*		*				*				*				4
18.				*	*						*				3
19.	*	*		*							*				4
20.										*	*			*	5
Total	5	6	3	8	5	6	10	2	0	6	20	4	2	8	85
%	25	30	15	40	25	30	50	10	0	30	100	20	10	40	

Note: * - Indicates presi:nce of severe probleim

Table 4.7c: Individual profile and teat profile of chidiren with Reading Disability at Grade IV with the % of children showing poor performances on each of the tests.

Indivi-duals	Tet!tS														
	MPD	CC	SR	LR	WR	NWR	RR	PO	PD	SD	PR	SR	GJ	SJ	Total
1.											*				1
2.				*		*			*		*				4
3.									*		*				3
4.						*	*	*	*	*	*	*	*		8
5.				*	*	*	*		*	*	*	*			8
6.		*						*			*				4
7.											*				3
8.		*		*		*					*				4
9.								*	*		*				3
10.			*								*				3
11.											*			*	6
12.			*								*				3
13.								*			*	*	*		5
14.						*					*			*	4
15.				*				*			*	*			5
16.								*			*				2
17.	*				*					*	*	*	*		8
18.											*			*	3
19.	*						*				*	*	*		5
20.											*			+	2
Total	3	3	3	5	3	6	3	8	12	5	19	6	4	4	84
%	15	15	15	25	15	30	15	40	60	25	95	30	20	20	

Note : * - Indicates presence of severe problem

Table 4.7c reveals that the Grade IV children with Reading Disability showed same trend as seen in Grade III. Most of the children were finding the metalinguistic tasks as the most difficult. Just like in Grade III, in the Grade IV also one subject performed (IV-1) relatively well on all the tasks except on phoneme reversal task.

Next step of analysis was computing the combined profile of all the 60 individuals irrespective of their Grade (Table 4.8). When the percentage or number of individuals having severe difficulties on various tasks were computed, the profile obtained was found to be almost similar to that of grade-wise profiles.

In order to ascertain the above observation, a complementary support was sought in the form of estimating number of reading disabled children who performed on par with normal children. For this purpose, we took the mean score of normal group as reference point. A score within one SD of normal mean was considered as (near normal) performance. Frequency and percentage of children with Reading Disability who performed at normal or near normal level on each of the tests were calculated. The summary is presented in Table 4.9. The results indicated that on the cognitive tasks

Table 4.8: Combined profile for all the 60 children with Reading Disability.

	Tests													
	MPD	CC	SR	LR	WR	NWR	RR	PO	PD	SD	PR	SR	GJ	SJ
Grade II Total individual	5	2	4	5	7	5	7	15	20	6	20	4	4	9
Grade III Total individual	5	6	3	8	5	6	10	2	0	6	20	4	2	8
Grade IV Total individual	3	3	3	5	3	6	3	8	12	5	19	6	4	4
Total no.of individuals	13	11	10	18	15	17	20	25	32	17	59	14	10	21
X of individuals	21.67	18.33	16.67	30	25	28.33	33.33	41.46	53.33	28.33	98.33	23.33	16.67	35

Table 4.9: Summary of frequency and percentage of children with Reading Disability who performed at normal or near normal level on different testa.

	Tests													
	MPD	CC	SR	LR	WR	NWR	RR	PO	PD	SD	PR	SR	GJ	SJ
GradeII Total individual	15	19	13	10	1	2	1	3	0	1	0	0	14	11
Grade III Total individual	11	15	8	13	6	7	4	17	0	5	0	2	7	12
Grade IV Total individual	6	5	7	11	0	2	3	9	2	8	0	0	5	5
Total no.of individuals	32	39	28	34	7	11	8	29	2	14	0	2	26	28
X of individuals	53.33	65	46.66	56.66	11.66	18.33	13.33	48.33	3.33	23.33	0	3.33	43.33	46.66

the many of children exhibited near normal performance - colour cancellation (65%), perception (53.3%) and short-term memory (46.66%) . The letter recognition task was found to be easier (56.66%) for most of the children. The other two linguistic tasks, word recognition and non-word recognition were found to be difficult (11.66% nd 18.33% respectively). It may be observed that on some of the metaiinguistic tasks [viz., rhyme recognition (13.33%), phoneme deletion (3.33%) and phoneme reversal (0%)), the group performance was very poor. These findings once again support the preceding analysis stating that the children with Reading Disability the metalinguistic tasks were found to be most difficult, followed by linguistic tasks and the cognitive tasks were easiest.

In the next step of the analysis, an attempt was made to categorise the children with Reading Disability on the basis their individual profiles. Those who exhibited a similar pattern in the performance were grouped together. The obtained groups are presented in a Table form (see Table 4.10). The seven categories emerged from this analysis along with the percentage of individuals on each category are as follows:

Table 4.10: Categories of Reading Disability

Sl. No.	Categories of Reading Disability	Individual entries	Total individual	% of individual
1.	Category I General Impairment Group	II-1, II-11, II-15, II-19, III-4, III-6, III-8, III-9, III-14, III-19, IV-6, IV-8, IV-17.	13	21.67
2.	Category II Cognitive Impairment Group	IV-7, IV-10	2	3.33
3.	Category III Linguistic Impairment Group	III-2, III-18,	2	3.33
4.	Category IV Phonemic Impairment Group	II-9, III-15, III-16 IV-1, IV-3, IV-9, IV-16	7	11.67
5.	Category V Metalinguistic- Impairment Group	II-5, II-10, III-3, III-7, IV-13, IV-18, IV-20	7	11.67
6.	Category VI Lingusitic and Metalinguistic Impairment Group	II-4, II-6, II-12, II-13, II-14 II-16, II-17, II-18, II-20 III-1, III-5, III-11, III-12, III-13, III-20, IV-2, IV-4, IV-5, IV- II. IV-14 IV-15.	21	35.00
7.	Category VII Cognitive and Metalinguistic Impairment group	II-2, II-3, II-7, II-8, III-10, III-17, IV-12, IV-19.	8	13.33

Note: Roman letter denotes grade and English number denotes individual in the respective grade.

Category I - General impairment group (21.67%), Category II - Cognitive impairment group (3.33%), Category III Linguistic impairment group (3.33%), Category IV - Phonemic impairment group (11.67%), Category V - Metalinguistic impairment group (11.67%), Category VI - Linguistic and metalinguistic impairment groups (35%), Category VII Cognitive and metalinguistic impairment group - (13.33 %) . The above analysis reveals that a major category consisted of individuals having difficulties in metalinguistic tasks (combined percentage was 71.67).

The next qualitative analysis employed was error analysis. Here, the reading errors committed by the children with Reading Disability were analysed. The number of errors committed were grouped into different categories. The data sheets of all the 60 children with Reading Disability were individually scrutinized and the various errors were tabulated. Then the percentage of errors for each of the categories were calculated (Table 4.11). From the Table, it is evident that maximum type of error was found in reading CC clusters (34.81%) followed by word substitution (27.90%) and errors in reading Anuswara (18.39%) and Arkas (10.12%). There were an evidence for letter substitution error (2.96%), Kagunitha errors (3.95) letter omission (0.86%) and change in

mutual letter position (0.99%). Only one error of reversal of letters was found in the entire protocols.

Table 4.11: Results of reading error analysis.

Sl.No.	Type of error	Percentage of error	
1.	Letter substitution	2.96	
2.	Word substitution		
	a) Meaningful	11.11}	
	b) Non-sense	16.79}	27.9
3.	Errors with Anuswara		
	a) Omission	10.12}	
	b) Adition	8.27)	18.39
4.	Arka	10.12	
5.	CC Clusters	34.81	
6.	Kagunitha omission	3.95	
7.	Letter omission	0.86	
8.	Change in mutual letter position	0.99	

The implications of these results will be discussed in the next chapter. The results related to the early identification of the Reading Disability will also be discussed in the next chapter.

DISCUSSION

CHAPTER V

LIST OF FIGURES

CHAPTER V

5.0.0. DISCUSSION

The results presented in the previous chapter will be discussed below keeping in view the research objectives of the present study. The entire discussion will be divided into 5 parts.

In the first part, issues related to the developmental factors in Reading Disability will be discussed with reference to the Tables 4.1, 4.2, 4.3a, 4.3b. In the second part, the discussion will be on the comparison between children with Reading Disability and Normal Reading. This in relation to the Tables 4.4, 4.5 and 4.6. An in depth analysis of the results of children with Reading Disability and its clinical implications will be discussed in part three. For this the Tables 4.7 through 4.11 will be the reference. The fourth part will deal with the issues related to early identification and prediction of Reading Disability. The final part will be the synthesis of overall findings and application value of the present study.

5.1.0. Developmental Factors

One of the major issues in the area of Reading Disability is whether the reading disabled group shows a similar pattern of development of reading skills as that of normal readers. Deveiopment of reading skills among children with Reading Disability and Normal Reading is discussed below on the basis of the obtained results. This discussion includes within group (across the grades) as well as between group comparisons.

5.1.1. Development of Cognitive Processes

(a) Attention :

When we observe the Tables 4.1 and 4.2 it is evident that the normal children showed sharp increments in their scores from one grade to next the higher grade. By Grade IV level the performance reached 68.25% accuracy level. On the other hand children with Reading Disability were far behind their counterparts at every grade. It seems that even though the pattern of development is similar for children with Reading Disability and Normal Reading, the reading disabled group always lags behind.

In general, statistically significant developmental changes could be seen across the grades for the children with Reading Disability (F=10.302 p.0002). But Scheffe's test revealed that the changes were not significant between the Grades II and III. That means, the attention process was improved over the grades in reading disabled group from Grade III onwards. In case of normal group there is an evidence for a steady improvement in this skill over the grades and these improvements were significant from one grade to another (F = 33.193, p .001). This difference in the developmental pattern can be seen in the Table 4.1 and 4.2.

(b) Perception and Short-term Memory Processes

The analysis showed that the children with Reading Disability did not show any progression over the grades on both the tasks (F = 2.716 in case of perceptual processes and it was .678 with regard to short-term memory). Neither of the 'F' value was found to be statistically significant. On the other hand, the children with Normal Reading showed a marked developmental changes from Grade II to Grade III ('F' value was 10.304 for perceptual processes and 12.321 for short-term memory processes). Both of the F' values were significant at beyond .01 level.

Thus, there is a clear evidence that, the developmental changes among children with Reading Disability and Normal Reading were different. The mean values and % of mean values show that, there was a steady improvement in the above cognitive skills in children with Normal Reading. Whereas, no such progression over the grades was observed in children with Reading Disability. In short, there is an evidence for the developmental delay of the cognitive tasks in children with Reading Disability when compared with the Normal Reading.

The present study findings seem to support Satz and his associates' (Satz & Sparrow, 1970; Satz & Van Nostrand, 1973) hypothesis that, developmental dyslexia is a result of a lag in the maturation of these cognitive functions. Even if we cannot claim the cause and effect relationship, it looks very obvious that the children with Reading Disability shows lag in the maturation of their cognitive functions.

