CHAPTER - II

REVIEW OF LITERATURE
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Lateral Asymmetry and Developmental Lag, and Reading Ability

So far as lack of cerebral asymmetry is concerned, Morgan (1896) described reading disability as "congential reading blindness", which he supposed was due to defective development of the region of the brain believed to be most important for reading ability. This region he supposed was angular gyrus. This view of relation of reading disability to a genesis or brain lesion remained popular till Orton (1937) published his book, "Reading, Writing and Speech Problems in children". Orton (1937) proposed that reading disability was due to a developmental lag in the establishment of cerebral dominance. He was the first to distinguish between acquired disorders of reading as a consequence of unilateral brain injury to the left hemisphere and specific disorders of reading observed in children with no central nervous system pathology. He postulated that the specific disorder could be due to a physiological defect that prevented the normal establishment of unilateral cerebral dominance and acquisition of reading proficiency.

Later studies attempting to relate hemispheric specialization and/or brain pathology with reading problems mainly used visual-half-field techniques, dichotic techniques, dichhaptic tactile technique, neuroimaging techniques, involving computed tomography (CT), magnetic resonance imaging (MRI), and postmertum studies. Visual-half-field technique consists of a brief exposure of visual stimulus material either in the left or in the right visual-half-field of the subject and asking him to recognize the material. Dichotic listening technique
involves presentation of auditory stimulus with digits as the stimulus item to the
subject. The test consists of presentation of two, three, or four pairs of digits
dichotically at the rate of one or two pairs per second. The subject is to report all
of the digits in any order. Dichaptic tactile technique consists of presentation of
tactile stimuli to the subject, who is asked to identify the shape of the stimulus
from an array of shapes presented to him later.

Kershner (1979) took reading disabled children with average intelligence
and compared them with good readers having average intelligence, and
academically accelerated, gifted children for their recognition of words presented
tachistoscopically under simultaneous, bilateral viewing conditions. The poor
readers were found to be inferior to both gifted children and good readers in their
right-field performance. When IQ was taken to be a covariate the difference was
magnified. The author concluded that reading acquisition involves enhanced left
hemisphere decoding of written language, and reading disability is related to the
prevalence of a right-hemisphere-based perceptual coding strategy.

Marcel, Katz, and Smith (1974) compared 8-year-old reading disabled
children with normal children of the same age for visual-half-field perception
ability. They observed a right-visual-field (RVF) advantage for normal readers.
Also better readers showed greater asymmetry in visual field perception. Marcel
and Rajan (1975) replicated Marcel et al. (1974) study with another group of
children and corroborated the previous findings. RVF advantage was replicated.

Naylor (1980), however, points out that some of the RVF superiority in
unilateral presentation can be attributed to normal strategy of scanning from right
to left. Sparrow and Satz (1970) administered dichotic digits task to 9-12-year-old reading disabled and normal children. The two groups were matched for age, sex, race, social class and performance IQ on Wechsler Intelligence Scale for children (WISC). Results for dichotic listening task showed that reading disabled children showed greater left ear advantage while both the groups had equal performance for the right ear. Satz, Radin, and Ross (1971) corroborate the previous finding.

Witelson (1977) administered the dichhaptic tactile tasks on reading disabled and normal children. It was observed that reading disability goes with right hand superiority but normal reading goes with left hand superiority. Witelson (1977), however, proposes that probably reading disabled children show the similar asymmetry like normal children, but at a later age.

Studies involving neuroimaging techniques were conducted by Denckla, LeMay, and Chapman (1985) taking into account both right-handed and left-handed subjects with and without reading problems. Children with reading problems showed neurological anomalies.

Annett and Manning (1990) recently examined a large sample of British school children and tested their hand preference and peg-moving skills, as well as, reading ability and non-verbal IQ. They found that poor readers tended to be extremely right-or left-handed; and right-handedness was strong in many poor readers.

Hynd and Semrud-Clikeman (1989) made an extensive review of studies in the field of dyslexia and brain morphology and point out that methodological
deficiencies are there in connection with the diagnosis of dyslexia and assessment of neurological deficits. They conclude that the observations implicate a relationship between reading problem and brain pathology and/or cerebral asymmetry, but fail to establish it conclusively. Some studies, on the other hand, implicate a developmental lag in the emergence of cerebral asymmetry among children showing reading problems. Snowling (1991) on the basis of a review of literature concludes that the association between handedness, laterality and reading skill is complex. And, work in this field is still in its infancy, though useful, to lead to any definite conclusion.

Geiger, Lettvin, and Zegarra-Maral (1992), and Geiger, Lettvin, and Fahle (1994) noted that normal readers identify letters close to the fixation point with almost 100 percent accuracy. Their accuracy drops for letters farther to the left or right of the fixation point. People with dyslexia are worse than normal at reading letters just to the right of fixation because of strong lateral masking. But for letters 5-10° to the right of fixation, they perform significantly better than normal readers do.