5.1.2. Development of Linguistic Processes

(i) Letter-recognition

It is worth noting that children with Reading Disability and Normal Reading exhibited a similar pattern in the

development of letter recognition task. The mean percentage showed that both the groups reached an almost ceiling level in the acquisition of this skill (Mean percentage values were 95.6% and 98.85% for children with Reading Disability and Normal Reading respectively) by the Grade III level. This could be because, in the present study only the basic Kannada letters were included in letter recognition task.

(ii) Word Recognition and non-word recognition

With respect to children with Reading Disability, a developmental progression on these two tasks were noticed upto Grade III. But from the Grade III onwards no further progression was noticed on these tasks. Instead, there was a slight regression on these acquired skills which can be inferred by comparison of the mean % values of Grade III and Grade IV. On word recognition task, the mean % value was 65.5% at Grade III and it was 64.75% at Grade IV. In case of non-word recognition task, the mean % value was 56.5% at Grade III and it was 53.25% at Grade IV. This type of dips in the course of development is not rare.

In case of children with Normal Reading a marked upward developmental changes were observed on word recognition and non-word recognition task (F = 29.27 for word recognition

task and 23.083 for non-word recognition task). On ail the three grades this group showed significant developmental increments in both the tasks as evident from Scheffe's test values (see Table 4.3b).

Thus, the results suggest that the changes from Grade II to Grade III were quite rapid in all the three skills. But, from the Grade III onwards there was a clear-cut evidence for stunted growth in case of children with Reading Disability, particularly on word-recognition and non-word recognition skills. Since the sample for both the groups were drawn from the same school, the influence of secondary variable viz., teaching methods could be nullified. In short, from this analysis it is clear that the developmental pattern of linguistic skills (except letter recognition skill) in children with Reading Disability was not the same as that of Normal Reading.

5.1.3. Development of Metalinguistic Processes

There are three major views on development of metalinguistic awareness - One view is that metalinguistic awareness develops concomitantly with language acquisition (Clark, 1978; Clark & Anderson, 1979). The second view is

that metaiingusitic awareness develops in middle childhood and is related to a more general change in information processing capabilities that occur during this period (Hakes, Evans & Tunmer, 1980; Tunmer, Harriman & Nesdale, 1988). In Piogetion terms this occurs at the concrete operational thought stage (Flavell, 1981; Tunmer, Pratt & Harriman, 1984). The third view is that metalinguistic ability develops after children begin formal schooling and is largely, a consequences of learning to read (Donaldon, 1978; Valtin, 1984).

Even though, it is not the objective of the present study to verify the above views, following inferences could be drawn from the present study.

(i) Rhyme recognition

From the results, it may be noticed that the children with Normal Reading performed approximately at 73% accuracy level in Grade II, at 100% level in Grade III and Grade IV respectively. Similar developmental trend could be seen in children with Reading Disability. The F' values were found to be significant in both the groups (91.596 and 64.552 for children with Reading Disability and Normal Reading respectively). Scheffe's test showed that there was no

statistically significant developmental changes between Grade III and Grade IV in both the groups. This could be because both the group attained the rhyme recognition skill almost at the ceiling level (mean X values were 87.5% and 100% for children with Reading Disability and Normal Reading respectively) by Grade III level.

ii) Phoneme oddity

With regard to phoneme oddity skill the children with Normal Reading performed at 15% accuracy level in Grade II. Even at the Grade IV the performance was only at 65% accuracy level. On the other hand, the children with Reading Disability were far behind from children with Normal Reading at all the grade levels (2.5% at Grade II, 29.58% at Grade III and 44.17% at Grade IV).

The developmental pattern of the phoneme oddity skills of children with Reading Disability were comparable with that of children with Normal Reading. Both the groups showed a marked progression in this skill over the grades (F' value was 59.405 and 64.552 for children with Reading Disability and Normal Reading respectively) (see Table 4.3b).

iii) Phonemic deletion :

This task was found to be more difficult for both the children with Reading Disability and Normal Reading at all the grade levels. Even the Normal Reading could perform only IX accuracy level at Grade II. This task was not at all acquired by children with Reading Disability at Grade II level. However, at Grade levels III and IV, there existed a large gap between children with Reading Disability and Normal Reading. The normal group could attain 54 79X of mastery over this skill at Grade IV, the corresponding figure for the children Reading Disability was 11%.

The analysis revealed that, both the groups showed developmental progression on this skill over the grades ('F' value was 6.278 and 80.182 for children with Reading Disability and Normal Reading respectively). But this progression was stopped at Grade III level in children with Reading Disability (Scheffe's test value was 1.874 between Grade III and Grade IV).

iv) Phoneme Reversal :

It is of interesting to note that neither the normal nor the reading disabled group acquired the phoneme reversal

skill even at Grade III. It is only children with Normal Reading who acquired 24.58% accuracy level at Grade IV. Thus, it is clear that, the phonemic skills were the most difficult metalinguistic tasks for the present study groups (both children with Reading Disability and Normal Reading). But, the reading disabled group was found to be far behind the normals at every grade, in spite of the same teaching methods, syllabi and socio-economic background. Stanovich, Cunningham and Cramer (1984); Yopp (1988) found that tests of rhyme sensitivity were the easiest to perform and tests of phoneme reversal, the most difficult. The present study supports their findings.

v) Syllable deletion

When we observe the developmental pattern of children with Normal Reading in the syllable deletion task, it is clear that the performance was at 71.67% accuracy level at Grade II and it was 100% at Grade IV. In case of children with Reading Disability it was 16.25% at Grade II and 78.33% at Grade IV. Both the groups showed statistically significant progression between the Grade II and Grade III (Scheffe's test value was 41.497 and 73.54 for children with Reading Disability and Normal Reading respectively).

vi) Syllable reversal

This skill was found to be relatively more difficult than syllable deletion skill both for children with Reading Disability and Normal Reading. Normal group performed at 61.65% accuracy level at Grade II and 97.08 level at Grade III (F' value was 9.221 and 86.824 for children with Reading Disability and Normal Reading respectively). From Grade III to IV not much progression (Scheffe's test value was .034) was observed. In case of children with Reading Disability the performance was at 16.25% accuracy level at Grade II and 40% at Grade IV. A point to be noted here is that, the children with Normal Reading acquired the syllabic tasks almost at 100% accuracy level at Grade III. On the other hand, children with Reading Disability were showing the developmental lag on these tasks.

vii) Grammaticality judgement

The performance of children with Normal Reading on the grammaticality judgement task reached 60% accuracy level at Grade II and 86.15% at Grade IV. The corresponding scores of children with Reading Disability were 53.78% and 72.09% respectively (F' value was 40.776 and 71.284 for children with Reading Disability and Normal Reading respectively).

Even though the developmental progression was significant on both the groups at all the three grade levels, the mean X values clearly indicate that the children with Reading Disability were far behind from children with Normal Reading (see Table 4.2).

viii) Synonymy judgement

The performance of children with Normal Reading on the synonymy judgement task reached 51X accuracy level at Grade II and 87.5% at Grade IV. The corresponding scores of children with Reading Disability were 46.84% and 66% respectively ('F' value was 12.039 and 51.628 for children with Reading Disability and Normal Reading respectively). The developmental progression was significant in children with Normal Reading at all the three grades. Whereas there was no significant developmental progression between the Grade III and Grade IV (Scheffe's test value was .112) in children with Reading Disability. However the mean X values clearly indicate that the children with Reading Disability were far behind from children with Normal Reading (see Table 4.2).

To recaptuate, the following points can be highlighted -

a) Developmentally the children with Reading Disability showed a lag in acquisition of various skills related reading.
b) The children with Reading Disability lag far behind the children with Normal Reading in linguistic and phonemic tasks. They are also poor in perceptual, short-term memory tasks.
c) Since the relevant extraneous factors such as intelligence, socio-economic status, emotional aspects and the teaching methods were remained the same for both the groups the lag whatever observed here in children with Reading Disability could be purely because of their inner processing deficit.

With these findings the validity of the null hypothesis (Hypothesis 4) was examined as follows :

1. The null hypothesis that there is no significant improvement on the cognitive skills across the grades for both children with Reading Disability and Normal Reading was accepted with regard to perceptual and short-term memory tasks in children with Reading Disability. But, this hypothesis was rejected partially, in case of

children with Normal Reading. Because the changes were significant on these tasks up to Grade III and subsequent changes were not significant. In case of attention task the hypothesis was rejected for both children with Reading Disability and Normal Reading.

2. The null hypothesis related to linguistic skills was supported partially in children with Reading Disability. This was because, the developmental changes were not significant from Grade II onwards in all the skills - letter recognition, word recognition and non-word recognition. But the hypothesis was fully rejected with regard to these skills in children with Normal Reading.

3. With regard to the metalinguistic skills the null hypothesis was rejected for children with Normal Reading on all the metalinguistic skills. In case of reading disabled group the null hypotheses were partially supported with regard to phoneme deletion, syllable reversal and synonymy judgement tasks, but accepted on phoneme reversal task. On other metalinguistic tasks the null hypothesis was fully rejected.

It may be observed that the children with Reading Disability were not only showing specific developmental lag

but also the developmental arrests in many of the skills measured. Failure to acquire a skill or many such skills related to reading may result in various forms of Reading Disability.

5.2.0 Comparison Between the Groups

In this section, the performance of children with Reading Disability will be compared with the children of Normal Reading on various tests. The statistical technique used was unpaired t' test.

5.2.1. Cognitive Processes and Reading Disability

(i) Attention

The obtained results indicate that the children with Reading Disability did not differ significantly from Normal Reading at any grade level (see Table 4.4). None of the t' values were significant. Thus, the null hypothesis (la) "There is no significant difference between children with Reading Disability and Normal Reading in the attention skill" was accepted.

Similar results were reported by Katz and Wicklund (1972) in which the dyslexics performed on par with normals on a task requiring them to see a row of letters for the presence or absence of a predetermined target letter.

(ii) Perception

In terms of visuo-spatial perception, the children with Reading Disability did not differ significantly from Normal Reading at Grade II, but at Grade III and IV they significantly differed from Normal Reading at 0.05 and .01 level (t=2 309; t=4.761). The negative sign seen in Table 4.4 was due to the fact that the MPD test was scored in reverse direction as compared to other functions.

Thus, the null hypothesis (lb) "There is no significant difference between children with Reading Disability and Normal Reading in the perceptual skills" was rejected.

The issues related to the perception and reading disabled has been debated widely. For e.g. Velluntio, Steger and Kandel (1972), in a study requiring children to reproduce single designs, number or letter which had been presented immediately before, showed that dysiexics performed normally. On the other hand, using the Bender Gestalt Test many

researchers showed that children with reading problems performed poorly when compared to normal readers (DeHirsch, Jansky & Langford, 1966; Koeogh & Smith, 1967; Koppitz, 1963). Indeed, the nature of the task, selection criteria used in the selection of subjects may lead to this type of variations and controversies from one study to another.

However, results of the present study, revealed poor performance on visuo-spatial task by children with Reading Disability when compared with Normal Reading and the difference was statistically significant.

(iii) Short-term memory

Children with Reading Disability and Normal Reading differed significantly on the short-term memory task in Grades III and IV ("t'=4.082 p.=.001). But the difference was not found to be significant at Grade II (t' = .678).

Thus, the null hypothesis (1c) "There is no significant difference between children with Reading Disability and Normal Reading in the short-term memory skills" was rejected.

Numerous studies consistently showed that reading disabled children do poorly on short-term memory when compared to normal reading children (Kluever, 1971; Senf & Freundel, 1972). In the present study also the reading disabled group showed poor performance. This is in accordance with the finding that the children with Reading Disability show poor performance particularly on verbal memory (Brady, Mann & Schmidt, 1987; Katz, Shankweiler & Liberman, 1981; Mann & Brady, 1988).

Thus, with regard to cognitive processes the present study shows that except on attention task the children with Reading Disability showed significantly poor performance as compared to Normal Reading in visuo-spatial perception and short-term memory.

5.2.2. Linguistic Processes and Reading Disability

The present study showed that in all the three linguistic skills - namely letter recognition, word-recognition and non-word recognition tasks - the children with Reading Disability performed significantly poorer than Normal Reading. The differences were significant at .01 level in all the three grades (see Table 4.4).

Thus, the null hypotheses (2a, 2b, 2c) There is no significant difference between children with Reading Disability and Normal Reading in the linguistic task viz., letter recognition, word recognition and non-word recognition" were rejected.

It is true that the letter recognition task must be easier than word recognition and non-word recognition tasks. But, even at letter-to-sound stage of reading acquisition the children with Reading Disability performed badly.

5.2.3. Metalinguistic Processes and Heading Disability

(a) Rhyme recognition

The performance of children with Reading Disability was significantly poor when compared to Normal Reading at all the three grades. The significance was at .0001 level of probability in Grade II, III and IV (See Table 4.4). Even though, developmentally the rhyme recognition task is easier than other metalinguistic task the children with Reading Disability performed badly.

Thus, the null hypothesis (3a) "There is no significant difference between children with Reading Disability and Normal Reading in the rhyme recognition skill was rejected.

(b) Phoneme Oddity and Phoneme Deletion

On this task the performance of children with Reading Disability significantly poorly when compared to Normal Reading at all the three grade levels (t = 3.794, 2.621 and 4.938 p= 01 respectively). The same is applicable in case of phoneme deletion test (t = 2.666, 11.757 and 7.478 p= .01 respectively).

Thus, the null hypotheses (3b and 3c) "There is no significant difference between children with Reading disability and Normal Reading in the phoneme oddity and phoneme deletion" were rejected.

(iii) Syllable Deletion and Syllable Reversal

On both of these tasks, the children with Reading Disability performed badly at all the three grades. The difference was significant at .01 level (t = 11.469, 6.646 and 4.466 respectively). Similar findings were observed in case of syllable reversal task (t = 11.384, 6.836 and 12.024 respectively).

Thus, the null hypotheses (3d and 3f) "There is no significant difference between children with Reading Disability and Normal Reading in the syllable deletion and syllable reversal skill" were rejected.

(iv) Phoneme Reversal

It is interesting to note that both the groups (children with Reading Disability and Normal Reading) did not acquire the skill till Grade IV. At Grade IV the normals acquired this skill to some extent (Approximately 25%) whereas the children with Reading Disability did not acquire this skill even at Grade IV. Among the metalinguistic tasks phoneme reversal task was found to be the most difficult skill.

Thus, the null hypothesis (3e) "There is no significant difference between children with Reading Disability and Normal Reading in the phonemic reversal skill" was rejected.

(v) Grammaticality Judgement

This being one of the meta-syntactic task, both children with Reading Disability and Normal Reading showed statistically significant differences at .01 level. In all the three grades the children with Reading Disability (t =

3.663, 4.894 and 5.481 for Grade II and Grade III respectively) performed badly.

Thus, the null hypothesis (3g) "There is no significant difference between children with Reading Disability and Normal Reading in the grammaticality judgement skill" was rejected.

(vi) Synonymy Judgement

In this meta-semantic task the children with Reading Disability and Normal Reading did not show significant differences at Grade II and III. But at Grade IV both the groups differed significantly at .01 probability level and the children with Reading Disability showing poorer performance (see Table 4.4).

Thus, the null hypothesis (3h) "There is no significant difference between children with Reading Disability and Normal Reading in the Synonymy judgement skill" was partially rejected.

To summarise, in the assessment of reading disability, we had put-forth many null-hypotheses pertaining to

cognitive, linguistic and metalinguistic processes. In case of attention the null-hypothesis was proved. With regard to perceptual and short-term memory tasks the null-hypotheses were proved at Grade II level only and at other two grade levels, these null-hypotheses were rejected.

The null-hypotheses were all rejected with regard to all the subprocess of linguistic skills - namely letter-recognition, word-recognition and non-word recognition at all the three grades.

Among the metalinguistic processes the null-hypotheses could not be rejected in case of phoneme reversal and synonymy judgement tasks at Grade II and III. However, the null-hypothesis was rejected at Grade IV level with respect to these two skills.

But, the null-hypotheses related to all other subprocesses of metalinguistic ability viz., rhyme recognition, phoneme oddity, phoneme deletion, syllable deletion, syllable reversal and grammaticality judgement, were rejected.

The reading level matched comparison between the children with Normal Reading (Grade II) and Reading

Disability (Grade IV) revealed that only on following skills the two groups differed. They were, attention (t' = -4.313, p .002), rhyme recognition (t' = -2.757, p .011), phoneme oddity (t' = -4.32, p .002), phoneme deletion (t' = 2.088, p .0476), syllable reversal ("t' = 2.402, p .0244) grammaticality judgement ('t' = -3.544, p .0017) and synonomy judgement (t' = -2.029, p=0073). The mean values of these tasks showed that, the performance of children with Reading Disability was better than Normal Beading except on syllable reversal task (See Table 4.5 and 4.6).

The age matched t' test analysis revealed that the children with Reading Disability showed significantly poor performance on almost all the tasks. But the reading level matched 't' test analysis revealed that the metalinguistic tasks were crucial for children with Reading Disability. Thus, the general impairment as observed at the first instance could further be specified. However, the poor performance on other tasks as observed in age matched analysis could not be ruled out.

5.2.4. General Discussion

In the literature, we have examples of studies that claim 'stronger hypotheses'. There are independent studies

in the realm of cognitive, linguistic or metalinguistic processes claiming that a particular category of processes/abilities is a prerequisite for reading acquisition and cause for Reading Disability

For e.g. Extensive studies were carried out on visuai-perception and perceptual motor functions and reading disabled to the extent that, these tasks were used as a predictive tool in Reading Disability and even for separate subtyping (Klillin, 1975). Recent studies on short-term memory have consistently proved that the key problem in Reading Disability is short-term memory of verbal type particularly 'working memory' - a component of short-term memory (Mann & Brady, 1988).

It is in the recent literature that studies are concentrating on metalinguistic tasks, particularly on phonological awareness with an attempt to prove that the core problem in Reading Disability is inadequate development of phonological skills. Wagner & Torgesen (1987) for e.g. claim that although the language deficits may be multifaceted, evidence points to a difficulty with phonological representation as the basis for many instances of poor reading.

The findings of present study are not in favour of 'Strong hypotheses'. Emerging picture of the present findings seems to suggest that 'each one of the processes is a prerequisite but not sufficient'. The strong hypotheses such as short-term memory is the determining factor in Reading Disability or 'metalinguistic process is the causative factor' etc., cannot be supported by the present results.

It is worth to present the findings of Leong (1984) who studied the reciprocal and interactive effects of cognitive processing, language awareness and reading proficiency. The results showed that language awareness emerged as the only significant variable presaging reading and accounting for 54% of variance. But, he did not deny the interactive, effect stating that while simultaneous and successive processes are necessary, they are not sufficient for reading. Based on the sophisticated statistical analyses he showed that the cognitive factors indirectly influence the reading ability whereas language processing directly affect the reading. The present study accept this view.

5.3.0. Profile of Reading Disability

Since the main objective of the study was to understand the Reading Disability in depth or to have the profile the discussion in this section will deal with subgrouping of the Reading Disability which may be useful in the clinical set-up for an appropriate remedial measures.

When the analysis was carried out quantitatively the children with Reading Disability as a whole, showed poor performance in almost all the subprocesses. Thus it may tempt any one to draw the conclusion that the children with reading disabled is a homogeneous group with a general developmental lag. But, when the results were examined individually and test-wise it clearly showed that the reading disabled group was heterogeneous. That means, within the group of children with Reading Disability, the difficulty level of the tasks were not equal to all the children. This observation stimulated to explore the data in depth. The purpose was to know whether the given reading disabled group could be subdivided into different categories or not. The analysis led to the ciassification of children with Reading Disability into seven categories.

Category I

General Impairment Group - Children who exhibited poor performance on 5 or more tasks out of 14 tasks were included in this category. Their major problems were not in any specific task. Among the 60 individuals 21.67% of children fell in this category.

Category II

Cognitive impairment group - Those who had performed very badly on cognitive tasks only were included in this category. 3.33% of children came in this category.

Category III

Linguistic impairment group - In this category only those children who performed poorly on linguistic tasks were included 3.33% belonged to this category.

Category IV

Phonemic impairment group - Here, those children he difficulty in phonemic tasks were grouped together. None the children showed any specific difficulties on syllable

rhyme, grammaticality judgement and synonymy judgement tests. 11.67% of children came in this category.

Category V

Metalinguistic Impairment Group - This group consisted of individuals who found difficulty on two or more metalingusitic tasks (related to syllables, phonemes, rhyme, grammaticality and synonymy judgement tasks). There were 11.67% of individuals who came in this category.

Category VI

Linguistic and Metalinguistic Impairment Group - Some of the children exhibited severe difficulties on both linguistic and metalinguistic tasks. This group consisted of 35% children with Reading Disability.

Category VII

Cognitive and Metalinguistic Impairment Group - This category of children showed severe problems in cognitive and metalinguistic skills. 13.33% of children belonged to this category.

Individual profiles revealed that, more number of children in reading disabled group found the metalinguistic tasks difficult. Linguistic tasks were found difficult by less number of individuals and very few children found the cognitive tasks difficult. In a few instances, particularly at Grade II level normal group also faced the problem in metalinguistic and cognitive tasks, but their reading skill was not affected by this. It implies that either the cognitive skills or metalinguistic skills were not sufficient for reading though may be necessary.

In order to support these findings, the performance of children with Reading Disability was subjected to Canonical discriminant function analysis (See Table 5.1). Two functions emerged as critical from the analysis. The function-1 was found to be most important since, it covered the 84.48% of variance (Eigen value=8.1002, Canonical correlation = .9435, and Wilks Lambda = .044169). On the other hand, the function-2 that emerged by this analysis, covered only 15.52% of variance (Eigen value = 1.4879, Canonical correlation = 7733 and Wilk's Lambda = .401948.