This analysis of dyslexia suggests the possibility of alleviating dyslexia by teaching people to see just one word at a time instead of several. In preliminary studies, a few dyslexic children and adults have been told, as part of their treatment, to place over any page that they are reading a sheet of paper with a window cut out of it, large enough to expose about one word at a time. A reader can either uncover the word at the fixation point, or, if preferred, fixate at one point and uncover a word that is several degrees to the right of that point. In either case, the idea is to focus attention on one word at a time instead of
several. In three months, 15 dyslexic children improved their reading skills by 1-22 grade levels (Geiger, Lettvin, & Fahle, 1994). Four dyslexic adults also made spectacular progress; one advanced from a third-grade reading level to a tenth-grade reading level in 4 months (Gieger, Lettvin, & Zegarra-Moran, 1992). After about the first 3 weeks of practice, they no longer needed the special cut-out sheet of paper.

According to one extensive review of literature, dyslexic people are more lively than other people to have a bilaterally symmetrical cerebral cortex, instead of having their planum temporale and certain other areas larger in the left hemisphere than in the right (Hynd & Semrud-Clikeman, 1989). In some dyslexic people, certain language-related areas are actually larger in the right hemisphere than they are in the left (Duara, Kushch, Gross-Glenn, Barker, Jallad, Pascal, Loewenstein, Sheldon, Rabin, Levin, & Lubs, 1991). Also, many dyslexic people have small anatomical abnormalities in their brains, especially on the left side and especially in the frontal and temporal cortex (Hynd & Semrud-Chlikeman, 1989).

The lateralization of cerebral hemispheres indicates that there is a distinction between the parvocellular and magnocellular pathways in visual system. The parvocellular system deals with details, especially of stationary objects. The magnocellular system deals with overall patterns and moving objects. Many people with dyslexia show indications of a relatively unresponsive magnocellular system (Livingstone, Rosen, Drislane, & Galaburda, 1991). Consequently, they are impaired on detecting overall patterns (such as words) and have trouble with rapid changing stimuli (such as happens when are moves
one’s eyes across a page). People with dyslexia generally show impairments on reading words and sentences, although they are as quick and accurate as any one else in reading a single isolated letter.

Sharma (1998) made an investigation on the understanding dyslexic children. The author discusses the characteristic etiology and diagnosis of dyslexic children. Being the most common type of learning disability, it refers to difficulty in learning to read. Dyslexic children are characterized by refusal to read, crying, distractibility, tension movements, use of high pitched voice, omission of words, substitution, reversal of letters or numbers, mispronunciation, confusion of vowel sounds, difficulty in remembering printed words, spelling errors, and speech disorders. Factors responsible for dyslexia have been identified as genetic, the result of brain dysfunction, psychological, physical, and environmental. To maximally utilize cognitive abilities early identification of these children and modification of the teaching strategy and examination system has been suggested.

Another very interesting study, designed by Vaid, Singh, Sakhuja, and Gupta (2002), examined the relative influence of reading/writing habits and handedness on the direction of stroke movement in free hand figure drawing. The sample consisted of 120 right and left-handed 15-20-year old adult readers of scripts with opposing directionality (Hindi Vs. Urdu) and illiterate controls. Respondents were asked to draw a tree, a hand, a house, an arrow, a pencil, and a fish. It was found that left-handed subjects (including left-handed illiterates) and right to left readers more often drew the figures from right to left, whereas right-handed subjects (including right-handed illiterates) and left to right
readers drew most figures in a left to right direction. These results supported previous findings and clearly demonstrated reading scan biases in nonlinguistic perception and production tasks. It is apparent that reading/writing habits cannot be ignored as a potential artefact in studies of hemisphere functional asymmetry employing nonlinguistic stimuli.

Thus, the research findings indicated that the lateral asymmetry and developmental lag cause reading disability in addition to other psychological and physical/physiological disabilities.

**Brain Injury and Minimal Brain Dysfunction, and Reading Ability**

Observations have related brain injury and brain dysfunctions to many different cognitive-intellectual functions including reading. As early as in 1896 Morgan implicated at such a relationship; and in 1937 Orton also described reading, writing, and speech problems in children being the result of improper cerebral functions.

During 1960's researchers showed interest in the relationship between brain functioning and cognitive-intellectual functions, social behaviour, and psychological adjustment of children. Clements (1966) observed children with minimal brain damage. His observation showed that these children were hyperactive, had perceptual-motor impairments, had disorders of attention apart from showing disability in reading, writing, and spelling. The author concluded that minimal brain damage resulting in brain dysfunction was the cause of observed disorders.
Such observations including the ones that some children show learning and adjustment problems in schools led to the development of the concept of learning disability. Interestingly enough, such children do not show a lag in intelligence, neither have any physical handicap nor have any social or emotional disturbances. Yet they show a significant retardation in classroom learning compared to their non-disabled counterparts. The National Advisory Committee to the Bureau of Education for Handicapped Children in U.S.A. in 1968 points out that such children have a disorder in the basic psychological process involved in understanding and using language. These disorders may manifest themselves in a poor ability to read, write, and spell including a poor ability to listen, think, and speak. These children may have brain injury and minimal brain dysfunction apart from having perceptual handicap and developmental aphasia.