From the structured matrix (Table 5.2), it can be seen that the function-1 covered only the metalinguistic awareness

Table 5.1: Canonical discriminant functions

	Function 1*	2*
Eigenvalue	8.1002	1.4879
Pet of Variance	84.48	15.52
Cum pot.	84.48	100.00
Canonical Corr.	.9435	.7733
After function	0	1
Wilks' Lambda	.044169	.401948
Chi-square	157.546	46.027
df	28	13
Significant	.0000	.0000

* Marks the 2 canonical discriminant functions remaining in the analysis.

tasks namely, rhyme recognition, phoneme oddity, syllable deletion, grammaticality judgement (only such variables with a factor loading of .30 or near to that value were taken into consideration). These variables are ordered by size of correlation within the function. Thus, the first function-1 refers to metalinguistic dimension.

The function-2 refers to cognitive dimension which included perception, attention and short-term memory. But

from the Table, it was evident that, the size of correlation within the function was very minimal.

Table 5.2: Structure Matrix :Pooled within-groups correlations between discriminating variables and canonical discriminant functions (variables ordered by size of correlation within function)

	Functions	
	F-l	F-2
RR	.61435*	-.29668
PO	.51046*	.07176
SD	.50799*	-.24966
GJ	.39487*	.33578
CCT	.32044*	.31569
SJ	.23319*	-.11358
WR	.22115*	-.17492
PD	.15854*	.10591
SR	.05133*	.04071
NWR	.25247	-.27720*
SRT	.17668	-.21796
LR	.14320	-.19190*
MDP	-.04539	.10530*

* Denotes largest absolute correlation between each variable and any discriminant function.

Thus, the result of Canonical discriminant analysis support the view that, the metalinguistic awareness is a predominant factor in Reading Disability. Canonical discriminant analysis further suggests that, the function-2 defined by cognitive skills also cannot be neglected as it covers 15% of variance. In this way, the overall results of canonical discriminant analysis confirms the categorization of Reading Disability derived from profile analysis.

The error analysis of children with Reading Disability at grade level and as a whole revealed that, the group committed major errors in the form of inability to read Consonant-Consonant clusters (34.81%); problems in word substitution (27.9%) was followed by errors in Anuswara (18.39%). Difficulties in Arka constituted 10.12% of errors and letter substitution errors were 2.96% and kagunitha errors 3.95%. Letter omission errors were only 0.86% and errors in the form of mutual change of letter position was 0.99%. It is interesting to note that only one word reversal error was observed throughout.

This error analysis indicated that the children had minimum difficulties in identification of basic letters. The next level of difficulty level was in blends. Another specific error was in Anuswara. But the maximum difficulty they had was at word level in the form of word substitution and particularly in words with CC clusters. Thus, the difficulty level faced by them in reading of Kannada is hierarchical and seems to follow a sequence - viz. basic letter level, letters with secondary vowel forms, words with blends and word with consonant clusters. This hierarchy of difficulty levels in reading has been clearly observed in another study conducted where the subjects were selected from the same reading disabled group (Swapna, 1997).

It is apparent that, types of the errors observed in reading of Kannada (syllabaries) were not the same as that observed in alphabetic writing systems. It implies that, characteristics of an orthography calls for its unique rules and features. Thus, the langauge specificity as a factor plays its role in reading.

In introduction and review of literature chapter, different approaches in the classification and subtyping of Reading Disability prevailing elsewhere mentioned. It is important to note that these subtypes were made based on the performance on language processing and cognitive processing skills.

Myklebust (1978) classified four types of childhood dyslexia viz., Inner Language Dyslexia, Auditory Dyslexia, Visual Dyslexia. Border's (1971) classification namely dyseidetic (problem on visuo-spatial orientation) and dysphonetic (problem auditory process) also demonstrated that the reading disabled group is not homogeneous. Cartles and Coltheart (1993) attempted to demonstrate that the distinct varieties of developmental dyslexia do exist analogous to those found in the acquired dyslexic population.

In all these attempts in subtyping, the modality, the language processing and cognitive processing were taken into consideration. In the present study an attempt was made to see whether similar subtypes can be found in Kannada also.

In a pioneering study in Kannada, Ramaa (1987) reported five categories of Reading Disability viz., visual dyslexia, auditory dyslexia, visual-auditory dyslexia and other two categories where, association skills were deficient in one and auditory processing skill in another. This indicates that even in semi-syllabic language like Kannada, the subtypes do exist.

The findings of the present study also suggest that subtypes do exist in Kannada and this subtyping can extend beyond the usual classification basis. For e.g. within the metalinguistic skill we could see different categories. These seven categories that have emerged certainly help a clinician to plan for appropriate remedial measures. For a researcher these findings lay down a basis for further exploration.

These findings are tried to put under a working model of information processing system. This has been schematically depicted in Figure 5.1. From this open ended working model,

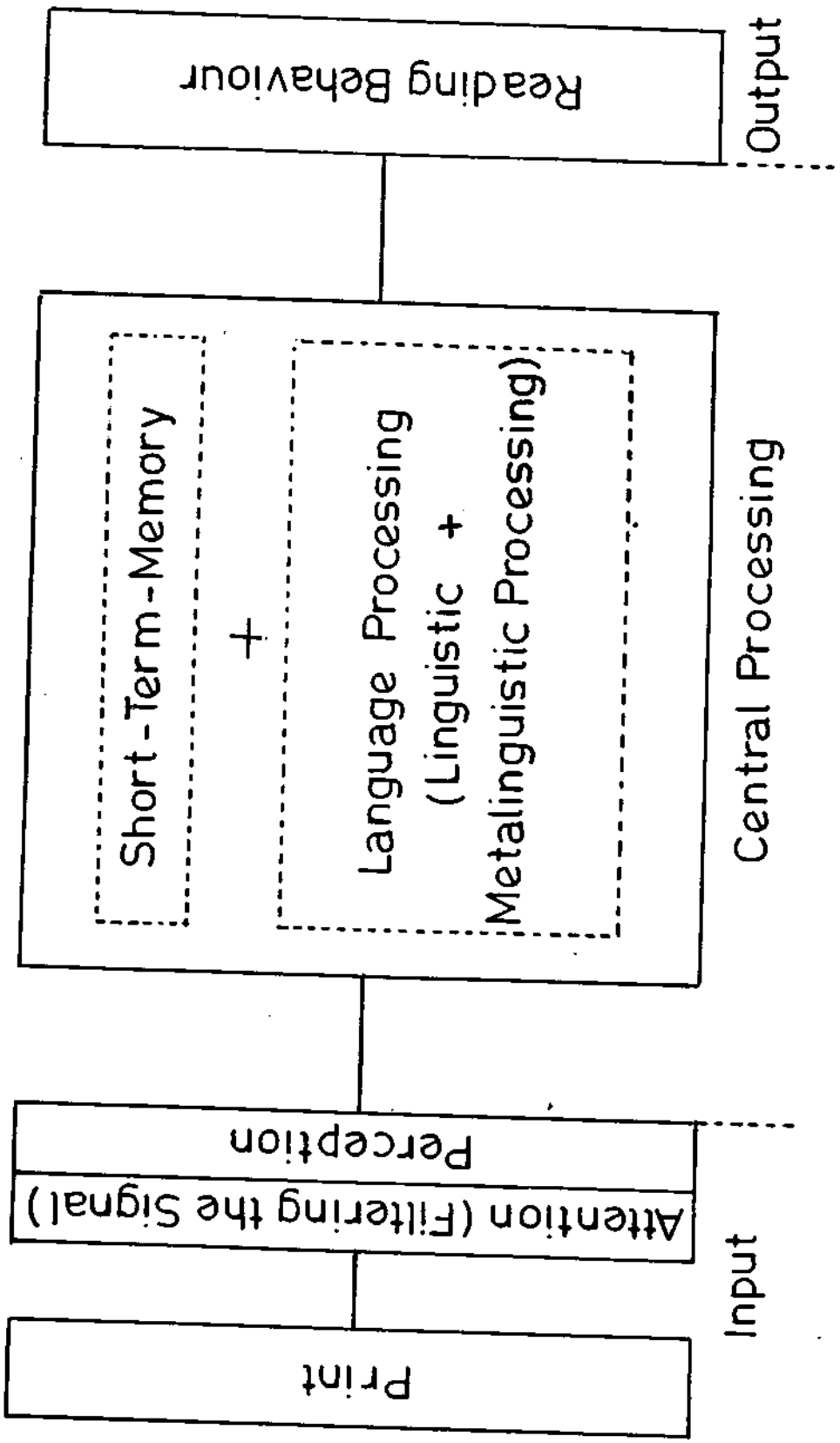

Fig. 5.1. Working model of Information Processing System.

it can be seen that at input end two cognitive processes namely attention and perception are necessary as basic requirement. The information from the print/text will be filtered and then perceived as signal which will reach the central processes unit. In the central processing unit language processing system will interpret the signals with the help of another component short-term memory. Thus the information collected will be encoded first. The language processing system will act as a resource already existing within the individual. This stored knowledge is useful to interpret or decode the information gathered through two peripheral input systems. The short-term memory assists the encoding and decoding of the signal and ultimately the reading behaviour emerges as an output.

One of the main features of the present study is that, the language processing aspects are further subdivided into sub-processes such as letter recognition, word recognition, phonemic skills, syntactic and semantic skills. The major utility of the study would be that in this information processing working model, one can identify the problem in any one of these processing units. On the basis of this, proper remedial measures can be planned by a clinician. The subgroups emerged from the present study, however can be empirically verified by further researches.

5.4.0 Identification and Prediction of Reading Disability

One of the objectives of the present study was related to the early identification of Reading Disability among children. From the findings so far discussed, it is evident that, in ail the parameters the children with Reading Disability showed poor performance. Now, the question arises, which variable has the maximum predictive value of Reading Disability.

This question was answered by two years' longitudinal study. In Grade I (beginning of schooling) all the non-linguistic measures including cognitive measure were administered (n=32). During the Grade II academic year ail the reading tests were administered to the same group of children. The results were analysed with the help of stepwise multiple regression (See Table 5.3).

The results indicate that among the cognitive and metalinguistic tasks, syllable deletion task emerged as the best predictor of all the three dependent variables viz., oral reading, word recognition and non-word recognition.

Table 5.3: Showing the summary of stepwise multiple regression of all four linguistic processes

Yl = Oral reading			
Steps	Variable	R	R2
1	Syllable deletion	.483	.233
2	S.R.	.575	.331
Steps	Variable	R	R2
Y2 = Letter recognition			
1	Syllable reversal	.639	.409
2	Rhyme recognition	.719	.517
Y3 = Word recognition			
Steps	Variable	R	R2
1	Syllable deletion	.692	.478
2	Rhyme recognition	.78	.608
Y4 = Non-word recognition			
Steps	Variable	R	R2
1	Syllable deletion	.597	.356

It is worth noting that in the present study oral reading was taken into consideration for the screening of reading disabled. Now, through this procedure it has been found that syllable deletion is the best predictor of the performance in this oral reading task. In the alphabetical system of orthography such as English the phonemic awareness task was consistently proved to be the best predictor of

reading disabled. In Kannada, which is semi-syllabic in nature, where the grapheme-phoneme correspondence is one to one, metaphonemic awareness may not be so crucial. Prakash, (1987) from his study showed that phonemic awareness is not a crucial factor in learning to read Oriya (an Indian language). Other Indian studies also supported this finding (Chandrika, 1990; Patel & Soper, 1987; Prakash, Rekha, Nigam & Karanth, 1993; Rekha, 1987).