Thus, the researchers have reported that brain damage and dysfunction may result in reading problems apart from other cognitive and psychological problems.
Cognitive Development and Reading Ability

Cognitive process refers to the process by which information is received, transformed, reduced, coded, stored, decoded, and recalled. The traditional image of cognition tends to restrict it to the fancier, more unequivocally, "intelligent" process and products of the human mind. This image includes such higher mental processes, types of psychological entities as knowledge, consciousness, intelligence, thinking, perceiving, memorizing, imagining, creating, generating plans and strategies, reasoning, symbolizing, and perhaps, fantasizing and dreaming. Although some of these activities would credited to the psychological repertoires of other animals, they, nonetheless, have a decidedly human mind ring to them. It includes all varieties of social cognition and the social communicative versus private cognitive uses of language.

It is obvious from the above definition of the problem that cognition must be intrinsically related to perceptual processes, such terms as sensation, perception, imagery, retention, recall, problem solving, and thinking, etc., are all aspects of cognition (Neisser, 1967). Some psychologists are also of opinion that mental activities such as exploration, curiosity, and creativity may be taken as aspects of cognition (Berlyne, 1965). Jean Piaget (1947), whose theory of cognitive development provides the most vivid and ingenium description of children's cognitive processes at different stages of development, has used "knowledge", "cognition", and "intelligence" interchangeably. To Piaget, cognition involves action; and "intelligence is experience". He considers intelligence as a general mental adaptability of the organism to the environment or to a limited
aspect of it. Piaget viewed human cognition as a specific form of biological adaptation of a complex organism to a complex environment.

Intelligence can be viewed as a cognitive potential or as the ability to profit from experience (Dechant, 1982). Wechsler (1944) views it as the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with one's environment. Inadequacy or failure of the development of the brain because of gene deficiency can become a major cause of inadequate intellectual functioning.

So far as the role of intelligence in reading is concerned, Rupley and Blair (1979) view that children with less than normal intelligence may have poor reasoning process which may result in reading difficulty. They point out that investigations have found a relationship between reading achievement and intelligence. The relationship is usually a positive one-high intelligence resulting in better reading ability, and low intelligence resulting in poor reading ability. However, exceptions do exist; some children with reading problems have been found to have average or above average intelligence. Hence, though low intelligence itself may not be a direct cause of reading difficulties, it may lead indirectly to such problems.

Waller and MacKinnon (1979) review an array of studies, and view that early readers on the average show higher intelligence scores than others. Thus, it seems that intelligence helps acquisition of reading skill, but its very existence may not ensure a good reading skill. This is testified by the fact that some children with reading difficulty show intelligence above the average level.
Richman and Lindgren (1980) examined the patterns of intellectual ability of children with verbal deficits. Observations showed that children with poor reading skills had specific language disability but had good sequencing-memory skills. Children with very poor reading ability displayed a general language disability along with deficits in abstract reasoning and sequencing-memory. Authors observed that children with verbal deficit and/or reading deficit need to be assessed from specific cognitive perspective instead of measuring intelligence globally.

Dechant (1982) views that disabled readers show low learning efficiency; their verbal IQ score tends to be significantly below their performance IQ score; show poor memories for sequences; think on a concrete rather than on abstract level; have difficulty remembering what they read; and have a small recognition and speaking vocabulary for their age. Besides, their overall reading score is substantially below their grade level; they cannot deal with quantitative relationships and concepts or think critically. Their intellectual inadequacy shows itself in shorter attention span, impulsivity, difficulty in associating graphemes and phonemes. They fail to integrate the meaningfulness of printed materials. They fail to generalize from word to concept, and have an impaired symbolic ability; they are unable to infer ideas from a paragraph or to grasp cause-effect relationships; and show difficulty in abstract thinking. Moreover, Dechant (1982) points out that one of the factors determining reading potential of a child is his/her IQ level. He observes that poor readers tend to do poorly on IQ tests, which require reading to get the correct answer. Such children need to be tested on individual intelligence scholarstic aptitude tests like Institute for Personality
and Ability Testing (IPAT), Culture fair Intelligence Test, Peabody Picture Vocabulary test, Slosson Intelligence Tests for Children and Adults, Stanford-Binnet Intelligence Scales, and Wechsler Intelligence Scale for Children. At the same time, Dechant also contends that IQ score should not be, and also, cannot be used as an absolute measure. It simply reflects the possible academic potential of a child, hence, may not be adhered strictly. However a low IQ is most likely predictive of scholarstic failure and/or under achievement including that in reading.

Dallman, Rouch, Char, and DeBoer (1982) view that a fairly close relationship exists between intelligence and the ability to read. Intelligence defined as the rate at which an individual is able to learn shows a positive relation to reading ability. On the other hand, when intelligence is thought of as an inherited ability the role of school and teacher as agents to provide environment to read to come to play a crucial role. The intelligence of a child plays a more important role in the beginning stage of reading than at later stage. Children who show high intelligence and start learning reading successfully some times come up with reading problems at later stage in life.