From the above results it is clear that, phoneme tasks did not contribute to the development of any of the dependent measures. Instead, syllable deletion, syllable reversal and rhyme recognition emerged as the contributors. Among these three, syllable deletion emerged as the best predictor. Similar findings were reported by a recent study on Kannada language (Rekha, 1996).

Thus, it can be concluded that the phoneme awareness is not a crucial factor in learning to read or write Kannada as it is reported in alphabetic system of orthography. In other words semi-syllabic scripts like Kannada demands metaphonological awareness at the syllabic level rather than at phonemic level. Children learning Kannada may not develop phonemic awareness in their early stages of literacy unlike

their western counterparts. The syllable deletion and rhyme recognition task may develop at the preschool level itself. So, the early training on these tasks may enhance the reading skill of the children.

5.5.0. SYNTHESIS

The main objective of the present study was to understand the Reading Disability in depth. As a first step the two groups namely children with Reading Disability and Normal Reading were compared between each other in terms of the cognitive, linguistic and metalinguistic parameters. Many studies have already established that the performance of Reading Disability group is poor when compared to normal groups. In a recent study on dyslexia and symbol processing difficulty in the Kannada language. Ramaa, Miles and Lalithamma (1993) reported that even though the orthography of the Kannada language is quite different from that of English it was still possible to identify dyBlexics among Kannada learners and further the same functional deficits can be seen as those found among dyslexics in other parts of the world. In the present study, the importance of cognitive, linguistic and metalinguistic skills is ascertained. Each of these skills was found to be prerequisite for reading but not sufficient. It may also be noted that the difference between

the groups was not only related to developmental lag observed (in children with Reading Disability), but also suggested that the groups were qualitatively different.

The qualitative analysis revealed that, metaiinguistic processes were most difficult for most of the children. Linguistic tasks were difficult to some children and very few found the cognitive tasks as difficult. Based on the test profile seven categories of Reading Disability were identified. The general approach followed in subtyping based on language processing or cognitive processing or sometimes in terms of modality. In the present study it has been found that, the language processing deficit can further be subdivided. This was further supported by canonical discriminate analysis. The error analysis, on the other hand, revealed that the pattern of errors committed by reading disabled group of Kannada language is not the same as that noticed in alphabetic type of scripts. For e.g. the maximum type of error noticed in the present study was difficulty in CC clusters. Errors related to grapheme-phoneme correspondence was very minimal because in Kannada the relationship between grapheme-phoneme is direct. At word level the children with Reading Disability committed maximum errors in reading blends. The point to be noted here is

that, a beginning reader should get the mastery of not only 50 basic letters, but the complex matrix of combination of these 34 consonants and 15 vowels (34 x 15 i.e., 510 additional symbols; refer to the Introduction chapter for more details of Kannada language). The children with Reading Disability also showed some script specific problems such as problems with Anuswaras. Thus, the present study indicate that the Kannada language being a polysyllabic agglutinative language with numerous inflections results in some unique kind of reading errors.

In English, or in most of the similar orthographic systems the phonological awareness was found to be playing the key role in the reading (Mann & Brady, 1988) and in predicting the Reading Disability (Majstorek & Ellenward, 1990). The results of the present study showed that phonemic skills had little role in predicting the Reading Disability in Kannada language. Step wise multiple regression revealed very clearly that awareness at the levels of syllable and rhyme have the best predictive value of Reading Disability. In fact, the syllable deletion task emerged as the best predictor.

Even though, the same cognitive and language processing factors operate in the reading acquisition or Reading

Disability the way in which these parameters influence the reading may vary from one orthographic category to another. The, interpretation of the results were put in an open ended, working model in terms of the information processing approach. Two of the cognitive factors viz., attention and perception will work at input level which help to select the signal from the print. Central processing unit (consists of linguistic and metalinguistic processing systems) in which the language processing operates on the incoming signal which will be encoded and decoded with the short-term memory component. The signal will be finally converted into reading behaviour at the out put level. By employing such an approach of one can rectify the problems at specific subprocesses levels and a proper action plan can be tailored for the remediation.

5.6.0 Application

Two major application values of the present study are in the area of -

1. Clinical set-up
2. Research

5.6.1 Clinical set-up

As a bi-product of the assessment procedure a comprehensive test battery has emerged. Since, a comprehensive test battery for the assessment of reading disability in Kannada language does not exist, this battery can be used very well in clinic or special education set-up.

In addition to this the syllable deletion test and rhyme recognition test can be used at the pre-schooi level for the early identification and remedial measures of reading disability. The administration of these tests are easy and less time consuming.

5.6.2 Research

Since, there is scarce for a comprehensive study in Kannada language on Reading Disability, the present study, though quasi-experimental, provides a lead for many more future studies in this area.

SUMMARY

CHAPTER VI

CHAPTER VI

6.0.0. Summary

The possibility of the influence of language specific features in Rreading Disability, lack of adequate, comprehensive approaches in the study of reading disability in the semi-syllabic Kannada language, and absence of any oomprehensive test batteries in clinical and educational set-up lack of an effective predictive tools for the early identification and remedial measures - all these lead to conceptualize present study.

The study is quasi-experimental in nature and it consisted of two groups viz., childen with Reading Disability and Normal Reading from Grades II, III and IV. There were a total of 60 children, 20 each from the three grades in Reading Ddisabiiity group and Normal Reading group respectively. These groups were selected from two average standard schools in which Kannada was the medium of instructions.

The screening of these groups were carried out with a set of screening tests namely 1. RCPM with Indian norms (Rao & Reddy, 1968), 2. Oral reading test - (Jaya Bai, 1958), 3. Rutter's Proforma A and B (Rutter, 1967). Based on the performance on these tests the children with Reading

Disability and Normal Reading were selected. The operational definition adopted in the present study was as follows:

'Reading Disability' is a condition in which children exhibit difficulty in reading that fall two Standard Deviations below their grade norms and which cannot be explicable in terms of general intellectual retardation, inadequate schooling, severe emotional disturbance, general impairment of speech, language and demonstrable neurological conditions or psychiatric conditions.

The assessment was carried out individually with a battery of selected tools. Both the groups viz., children with Rreading Ddisability and Normal Reading were assessed on 14 parameters which included cognitive, linguistic and metalinguistic tasks.

The results obtained were tabulated and proper statistical analysis were carried out with descriptive statistics of mean, SD and mean percentage values.Unpaired 't' test was used to compare the two groups. Onw way ANOVA and Sheffe's multiple comparison test were applied to compare the groups in terms of their developmental progression of cognitive, linguistic and metaiinguistic skills.

For an in depth study the performance of all the chidlren with Reading Disability (grade-wise and combined) was subjected to qualitative analysis viz., profile analysis and error analysis. In order to ascertain the findings of this profile analysis a canonical discriminant function analysis was carried out. The summary of these findings are as follows :

1. The children with Beading Disability showed a developmental lag as compared to Normal group.

2. The children with Reading Disability differed significantly from Normal Reading group on all the 14 parameters except on attention and concentration processes.

3. The metalinguistic tasks were found to be difficult to most of the children. For some of them linguistic tasks were difficult and only a few children found the cognitive tasks as difficult.

4. Error analysis revealed that the maximum errors committed by children with Reading Ddisability was on CC clusters and blend letters. They had problems in anuswara and kagunitha also. Problem at letter recognition (basic letters) level was minimum. Only one instance of word reversal was observed.

5. Based on the profile analysis (test, profile) seven categories of children with Reading Disability were identified : Category I - General impairment Group (21.67%), Category II - Cognitive impairment group (3.33%), Category III - Linguistic impairment group (3.33%), Category IV - Phonemic impairment group (11.67%), Category V - Metalinguistic impairment group (11.67%), Category VI - Linguistic and metalinguistic impairment groups (35%), Category VII - Cognitive and metalinguistic impairment group -(8%). This analysis was supported by canonical discriminant function analysis (Function-1 defined as metalinguistic functions covered 84.48% variance and Function-2 defined as cognitive function covered 15.52% variance).

An attempt was made to fit the results into an information processing model in which attention and perception skill act as input and language processing-consisting of linguistic and metalinguistic processes will work as central processing unit with short-term memory assisting the encoding and decoding of signals. The out put is in the form of reading behaviour. Thus, the deficit can be identified at different sub-processes level and an adequate remedial measures can be planned at any of the sub-processing levels.

In addition, a separate group from I Grade was taken for two years' longitudinal study. All the non-linguistic tests were administered to them in the first year and ail the linguistic tests were administered in the following year. Using Step-wise Multiple Regression Technique. The best predictor of children with Reading Disability was found to be the syllable deletion test.

6.1.0. Utility of the study

1. The comprehensive test battery, emerged as a bi-product of the present study, can be used for the assessment of children with Reading Disability in Kannada language at clinical and special education set-ups.

2. The syllable deletion test which was found to be the best predictor can very well be used for the early identification of children with Reading Disability.

3. Future researches can be attempted to study the developmental factors in children with Reading Disability using bilinguals (English and Kannada) to know the cross-language influences in children with Reading Disability.

BIBLIOGRAPHY

BIBLIOGRAPHY

Alegria, J., Pignot, E., & Morais, J. (1982). Phonetic analysis of speech & memory codes in beginning readers. Memory & Cognition. 10, 451-456.

Backman, J., Bruck, M., Herbert, M., & Seidenberg, M.S. (1984). Acquisition and use of spelling - sound correspondences in reading. Journal of Experimental Child Psychology. 38, 114-133.

Baddeley, A.D., & Hitch, G. (1974). Working memory. In G.A.Bower (Eds.). The Psychology of Learning and Motivation (Vol.8). New York : Basic Books.

Bakker, D.J. (1972). Temporal order in disturbed reading. Rotterdam, Rotterdam University Press.

Bakker, D.J. (1979). Hemispheric differences and reading strategies : Two dyslexias? Bulletin of the Orton Society. 29, 84-100.

Bakker, D.J. (1984). The brain as dependent variable. Journal of Clinical Neurology, 6, 1-18.

Ball, E.W., & Bachman, B.A. (1991). Does phoneme awareness training in kindergarten make a difference in early word recognition and developmental spelling? Reading Research Quarterly. 26, 49-66.

Baron, J., & Strawson, C. (1976). Use of orthographic and word-specific knowledge in reading words aloud. Journal of Experimental Psychology : Human Perception and Performance. 2, 386-393.

Barrett, T.C. (1965). Visual discrimination tasks as predictors of first grade reading achievement. Reading Teacher. 18, 276-282.

Bashir, A.S., & Scavuzzo, A. (1992). Children with language disorders. Natural history and academic success. Journal of Learning Disabilities. 25, 53-65.

Bender, L.A. (1957). Specific reading disability as a maturationai lag. Bulletin of the Orton Society, 7, 9-19.

Berger, N. (1978). Why can't John read? Perhaps he's not a good listener. Journal of Learning Disabilities. 11, 633-638.

Bertleson, P. (1986). The onset of literacy liminal remark. Cognition, 24, 1-30.

36..

Berthoud-Papandropoulu, I. (1978). An experimental study of children's ideas about language. In A.Sinclair, R.Jarvella and W.Levelt (Eds.). The Child's Conception of Langauge (pp.55-64). New York :Springer-Verlag.