One interesting study was designed by Sharma (2000) to investigate cognitive development as a function of reading writing skills of children. The study assesses the cognitive abilities and reading-writing skills of children attending ICDS centers and non-ICDS schools. The sample consisted of 50 children (age 5+ years) attending ICDS centers like Anganwadis and 50 children (age 5+ years) attending non-ICDS schools will and equal number of boys and girls in each group. The cognitive development test for preschoolers (Pandey,
1980), and the Reading. Writing Readiness Test (Singh, 1982) were administered to the students. It was observed that the ICDS and non-ICDS children did not differ significantly as far as their cognitive abilities were concerned, but both the groups were significantly different in terms of their reading-writing skills. However, reading-writing skills and cognitive abilities were significantly correlated to each other in both groups of children.

Another study was conducted by Pani (2001) to find out the effect of verbal self instructional (VSI) treatment package on the performance of reading disabled children. The study assesses the effect of the VSI treatment package on the performance of reading disabled children on cognitive tasks. Out of 100 Grade three children, 20 reading disabled children were identified on the basis of their performance on 5 reading tasks. They were administered a battery of cognitive tasks before as well as after two months of VSI training. The training programme was spread over 8 weekly sessions. Pre-and Post-treatment comparisons revealed that the VSI therapy significantly improved the performance of reading disabled children on cognitive tasks.

Another important study was designed by Padakahnaya, Devi, Zaveria, Chengappa, and Vaid (2002) to investigate the directional scanning effect on the strength of reading habit in picture naming and recall. They study assesses directional scanning effects (DSE) on picture naming and recall as a function of reading habit strength (years of exposure to reading/orthography). The sample comprised four groups of readers: (a) 11 illiterate 22-35-year-old Urdu speakers; (b) twelve 11-16-year-old students, unidirectional right to left readers of Arabic; (c) 12 Grade-IV students, unidirectional left to right readers of Kannada; and (d)
48 bi-directional readers (Grades I-VII) of Urdu and English. Results indicated a right to left DSE in Arabic and Urdu readers. Among Urdu readers, the strength of the scanning effect decreased with the duration of schooling in English. No right to left effect was observed among Urdu illiterates or Kannada readers. These results seem to be an extension of extant research in documenting an "invasion" of culturally acquired reading scan habits on to a nonlinguistic domain.

The authors suggest that DSEs either be controlled or directly examined in future laterality research involving nonlinguistic stimuli.

One very interesting study was designed by Singh, Man, and Sowgandhi (2002) to find out the effect of listening to Panchatantra stories on cognition of children. The study tests the impact of reading of Panchatantra (ancient Indian collection of stories with a moral at the end of each story) an children's cognitive ability, particularly comprehension. Of a sample of 120 students (age 12-13 years), 60 children read the stories regularly whereas the other 60 did not. The experimental group scored significantly higher on the comprehension as compared to the control group. The findings confirmed that the stories of the Panchatantra helped to improve comprehension of children during the early developmental stages.

Another study was conducted by Mohanty and Mishra (1991) on the effect of cognitive intervention training on mental ability and epistemic curiosity. Employing Columbia Mental Maturity Scale for measuring non-verbal intelligence and the curiosity scale for measuring epistemic curiosity on 4-5 years preschool children, 20 subjects in each, Experimental and Control groups. The investigators reported that: (i) Short-term cognitive intervention training improved
significantly the performance of young children in cognitive tasks; (ii) further, direct, intensive, and individualized cognitive training programmes were found more effective than the regular ones. The investigators have advocated for special cognitive training for boosting up the cognitive growth among children.

The primary objective of the study conducted by Mohanty and Mishra (1994) was to investigate the effects of two training sequences on the development and generalization of number skills and logical operations. Thirty urban middle class preschool children of ages ranging from 3 years 11 months to 4 years 11 months (Mean age=4 years 6 months) were randomly selected, randomly assigned, and trained for 4 weeks in one of the three treatment conditions: number skill (counting), logical operations (classification and seriation) and control, having 10 subjects in each condition. Each of the experimental treatments was based on either of two broad perspectives: the logical foundations model of Piagetian theorists and a skills integration model. Tests measuring number abilities and logical operations were designed as pre and post test measures. Findings were that: (a) both experimental groups-number skills group and logical foundations group, significantly out performed the control group on both tests-number knowledge and logical operations; (b) the number skills group significantly outperformed the logical foundations group on the number knowledge test; and (c) the logical foundations group significantly outperformed the number skills group on the logical operations test. Results were discussed in terms of their implications for developmental psychology and education.
Thus, studies show that an average intelligence is one of the pre-requisites for successful acquisition of reading skill; but does not ensure it. So also, a high intelligence score may facilitate better reading competence but never ensures it.
Phonological Processing and Reading Ability

Phonology refers to the sound pattern of a language. Researchers in this area can be broadly divided into three categories: phonological awareness, phonological recoding in lexical access, and phonetic recoding in working memory (Wagner & Torgeson, 1987). Phonological awareness refers to the awareness of sound structure of a language; phonological recoding in lexical access refers to the recoding of written symbols into a sound-based representational system to get from the written word to its lexical referent; and phonetic recoding in working memory refers to the recoding of written symbols into a sound based representational system to maintain them efficiently in working memory.