Biederman, I. (1987). Recognition by components : A theory of human image understanding. Psychological Review. 94, 115-147.

Biederman, I. (1990). Higher level vision. In E.N.Osherson, S.M. Kosslyn & J.M.Hollerbach (Ed.), An invitation to cognitive science II. (pp.41-72). Cambridge, MA ;MIT Press.

Blachman, B.A. (1994). Early literacy acquisition - The role of phonological awareness. In G.P.Wallach & K.G.Butler (Eds.,), Language Learning Disabilities in School-age children and Adolescents (pp.253-275). New York : MacMiliion College Publishing Company.

Blodgett, E., & Cooper, E. (1987). Analysis of the langauge of learning. The practical test of metalinguistics. Moline, IL : Lingue Systems.

Bloom, L., & Lahey, M. (1978). Language Development and Language Disorders. New York : John Wilesy and Sons.

Border, E. (1973). Developmental dyslexia : A diagnostic approach based on three typical reading - spelling patterns. Developmental Medicine and Child Neurology. 15, 663-687.

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

Bowey, J., & Tunmer, W. (1984). Word awareness in children. In W.Tunmer, C.Pratt, & M.Herriman (Eds.), Metalinguistic awareness in children : Theory, research and implications. Berlin : Springer-Verlag.

Bradley, L., & Bryant, P.E. (1978). Difficulties in auditory organisation as a possible cause of reading backwards. Nature. 271, 746-747.

Bradley, L., & Bryant, P.E. (1979). Independence of reading and to spelling in backward and normal readers. Developmental Medicine and Neurology. 21, 504-514.

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

Brady, S. (1986). Short-term memory, phonological processing and reading ability. Annals of Dyslexia. 36, 138-153.

Brady, S., Mann, V.A. , & Schmidt, R. (1987). Errors in short-term memory for good and poor readers. Memory and Cognition. 15, 444-453.

Brady, S., Shankweiler, D., & Mann, V. (1983). Speech perception and memory codings in relation to reading ability. Journal of Experimental Child Psychology. 35, 345-367.

Bruce, D.G. (1964). The analysis of word sound by young children. British Journal of Educational Psychology. 34, 158-170.

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

Calfee, R., Lindamood, P., & Lindamood, C. (1973). Acousti-phonetic skills & reading - kindergarten through twelfth grade. Journal of Educational Psychology. 64, 293-298.

Carr, D. (1979). The development of young children's capacity to judge anomalous sentences. Journal of Child Language. 6, 227-241.

Castles, A., & Caltheart, M. (1993). Varieties of developmental dyslexia. Cognition. 47, 149-180.

Cattell, J.M. (1986). The time it takes to see and name objects. Mind. 11, 63-65.

Chall, J.S. (1967). Learning to read ^ The great debate. New York : MacGraw Hill.

Chaii, J.S. (1983). Stages of reading development. New York : MacGraw Hill.

Chandrika, S. (1990). Metaphonoiogical awareness and reading acquisition in Kannada. MA. Dissertation, University of Mysore, Mysore.

Chaney, C. (1989). I pledge allegiance to the flag : Three studies in word segmentation. Applied Psycholinguistics. 10(3), 261-281.

Clark, E.V. (1978). Awareness of language : Some evidence from what children say and do. in A.Sinclair, R.J.Garvelia and W.G.M.Revelt (Eds.). The child's conception of language. Berlin : Springer-Verlag.

Clark, E.V., and Anderson, E.S. (1979). Spontaneous repairs : Awareness in the process of acquiring language. Paper presented at symposium on reflections on metacognition. Society for Research in Child Development, San Francisco.

Cohen, J.D., Dunbar, K., & McClelland, J.L. (1990). On the control of automatic processes : A parallel distributed processing account of the stroop effect. Psychological Review. 97, 332-361.

Corkin, S. (1974). Serial-ordering deficits in inferior readers. Neuropsychologia. 12, 347-354.

Cromer, W. (1970). A different model : A new explanation for some reading difficulties. Journal of Educational Psychology. 61, 471-483.

Cummings, E.M., & Faw, T.T. (1976). Short-term memory and equivalence judgements in normal and retarded readers. Child Development. 47, 286-289.

Das, U.N. (1982). A study of cognitive processes: Effects of schooling and literacy. Unpublished doctoral dissertation, University of Alberta, Edmonton.

Denckla, M.B. (1972). Clinical syndromes in learning disabilities : The case for "spelling" vs. "lumping". Journal of Learning Disabilities. 5, 401-405.

Denckla, M.B., & Rudel, R.G. (1976). Rapid "automized naming : Dyslexia differentiated from other learning disabilities. Neuropsychologia. 14, 471-479.

Deltirsh, K., Jansky, J., and Langford, W.S. (1966). Predicting reading failure. New York : Harper and Row.

Donaldson, M. (1978). Children's minds. Glasgow :Collins.

Eden, G.F., Stein, J.F., & Wood, F.B. (1993). Visuo-spatial ability and language processing in reading disabled and normal children. In S.F.Wright & R.Groner (Eds.), Facets of Dyslexia and its Remediation : Studies in Visual Information Processing (pp.321-331). Amsterdom North-Holland.

Eden, G.F., Stein, J.F., Wood, H.M., & Wood, F.B. (1995). Verbal and visual problems in reading disability. Journal of Learning Disabilities. 28, 272-290.

Ehri, L. (1975). Word consciousness in readers and prereaders. Journal of educational Psychology. 67, 204-212.

Ehri, L. (1979). Linguistic insight : Threshold of reading acquisition. In. T.Waller & G.Mackinam (Eds.), Reading Research. New York : Academic Press.

Ellis, A.W. (1985). Reading, writing and dyslexia cognitive analysis. London : Lawrence Erlboum.

Evans, M., Taylor, N., & Blum, I. (1979). Children's written language awareness and its relation to reading acquisition. Journal of Reading Behaviour. 11, 7-19.

Firth, U. (1985). Beneath the surface of developmental dyslexia. In K.E.Patterson, J.C.Marshall & M.Coltheart (Eds.), Surface dyslexia. London : Lawrence Erlbaum.

Fiscer, F.W., Liberman, I.Y., & Shankweiler, D. (1977). Reading reversals and developmental dyslexia : A further study. Cortex. 14, 496-510.

Flavell, J.H. (1981). Cognitive monitoring, In W.P.Dickson (Ed.), Children's Oral Communication Skill. NY: Academic Press.

Fletcher, J.M., Francis, D.J., Rourke, B.P., Shaywitz, S.E., & Shaywitz, B.A. (1992). The validity of discrepancy -based definition of reading ability. Journal of Learning Disabilities. 25, 555-573.

Francis, H. (1973). Children's experience of reading and notions of units in language. British Journal of Educational Psychology, 43, 17-23.

Franks, J.J., and Bransford, J.D. (1971). Abstraction of visual patterns. Journal of Experimental Psychology. 90, 65-74.

Fuller, G.B., & Laird, J.T. (1963). The Minnesota Percepto-Diagnostic Test. Journal of Clinical Psychology. 19, 1-34.

Garman, M. (1994). Psycholinguistics. New York : Cambridge University press.

Garner, R.C. (1980). Monitoring of understanding :An investigation of good and poor readers awareness of induced miscomprehension of text. Journal of Reading Behaviour. 12, 55-63.

Gate, A.I., & MacGinite, W.N. (1965). Gates-MacGinite Reading Tests - Teacher's manual. Levels A, B, C A D. New York : Teachers College Press.

Gibson, E.J. (1969). Principles of perceptual learning and development. New York : Prentice-Hail.

Goodman, K. (1972). Behind the eye, what happens in reading. In A.Meinik & J.Merritt (Eds.), Reading Today and Tomorrow. London : University of London Press.

Goodman, K. (1973). The 13th easy way to make learning to read difficult : A reaction to Gleitman & Rozin. Reading Research Quarterly. 8, 484-493.

Gough, P.B. (1972). One second of reading. In Kavanagh & Mattingly (Eds.), Language by Ear and By Eye. Cambridge:MIT Press.

Gough, P., & Hillinger, M. (1980). Learning to read : An unnatural act. Bulletin of the Orton Society. 30, 179-196.

Gough, P.B., & Tunmer, W.F. (1986). Decoding, reading and reading disability. Remedial and Special Education. 7(1), 6-10.

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

Hakes, D.T., Evan, J.S., and Tunmer, W.E. (1980). The development of metalinguistic abilities in children. Berlin : Spriner-Verlag.

Harris, M., & Coltheart, M. (1986). Language processing in children and adults : An introduction. London: Routledge and Kegan Paul.

Hawkins, H.L., & Presson, J.C. (1986). Auditory information processing. In K.R. Boff, L. Kaufman & J.P.Thomas (Eds.). Handbook of Perception and Human Performance. II, 26-1-26-44. New York : Wiley.

Henderson, L. (1984). Writing Systems and Reading Processes. In Orthographies and Reading : Perspectives From Cognitive. Psychology. Neuropsychoiogy and Linguistics (Eds.), Leslie Henderson.

Hinshelwod, J. (1895). Wordblindness and visual memory. Lancet. 2, 1564-1570.

Hinshelwood, J. (1917). Congenital Word Bindness. London : H.K. Lewis.

Hoover, W.A., & Gough, P.B. (1990). The simple view of reading. Reading and Writing : An Interdisciplinary Journal. 2, 127-160.

Howe, H., & Hillman, D. (1973). The acquisition of semantic restrictions in children. Journal of Verbal Learning and Verbal Behavior. 2, 132-139.

Ingram, T.T.S., Mason, A.W., & Blackburn, I. (1970). A retrospective study of 82 children with reading disability. Developmental Medicine and Child Neurology, 12, 271-281.

Jaya Bai, K. (1958). Standardisation of Kannada oral reading test for primary school. An unpublished dissertation, University of Mysore, Mysore.

Johnson, D., & Myklebust, H. (1967). Learning Disability : Educational Principles and Practices. New York : Grune & Stratton.

Jorm A.F. (1977). Effect of word imagery in reading performance as a function of reader ability. Journal of Educational Psychology. 69, 46-54.

Jorm, A.F. (1979). The cognitive and neurological basis of developmental dyslexia : A theoretical framwork and review. Cognition. 7, 19-33.

Kamhi, A.G., & Catts, H.W. (1989). Reading Disabilities :A Developmental Language Perspective. Austin, TX : Pro.Ed. Mill.

Karanth, P. (1984). Analysis of the acquired disorder of reading in Kannada. Journal of AIISH. 15, 65-71.

Karanth, P. (1985). Dyslexia in a dravidian language. in K.E. Paterson, J.C.Marshall and M.Coltheart (Eds.). Surface dyslexia : Neuropsychological and Cognitive Studies in Phonological Reading. Erlbaum, London.

Karanth, P., Ahuja, G.K., Nagaraja, D. , Pandit, R., and Shivashankar, N. (1991). Language disorders in Indian neurological patients - A study in neurolinguistics in the Indian context - A report -An Intern-Institutional Project.

Karpova, S. (1966). The preschooler's realization of the lexical structures of speech. Abstracted by D.SIobin in F.Smith & G.A.Miller (Eds.). The Genesis of Language. Cambridge, MA : MIT Press.

Katz, R.B. (1986). Phonological deficiencies in children with reading disability : Evidence from an object naming task. Cognition. 22, 225-257.

Katz, R.B., Shankweiler, D., & Liberman, I.Y. (1981). Memory for item order and phonetic recoding in the beginning reader. Journal of Experimental Child Psychology. 32, 474-484.

Katz, L., & Wicklund, D.A. (1972). Letter scanning rate for good and poor readers in grades two and six. Journal of Educational Psychology. 63, 363-367.

Keogh, B., and Smith, C.E. (1967). Viso-motor ability for school prediction : A seven year study. Perceptual and Motor Skills. 25, 101-110.

Killen, J. (1975). A learning systems approach to intervention - In H.Myklebust (Ed.). Progress in Learning Disabilities. Vol.111, New York : Grune & Stratton.

Kinsbourne, M. (1976). Looking and listening strategies in beginning reading. In J. Guthrie (Ed.). Aspects of Reading Acquisition. Baltimore : Johns Hopkins.

Kluever, R. (1971). Mental abilities and disorders of learning. In H.R. Mykelbust (Eds.). Progress in Learning Disabilities. 2. New York :Grune and Stratton.

Koppitz, E.M. (1963). The Bender Gestalt teat for young children. New York : Grune and Stratton.

LaBerge, D., & Samuels, S.J. (1974). Towards a theory of automatic information processing in reading. Cognitive Psychology. 6, 293-323.

Leong, C.K. (1984). Cognitive processing, language awareness and reading in Grade II and Grade IV children. Contemporary Educational Psychology. 9, 369-383.

Liberman, I., Cooper, F.S., Shankweiler, D., & Studdert-Kennedy, M. (1967). Perception of the speech code. Psychological Review. 74, 431-461.

Liberman, I.Y., Liberman, A.M., Mattingly, I.G., & Shankweiler, D. (1980). Orthography and the beginning reader. In J.Kavanaugh & R.Venezkey (Eds.). Orthography. Reading and Dyslexia (pp.137-154). Baltimore, MD : University Park Press.

Liberman, I.Y. & Shankweiler, D.S. (1985). Phonology and the problems of learning to read and write. Remedial and Special Education. 6, 3-17.

Lieberman, I., & Shankweiler, D. (1991). Phonology and beginning reading : A tutorial. In L.Rieben, & C.Perfettc (Ed.), Learning to Read j. Basic Research .and LtjL Implications. Hillsdale, N.J : Lawrence Erlbaum.

Liberman, I., Shankweiler, D., Fischer, M., & 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, & Fisher, F.W. (1977). Phonetic segmentation and recoding in the beginning reader. In A.S.Reber and D.L. Seorborough (Eds), Toward a psychology of reading : The proceedings of the CUNY Conferences, Lawrence Erlbaum Associates. Publishers, Hillsdale, N.J.

Lundberg, 1., Oloffson, A., & Wall, S. (1980). Reading and spelling skills in the first school years predicated from phoneme awareness skills in kindergarten. Scandinavian Journal of Psychology. 21, 159-173.

Lyon, R. (1982). Subgroups of LD readers :Clinical and empirical identification. In H.R.Mykiebust (Ed.), Progress in Learning Disabilities (Vol.5, p.226-282). New York : Grune & Stratton.

Lyon, R. (1985). Educational validation studies of learning disability subtypes. In B.P. Rourke (Ed.), Neuropsychology of learning disabilities : Essentials of subtype analysis, (p.228-253). New York : Guilford Press.

Maclean, M., Bryant, P. , & Bradley, L. (1987). Rhymes, nursery rhymes and reading in early childhood. Merrill Palmer Quarterly. 33(3), 255-281.

MacLeod, CM. (1991). Half a century of research on the Stroop effect : An integrative review. Psychological Bulletin. 109, 163-203.

Majsterek, D.J., & Ellenwcod, A. (1990). Screening preschoolers for reading earning disabilities :Promissing procedurs. LD Forum. 16(1), 6-14.

Mann, V.A. (1984). Longitudinal prediction and prevention of reading difficulty. Annals of Dyslexia. 34, 117-137.

Mann, V.A. (1986a). Phonological awareness : The role of reading experience. Cognition. 24, 65-92.

Mann, V.A. (1986b). Why some children encounter reading problems : The contribution of difficulties with langauge processing and linguistic sophistication to early reading disability. In J.K. Torgessen & B.Y.Wong (Eds.), Psychological and Educational Perspectives on Learning Disabilities, (pp.133-159). New York : Academic Press.

Mann, V.A. & Brady, S. (1988). Reading disability : The role of language deficiencies. Journal of Consulting and Clinical Psychology. 56(6), 811-816.

Mann, V.A., Liberman, I.Y., & Shankweiler, D. (1980). Children's memory for sentences and word strings in relation to reading ability. Memory and Cognition. 8, 329-335.

Mann, V.A., t Liberman, I.Y. (1984). Phonological awareness and verbal short-term memory. Journal of Learning Disabilities, 17, 592-598.

Mann, V.A., Shankweiler, D., & Smith, S.T. (1985). The association between comprehension of spoken sentences and early reading ability : The role of phonetic representation. Journal of Child Language. 11, 627-643.

Manis, F.R., & Morrison, F.J. (1985). Reading disability : A deficit in rule learning? In L.S.Seigel & F.J.Morrison (Ed.), Cognitive Development in Atypical Children. New York : Springer-Verlag.

Mark, L.S., Shankweiler, D., Liberman, I.Y., & Fowler (1977). Phonetic recoding and reading difficulty in beginning readers. Memory and Cognition. 5, 623-629.

Marr, D. (1982). Vision. San Francisco : Freeman.

Marsh, G., Friedman, M., Welsh, V., & Desberg, P. (1981). A cognitive developmental theory of reading acquisition. In G.F. Mackinnon & T.G.Waller (Eds.). Reading Research : Advances in Theory and Practice. New York : Academic Press.

Marshall, J.C. (1978). On the mechanics of EMMA. In Sinclair, R.J.Jarvella & W.J.M.Lavelt (Eds). The child's conception of language. Berlin :Springer-Veriag.

Marshall, J.C. (1984). Toward a rational taxonomy of the developmental dyslexias. In R.N.Malatesha & H.A.Whitaker (Ed.), Dyslexia : A Global Issue (211-232). The Hague : Martinus Nizhoff.

Matlin, M.W. (1995). Cognitive (III Ed.). Prison Book Pvt. Ltd., Bangalore.

Mattis, S. (1978). Dyslexia syndromes : A working hypothesis that works. In A.L.Benton & D.Pearl (Eds.), Dyslexia : An appraisal of Current Knowledge (p.43-48). New York :Oxford University Press.

Mattis, S., French, J.H., & Rapin, I. (1975). Dyslexia in children and young adults :Three independent neuropsychoiogical syndromes. Developmental Medicine and Child Neurology. 17, 150-163.

Mclntyre, C.W., Murray, M.E., Cronin, CM., & Blackwell, S.L. (1978). Span of apprehension in learning disabled boys. Journal of Learning Disabilities. 11, 13-20.

McNich, G.H. (1974). Awareness of aural and visual word boundary within a sample of first graders. Perceptual and Motor Skills. 38, 1127-1134.

Mitterer, J.O. (1982). There are at least two kinds of poor readers : Whole word for readers and recoding poor readers. Canadian Journal of Psychology. 36, 445-461.

Mocheod, C.M. (1991). Half a century of research on the stroop effect : An integrative review. Psychological Bulletin. 109, 163-203.

Morais, J. (1995). Do orthographic and phonological peculiarities of alphabetically written languages influence the course of literacy acquisition? Reading and Writing Interdsciplinary Journal. 7, 1-7.

Morais, J., Cary, L. , Alegria, J., & Bertelson, P. (1979). Does awareness of speech as a sequence of phonemes arise spontaneously? Cognition. 7, 323-331.

Morrison, F.J., Giordani, B. , & Nagy, I. (1977). Reading disability : An information-processing analysis. Science. 196, 77-79.

Morrison, F.J. (1984). Reading disability : A problem in rule learning and word decoding. Developmental Review. 4, 36-47.

Morton, J. (1979). Word recognition. In J.Morton & J.C.Marshall (Ed.). Psycholinguistic Series. 2. Cambridge : MIT Press.

Morton, J., & Sasanuma, S. (1994). Lexical access in Japanese. In Henderson (Eds.), Orthographies and Reading : Perspectives from Cognitive Psychology. Neuropsychology and Linguistics. London and Hillsdale, N.J. : Erlbaum.

Myklebust, H.R. (1978). Toward a science of dyslexiology. In H.R.Myklebust (Ed.), Progress in Learning Disabilities (IV). New York : Grune and Stratton, Inc.

Neisser, U. (1967). Cognitive Psychology. New York : Appleton-Century-Crofts.

Newcombe, P., & Marshall, J.C. (1981). On psycholinguistic classifications of the acquired dyslexias. Bulletin of the Orton Society. Vol.xxxi.

Nippold, M., & Sullivan, M. (1987). Verbal and perceptual analogical reasoning and proportional metaphor comprehension in young children. Journal of Speech and Hearing Research. 30, 367-376.

Noelker, R.W., & Schumsky, D.A. (1973). Memory for sequence, form and position as related to the identification of reading retardation. Journal of Educational Psychology. 64, 22-35.

Norman, D.A. (1968). Towards a theory of memory and attention. Psychological Review. 75(6), 522-36.

Ohlhausen, M., & Roller, C. (1988). The operation of text structure and content schemata in isolation and interaction. Reading Research Quarterly. 23, 70-88.

Orton, S.T. (1925). Word-blindness" in school children. A Review of Neurology and Psychiatry, 14, 581-615.

Orton, S.T. (1937). Reading. Writing and Speech Problems in Children. New York : Norton.

Palmer, S.E. (1975). Visual perception and world knowledge : Notes on a model of sensory-cognitive interaction. In D.A.Normon & D.E.Rumelhart (Eds.). Explorations in cognition pp.279-307. San Francisco : Freeman.

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

Pelham, W.E. (1979). Selective attention deficits in poor readers? Dichotic, listening, speeded classification and auditory and visual central and incidental learning tasks. Child Development. 50, 1050-1061.

Perfetti, C.A., & Goldman, S.R. (1976). Discourse memory and reading comprehension skill. Journal of Verbal Learning and Verbal Behaviour. 14, 33-42.

Perfetti, C.A., & Hogaboam, T. (1975). Relationship between word difficulty and access of single-word meaning by skilled and less-skilled readers. Journal of Educational Psychology. 67, 461-469.

Pershad, D. , & Wig, N.W. (1987). PGI - Memory Scale. National Psychological Corporation, Agra, India.

Pinker, S. (1984). Visual cognition : An introduction. Cognition. 18, 1-63.

Prakash, P. (1987). Reading development. metalinguistic awareness and cognitive processing skills. Unpublished Doctoral Dissertation, Utkal University, Bhubaneswar, India.