So far as the role of phonological awareness in reading is concerned, Mattingly (1980) views that phonological awareness about a language enables a reader to perceive the letter-sound correspondence, hence, facilitates reading. Soderbergh (1977) points out that learning to read new words involves the segmenting the letter string into units that correspond to individual phonemes and blending the individual sounds together to pronounce the word, i.e., an analytical approach to reading the new words. Phonological awareness helps in this process. Calfee, Lindamood, and Lindamood (1973) took into account beginning readers and adult readers in their study. Strong relations between measures of phonological awareness and reading skill were observed for all these groups. However, the study did not control the IQ variable. Rosner and Simon (1971) in a study controlled for IQ variable while looking into the relation
ship between phonological awareness and reading achievement. Subjects included ranged from beginning readers to fluent readers. Strong relationship between measures of phonological awareness and reading achievement were observed.

Bradley and Bryant (1985) did a large scale longitudinal study to examine the relationship between phonological awareness and reading. Results suggest that the phonological awareness of pre-readers is one of the factors determining their success in early reading. IQ and educational history were other factors determining early reading achievements. Pratt and Brady (1988) observed that phonological awareness is related to reading success both among child readers and adult readers. All these studies point to the fact that awareness about the sound structure of a language facilitates acquisition of reading skills among beginning readers and level of reading achievement among fluent readers.

So far as phonological recoding in lexical access and acquisition of reading skill is concerned, Ehri and Wilce (1979) observed that it is especially important in the early stages of the acquisition of reading skills, though such a recoding is used by readers of all levels. Stanovich (1982) observed that dyslexic subjects were slower at naming series of objects, colours, numbers, and letters and this problem in dyslexics was due to deficits in using phonological information for lexical access and not due to visual-perceptual deficits. Such studies implicate at the importance of phonological recoding in lexical access as an important variable in acquisition of reading skill and also in the reading achievement level. However, a causal relation between the two is yet to be established.
So far as the role of phonetic recoding in working memory in reading is concerned, a number of researchers have shown that recoding the written symbols into a sound-based representational system to maintain them efficiently in working memory is necessary for an efficient reading. Working memory has been conceptualized as a storage system of limited capacity that supports ongoing cognitive processing. Katz, Shankweiler, and Liberman (1981) took good and poor readers from second grade into account. The subjects had to recall series of common object pictures and abstract line drawings. Verbal labels for line drawings were not apparent. Good and poor readers differed for their recall of common objects not for their recall of abstract line drawings. Basing on their findings, the authors have concluded that the problem for poor readers was not a general problem in working memory but a problem specific to coding items phonetically into working memory. Mann and Liberman (1984) in a longitudinal study for beginning readers observed a correlation between phonetic coding in working memory and acquisition of reading skills. Such studies point to the role of working memory and phonetic recoding into it in reading acquisition and achievement.

Sahu (1985) conducted one study to find out the use of orthographic and semantic cues in learning to read. The study aimed at assessing how the beginning good and poor readers make use of orthographic-graphemic cues and contextual-semantic cues while reading English writing. The study had 40 beginning readers within the age range of 5 years 2 months to 7 years 5 months. There were 21 girls and 19 boys in this group. The results showed that while reading the list of words, the good readers committed less errors, but produced
proportionately larger number of misreadings than did the poor readers. Moreover, the good readers use graphemic information and semantic cues more than the poor readers; the poor and good beginning readers follow different strategies when faced with a new word.

Another interesting study was designed by Sahu (2000) to investigate the lexical access in Oriya orthography. The study looked into the possible lexical access mode of fluent oral readers reading unfamiliar worlds in Oriya orthography. Twenty-five boys and 25 girls of Grade-V were made to read real words and parallel pseudohomophones and make lexical decision under conditions of suppression of phonetic articulation; and no suppression of phonatic articulation. Dependent measures observed were lexical decision and lexical decision making time. Results showed that lexicality decision was adversely affected by suppression condition; and also by pseudohomophone materials. So far as lexical decision time was concerned both groups of subjects took longer time under conditions of suppression and for pseudohomophones. Girls here showed a significant interaction between the two variables indicating that lexical decision time taken under suppression conditions for pseudohomophone was the highest. Results have been interpreted in the light of the features of Oriya orthography vis-à-vis the impact of suppression on its reading. It has been concluded that reading unfamiliar test in Oriya orthography takes the helps of articulation of phonetic code.

Another study was conducted by Prakash (1999) on reading disability and knowledge of orthographic principles. The study compares the cognitive and language related abilities of reading disabled with chronological age matched
and reading age matched normal children. A group of 16 children with reading
disability and another group of 16 normal children of Grade-IV were administered
tests of rhyme recognition, phoneme deletion, syllable detection, syllable
reversal, serial recall, visual retention, identification of body parts, and
knowledge of orthographic principles. In addition, 5 reading disabled children
were compared with a group of normal reading controls matched on age on the
same measures. Results revealed that the performance of chronological age
matched controls differed significantly on all the tests while the reading age
matched group differed significantly on tasks of rhyme recognition, identification
of left-right body parts, and knowledge of orthographic principles from the
reading disabled group. Poor knowledge of orthographic principles was the most
crucial factor in determining reading ability.