Prakash, P., & Chandrika.(In Press). Syllabic, and Phonemic awareness in children acquiring literacy in a, semi- syllabic script.

Prakash, P., & Joshi, R.M. (1994). Orthography and reading in Kannada : A Dravidian language. In I.Taylor & D.R.Olson (Ed.), Scripts and Literary. 95-108. Netherlands : Kluwer Academic Publishers.

Prakash, P., Rekha, D., Nigam, R. , & Karanth, P. (1993). Phonological awareness. Orthography and literacy. In R.J.Scholar (Ed.).

Pringie & Morgan, W. (1896). A case of congenital world blindness. British Medical Journal. 2, 1378.

Purushothama, G. (1986). A framework for testing Kannada reading on the basis of automaticity. males of orthography and sequential processing. An unpublished Doctoral thesis, University of Rochester.

Ramaa, S. (1987). Diagnosis and remediation of dyslexia - an attempt. An unpublished doctoral thesis, Department of Post-graduate Studies and Research in Education, University of Mysore, Mysore.

Ramaa, S., Miles, T.R., & Lalithamma, M.S. (1993). Dyslexia : Symbol processing difficulty in Kannada language. Reading and Writing : Interdisciplinary Journal. 5, 29-42.

Rao, S.N., & Reddy, I.K.S. (1968). Indian norms on Raven's A AB B Form. Journal of Psychological Studies. 13(2).

Read, C, Zhang, Y., Nie, H., & Ding, B. (1986). The ability to manipulate speech sounds depends on knowing alphabetic transcription. Cognition. 24, 31-34.

Reicher, G.M. (1969). Perceptual recognition as a function of meaningfulness of stimuli material. Journal of Experimental Psychology. 81, 275-280.

Rekha, D. (1987). A study on development of reading and phonological awareness skills in Rannada speaking children. Unpublished M.A. dissertation, University of Mysore, Mysore.

Rekha, D. (1996). Reading acquisition and metaphological awareness : A longitudinal study. An unpublished doctoral thesis, University of Mysore, Mysore.

Rhodes, G., Brennon, S., & Carey, S. (1987). Identification and ratings of caricatures : Implications for mental representations of faces. Cognitive Psychology. 19, 473-497.

Roller, C.M. (1990). Commentary : The interaction of knowledge and structure variables in the processing of expository prose. Reading Research Quarterly. 25(2), 79-89.

Rosner, J., & Simon, D. (1971). The auditory analysis test : An initial report. Journal of Learning Disabilities. 4, 384-392.

Rugel, R.P. (1974). WISC subtest scores of disabled readers : A review with respect to Bannatyne's recategorization. Journal of Learning Disability. 1, 48-64.

Rutter, M. (1967). A children's behavior questionnaire for completion by teachers : Preliminary findings. Journal of Child Psychology and Psychiatry. 8, 1-11.

Rutter, M. (1978). Prevalence and types of dyslexia. In A.L.Benton & D.Pearl (Eds.), Dyslexia : An Appraisal of Current Knowledge. New York : Oxford University Press.

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

Ryan, E. (1980). Metalinguistic development and reading. In F.B. Murray (Ed.), Language Awareness and Reading. New York, International Reading Association.

Samuels (1967). Attritional process in reading : The effects of pictures on the acquisition of reading response. Journal of Educational Psychology. 38, 337-342.

Satz, P., & Sparrow, S. (1970). Specific developmental dyslexia : A theoretical formulation. In D.Bakker & P.Satz (Eds.,), Specific reading disability - advances in theory and method. Netherlands : Rotterdam University Press.

Satz, P., & Van Nostrand, G. (1973). Developmental dyslexia : An evaluation of a theory. In P.Satz and J.Ross (Eds.,), The disabled learner : Early detection and intervention. Rotterdam, The Netherlands : Rotterdam University Press.

Sawyer, D. (1987). Test of Awareness of Language Segments (TALS). Austin : Pro-ED.

Sawyer, D.J. (1991). Whole language in context : Insights into the current great debate. Topics in Language Disorders. 11(3), 1-13.

Scott, CM. (1989). Problem writers : Nature, assessment and intervention. In A.Kamhi & H.Catts (Eds.), Reading Disabilities : A Developmental Language Perspective (pp.303-344). Austin, TX : Pro-Ed.

Scott, CM. (1994). A discourse continuum for school-age students (Impact of Modality and Genre). In G.P.Wallach and K.G.Butler (Ed.), Language Learning Disabilities in School-Age Children and Adolescents. (pp.27-37) New York : MacMillan College Publishing Company.

Senf, G.M., & Freundel, P.C. (1972). Memory and attention factors in specific learning disabilities. Journal of Learning Disabilities. 4, 94-106.

Siegei, L.S., & Ryan, E.B. (1989). Subtypes of developmental dyslexia : The influence of definitional variables. Reading and Writing : An Interdisciplinary Journal. 2, 257-287.

Shah, B. (1987). Socio-economic status scale. Agra Psychological Research Ceil, Agra, India.

Shankweiler, D., Liberman, I.Y., Mark, L.S., Flower, C.A., and Fisher, F.W. (1979). The speech code and learning to read. Journal of Experimental Psychology : Human Learning and Memory. 5, 531-545.

Share, D.L., McGee, R., McKenzine, D., Williams, S., & Silva, P.A. (1987). Further evidence relating to the distinction between specific reading retardation and general reading backwardness. British Journal of Developmental Psychology. 5, 35-44.

Smith, F. (1973). Psycholinguistics and Reading. New York : Holt, Rhinehart and Wioston, Inc.

Smith, S., Mann, V.A., & Shankweiler, D. (1987). Token test performance by good and poor readers. Cortex. 22, 627-632.

Snowling, M., Goulandris, N., Bowlby, M., & Howell, P. (1986). Segmentation and speech perception in relation to reading skill : A developmental analysis. Journal of Experimental Child Psychology. 41, 489-507.

Spring, C, & Capps, C. (1974). Encoding speed, rehearsal and probed recall of dyslexic boys. Journal of Educational Psychology. 66, 780-786.

Spring, C, & French, L. (1990). Identifying children with specific reading disabilities from listening and reading discrepancy scores. Journal of Learning Disabilities. 23, 53-58.

Stanley, G. (1975). Visual memory processes in dyslexia : In D.Deutsch & J.A.Deutsch (Eds.), Short-term Memory. New York : Academic Press.

Stanovich, K.E. (1991). Discrepancy definitions of reading disability : Has intelligence led us astray? Reading Research Quarterly. 26, 7-29.

Stanovich, K.E., Cunningham, A.E., & Cramer, B.B. (1984). Assessing phonological awareness in kindergarten children : Issue of task comparability. Journal of Experimental Child Psychology. 38, 175-190.

Stanovich, K.E., Cunningham, A.E., & Freeman, D.J. (1984). Intelligence, Cognitive skills and early reading progress. Reading Research Quarterly. 14, 278-303.

Stuart, M., & Coltheart, M. (1988). Does reading develop in sequence of stages? Cognition. 30, 139-181.

Swapna, A.C. (1997). Characteristics of developmental dyslexia in Kannada. An unpublished dissertation as part fulfillment of Master degree in Speech and Hearing submitted to University of Mysore, Mysore.

Temple, CM. (1985). Reading with partial phonology :Developmentai phonological dyslexia. Journal of Psycholinguistic Research. 14(6), 523-541.

Thompson, R.A. (1992). A critical perspective on whole language. Reading Psychology. 13, 131-155.

Torgesen, J.K. (1975). Problems and prospects in the study of learning disabilities. In M.Hetherington & J.Hagen (Eds.), Review of Research in Child Development. 5. Chicago : University of Chicago Press.

Treiman, R. (1983). The structure of spoken syllables. Evidence from novel word games. Cognition. 15, 49-74.

Treiman, R. (1986). The division between onset and rhymes in English syllables. Journal of Memory and Language. 25, 476-491.

Treiman, R. (1991). The role of intrasyllabic units in learning to read. In L.Ruben & C.Preletti (Eds.) Learning to Read : Basic Research and its implications. Hillsdale, NJ, : Lawrence Erlbaum.

Treiman, R., Berch, D., & Weatherston, S. (1992). Effects of linguistic structure on children's ability to isolate initial consonants. Journal of Educational Psychology. 84, 174-181.

Triesman, A.M., & Gormican, S. (1988). Feature analysis in early vision : Evidence from search asymmetries. Psychological Review. 95, 15-48.

Trieman, R., Weatherston, & Berch, D. (19940. The role of letter names in children's learning of phoneme-grapheme relations. Applied Psycholinguistics. 15, 97-122.

Tunmer, W., Bowey, J., & Grieve, R. (1983). The development of young children's awareness of the word as a unit of spoken language. Journal of Psycholinguistic Research. 12, 567-594.

Tunmer, W.E., Herriman, M.L., & Nesdale, A.R. (1988). Metalinguistic abilities and reading. Reading Research Quarterly. 23, 134-138.

Tunmer, W.F., Pratt, C, & Harriman, M. 1. (Eds.) (1984). Metalinguistic awareness in children : Theory, research and implications. New York :Springer-Verlag.

Ullman, C.A. (1969). Prevalence of reading disability as a function of the measure used. Journal of Learning Disabilities. 2, 556-58.

Valtin, R. (1984). Awareness of features and functions of language. In J.Downing & R.Valtin (Eds.). Language awareness and Learning to Read. New York : Springer-Verlag.

Van Kleeck, A., & Bryant, D. (1984). Learning that language is arbitrary : Evidence from early lexical changes. Paper presented at the Annual Convention of ..

Van Kleek, A. (1994). Metalinguistic development. In B.P.Wallach & H.R.Myklebust (Eds.,), Language learning disabilities in school-age children and adolescents. New York: MacMillian College Publishing Company.

Vellutino, F.R. (1979). Dyslexia : Theory and Research. Cambridge; MIT Press.

Vellutino, F.R., Steger, J.A., & Kandel, G. (1972). Reading disability : An investigation of the perceptual deficit hypothesis. Cortex. 8, 106-118.

Wagner, R.K., & Torgeson, J.K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. Psychological Bulletin. 101, 192-212.

Wallach, G.P., & Butler, K.G. (1994). Language Learning disabilities in school-age children and adolescents - some principles and applications (pp.1-88). NY : MacMillon College Publishing Company.

Waller, T.G. (1976). Children's recognition memory of written sentences : A comparison of good and poor readers. Child Development. 49, 717-727.

Watson, C, & Willows, D.M. (1995). Information processing patterns in specific reading disability. Journal of Learning Disabilities. 28(41), 216-231.

Weaver, P., & Shonkoff, P. (1978). Research within re search : A research guided response to concerns of reading educators. St. Louis, Cemrel.

Williams, J. (1980). Teaching decoding with an emphasis on phoneme analysis and phoneme blending. Journal of Educational Psychology. 72, 1-15.

Wimmer, W., A Goswami, U. (1994). The influence of orthographic consistency on reading development : Word recognition in English and German children. Cognition. 51, 91-103.

Yopp, H.K. (1988). The validity and reliability of phonemic awareness tests. Reading Research Quarterly. 23, 159-177.