Karanth (2002) made a search for deep dyslexia in syllabic writing
systems. The study describes the reading deficits of a bilingual/biliterate patient
in his/her native Hindi and in English. Like majority of the Indian writing systems,
Hindi (Devanagiri) is phonologically transparent, nearly always regular, and can
therefore, be treated sublexically. The use of the lexical route may not arise
because Hindi words, even the complex ones, are phonologically transparent
and there are very few irregular words. Since the neural bases of sublexical
reading are impaired in deep dyslexia, the differential effect of this neural
impairment on the processing of the two scripts may be useful for the validation
of the psycholinguistic models and also to enhance understanding of the neural
bases of reading.
Another interesting study was conducted by Karanth (2002) on reading into reading research through non-alphabetic lenses: evidence from the Indian languages. The author argues in favour of expanding the research base on reading from the specific constraints of reading in alphabetic scripts to a larger database covering a variety of scripts to find solutions to some persistent questions. The rationale for this expansion is provided by research on several aspects of reading in a series of studies on reading the alphasyllabaries of India.

Taken together, phonological awareness, phonological recoding in lexical access, phonetic recoding in working memory project a strong relation to acquisition of reading skill and later reading achievement. Though causal relations are yet to be established, yet correlations projected are very high.
Vellutino and Scanlon (1982) made an extensive review of researches done in the area of reading difficulty and various proposed hypotheses for it, and point out that reading difficulty in children is mostly caused by poor verbal processing and verbal deficit in the children. Their review looked into visual deficit hypothesis, cross-modal transfer deficit hypothesis, serial memory deficit hypothesis, attention deficit hypothesis, problem in association and rule learning hypothesis; and show that none of these proposed explanations is sufficient enough to explain reading problems in children. Therefore, the authors propose that the most likely source of reading difficulty in children who have no significant learning problems in other content areas is deficiency and/or disorder in linguistic coding. The basic assumption is that language is of great importance in learning to read and other representational systems like visual and motor systems, play secondary role in this process. Hence, it follows that reading processes would be especially vulnerable to limitations in linguistic ability. By limitations in linguistic ability authors refer to limitations in the acquisition and use of semantic, syntactic, and phonological information. Semantic coding refers to the use of words, phrases, and sentences to code meaningful information. It is probable that children with reading problems fail doing it as effectively as their normal counterparts. The possible reasons for this failure are: (a) deficient lexical development; (b) name retrieval problems; (c) problem in apprehending word or sentence meanings; and (d) deficiency or inefficiency in syntactic or phonological coding. Syntactic coding refers to the assignment of meanings and functional valences to words encountered in linguistic discourse. This is done through the
application of grammatical rules that constrain the contexts in which those words may appear, as well as the ways in which they may be combined. Phonetic coding refers to the ability to internalize phonological representations of words, graphic components as means for recovering its name and meaning when they appear in printed texts. It also refers to the process whereby linguistic units (i.e., words, phrases, sentences) are encoded phonologically when they are presented in visual or auditory modes.

Vellutino and Scanlon's (1982) review substantiates the proposition that reading difficulty is associated/caused by linguistic coding deficits; these deficits being there in the areas of semantic, syntactic, and phonological coding processes.

Apart from the above review, Moore, Kagan, Sahl, and Grant (1982) report of a two-phased intensive research to ascertain the causes of reading disability. The authors looked into the possible causes of the deficit. They conclude that the popular hypothesis of perceptual deficit was not supported by the data. Short-term memory deficit proposition was affirmed. But the most significant finding was that the reading disabled children had serious difficulty in processing and evaluating information contained in oral speech. Authors point out that difficulty in processing linguistically presented material lie at the core of reading problems in children.

Vellutino and Scanlon (1987) further looked into the linguistic coding and reading ability among children. It is pointed out that young poor readers were less sensitive than young normal readers to phonological and syntactic
components of spoken and written words. Besides, they were found to be less proficient than normal readers in using these codes to store and retrieve these stimuli. These later observations correlate author's previous contentions.

Wagner and Torgesen (1987) also point out that phonological awareness, i.e., awareness of the sound structure of a language is related to the acquisition of reading skill. Phonological awareness ensures one's access to the phonology of the language. This ability is manifested in the ability to analyse spoken words at the phonemic level. They suggest that this ability is crucial for success in alphabetic mapping. Mattingly (1972) suggests that meta-linguistic awareness as manifested in the ability to analyse spoken words at the level of phoneme is crucial for success in alphabetic mapping, hence in the acquisition of reading skill.

One study was conducted by Patra and Dash (1999) on reading achievements of children with bilingual media of instruction. The study assesses the reading performance of children in two different languages. The sample consisted of 60 students of Grade 3 from a school where the medium of instruction was both English and Hindi. Word identification and passage comprehension tests in English, and word decoding and passage comprehension tests in Hindi were used to assess reading achievements. Results indicated that the decoding performance of students was better in English compared to Hindi, whereas comprehension was better in Hindi compared to English. A majority of the students had an average performance on reading in both the languages and they were categorized into high-achievers, general underachievers, true dyslexics, and instructional failures. Findings were
interpreted in terms of the extent of language usage. Implications of the results for the identification and remediation of reading and language difficulties were pointed out.

Another important study was conducted by Sen and Blatchford (2001), which examines the factors associated with achievement and progress in young Indian children learning to read in English. Using a longitudinal design, a follow-up was done of children's reading from the end of nursery for 17 months. The sample consisted of 161 children (average age 5 years 3 months at the onset of the study) from seven schools of Kolkata. Measures such as reading and writing tasks, including the Neale Analysis of Reading Ability and the word reading subtest of the British Ability Scales were employed. Teachers used the Infant Rating Scale to provide ratings and parents completed questionnaires relating to home background and exposure to English. Findings revealed that the variable most strongly associated with progress in reading was word recognition at the end of nursery. However, the findings need to be interpreted in the context of the children's generally poor scores on comprehension of text. These findings have implications for teaching practices that lay stress on word recognition without emphasizing language comprehension, especially in relation to bilingual children who have been educated in a language other than their mother tongue.

Thus, it is obvious that proficiency in linguistic skills is a necessary prerequisite for acquisition of reading skills. These linguistic skills are manifested in semantic, syntactic, and phonological coding proficiencies.
Memory Processes and Reading Ability

According to Atkinson and Shiffrin (1968), the basic structural features of episodic memory are three memory stores, which they call the sensory register, the short-term store, and the long-term store. These stores are said to be structurally distinct because they preserve information in different formats, for different durations, for different purposes, and because they lose information in different ways. The sensory register is a nearly literal record of the sensory image. The entry of information into the register is passive, and cannot be sensory information in a complete and raw form, it does not keep it for very long. The information is lost from the register in less than a second. However, we pay attention to, and recognize some of the information in the sensory register. When we do this the information is passed on to short-term memory for further processing.

Inputs for short-term memory (STM), however, come from both the sensory register and the long-term store. Atkinson and Shiffrin (1968) argue that information cannot be consciously processed in either the sensory register or the short-term store. The memory in STM is more durable and in a more memorable form in comparison to sensory memory. In this stage an information remains in the STM for about 30 seconds. The STM has two important characteristics. One, short-term memory storage has limited capacity, that is, it cannot hold a lot of information simultaneously. This capacity is estimated to be about 7 items, plus or minus 2 (Miller, 1956). Two chunks of information from this memory will decay
and be gone completely within about 30 seconds, unless one does something to prevent the decay. Constant attention to or rehearsal of the information can serve to maintain it indefinitely.

Some of the information in short-term memory is neither lost nor retrieved but passed along to the next memory stage, i.e., long-term memory through rehearsal. Just going over and over what is to be remembered (called maintenance rehearsal) does not necessarily succeed in transferring it to long-term memory (Craik & Watkins, 1973). What is known as elaborative rehearsal is more likely to succeed. Elaborative rehearsal involves giving the material organization and meaning as it is being rehearsed; it is an active rehearsal process, not just the passive process of repetition. In elaborative rehearsal, people use strategies that give meaning and organization to the material so that it can be fitted in with existing organized, long-term memory. The capacity of the long-term store greatly exceeds that of the short-term store. Its capacity is unlimited. But its great capacity does not imply that information is never lost from long-term storage. Memory loss from long-term memory (LTM) storage may be there through interference. Interference may mean disruption of information when new information is transferred to the long-term store. Cowan (1988) views that short-term memory (STM) store keeps memories in active state through rehearsal, whereas long-term memory (LTM) stores are made mostly in terms of semantic elaborations.

Reading is a life long activity in which many skills are used. It is a multidimensional skill involving linguistic, perceptual, cognitive, and motivational components. While reading, a reader has to decode the written symbols first,
and then comprehend it. Reading thus, is a balance between word recognition and comprehension. In other words, word recognition and comprehension together define reading. Oral reading and comprehension are two traditional measures of reading achievement. In this context a study was conducted by Mohanty and Rout (1992). The study was designed to examine the relationship among reading skill, simultaneous-successive-planning processes and reading awareness of readers with a sample of 80 urban primary school (Grade IV) children. Results indicated significant correlations between reading skill and simultaneous processes, and between reading skill and reading awareness. The correlations between reading skill and successive process, and between reading skill and planning process were not significant. The level of oral reading and reading comprehension had significant effects on simultaneous process and reading awareness, but not on successive and planning processes. The findings were interpreted in the context of Oriya orthographic system and also in view of the level of reading skill required at Grade IV.

The concept of working memory is of recent origin. While short-term memory has been traditionally conceived as a passive storage buffer the term working memory developed as a way to refer to a more active part of human processing system (Newell, 1973). Working memory is assumed to have processing as well as storage functions: it serves as the site for executing processes and for storing the products of these processes (Baddeley & Hitch, 1974; LaBerge & Samuels, 1974). Information can become a part of working memory through several routes: it may perceptually encoded from the text; it may be sufficiently activated so that it is retrieved from long-term memory; and it
may be the output of a comprehension process. Information can also be lost from working memory since its capacity is assumed to be limited (Miller, 1956; Simon, 1974). Information may be lost through decay or displacement. Decay occurs if the activation of information subsides to a subthreshold level with time (Collins & Loftus, 1975; Hitch, 1978; Reitman, 1974). Displacement occurs if additional structures are encoded, activated, or constructed until the capacity is exceeded. Just and Carpenter (1992) view that working memory plays a central role in all forms of complex thinking such as reasoning, problem solving, and language comprehension. Its role in language comprehension is viewed to be especially crucial since language comprehension involves processing a sequence of symbols that is produced and perceived over time.

Some experiments have shown that memory plays a role in reading. It has already been discussed that memory processes are traditionally divided into sensory register, long-term memory, and short-term memory processes. Their features and the distinctions between them have already been pointed out. The concept of working memory is rather of recent origin. Its features and characteristics have already been mentioned.

Deficit in memory for serial information has been proposed as one of the reasons of reading problem in children (Johnson & Myklebust, 1967; Kirk & McCarthy, 1968). This hypothesis suggests that poor readers have difficulty in perceiving temporal order in verbal stimuli and in spoken language; hence the reading problem ensues. But the later studies controlling for item memory report that this explanation is implausible (Davis & Bray, 1975; Swanson, 1978).
Corkin (1974), Doehrin (1968), and Senf and Freundl (1971) report that reading difficulty in children is associated with shorter recall memory span. The digit span subscale of Wechsler Intelligence Scale for children test differentiates children with reading difficulty from normally reading children. One of the reasons of low short-term memory of children with reading difficulty is their efficiency in gaining access to stored information. Vellutino (1979) observes that poor memory could be one of the reasons of reading problem in children. Batchelor, Kixmiller, and Dean (1990) observe that poor reading skill goes with poor visual short-term memory. Measures of short-term memory usually include letter span and digit span tasks (Dempster, 1981). Dempster views that since digits and letters have different feature discrimination marks their item identification rates are different which results in span differences. Studies show that digit span is usually larger than letter span, and develops at a faster rate over age than letter span. Dempster (1981), however, views that rate of identification is the main source of individual differences in letter and digit span. However, short-term memory has been shown to be related to reading ability.

Though short-term memory deficit and serial memory deficit hypotheses for reading problems have been discarded by recent studies; researches during the past decade have emphasized upon the role of working memory in reading processes. Danneman and Carpenter (1980) report that reading span, a language-loaded test of working memory, correlates significantly with most of dimensions of reading ability. These dimensions include reading comprehension and verbal scholastic aptitude. Word span and listening span also showed similar correlations. At the same time, digit span and word span measures did
not correlate with reading comprehension. Authors conclude that working memory, which has both storage and processing site, significantly determines the whole range of reading processes.

Danneman and Green (1986) took two different measures of working memory into account, i.e., speaking span and reading span, and looked into their relationships with comprehension and production of words in context. Results showed that speaking span significantly correlated with vocabulary production fluency even after the effect of reading span was statistically partialled out.

Ormrod and Cochran (1988) looked into the relationship between working memory, reading, and spelling. The experiment involved language-loaded test of working memory. Results showed that working memory capacity accounted for a significant portion of spelling variance. Siegel and Ryan (1989) experimented with both verbal and non-verbal measures of working memory and reading processes. Results showed that working memory capacity grows with age. Children with reading problems showed significantly lower scores on both the measures of working memory. Development of reading skill was related to the growth and development of working memory capacities across both language and non-language measures. Reading disability, the authors concluded, involves a generalized deficit in working memory.

Swanson, Cochran, and Ewers (1989) took into account skilled and less skilled readers and looked into their working memory performance. Results showed that working memory differences exists between different reading groups. Danneman (1990) looked into the relationship between working memory
and verbal fluency. Working memory was assessed by a speaking span test, which taxes the processing and storage functions of working memory during sentence production. Verbal fluency was assessed by speech generation task, an oral reading task, and a task for eliciting oral slips of the tongue. Speaking span was significantly correlated with performance on all three tasks; individuals with small speaking spans were less fluent and more prone to making speech errors.

Just and Carpenter (1992) reviewed studies relating different facets of language comprehension to working memory capacity. Authors concluded that individual differences in working memory capacity for language can account for qualitative and quantitative differences in several aspects of language comprehension. MacDonald, Just, and Carpenter (1992) looked into the relationship between working memory and processing of syntactic ambiguity. Results supported the hypothesis that language loaded measure of working memory influence the processes that are executed to understand a syntactically ambiguous sentence.

The studies cited so far have been done taking English orthography into account. English is an alphabetic type of non-phonetic orthography. Orthographic differences could have implications for reading strategies and processes. Hence, taking Oriya orthography into account which is an alphabetic-syllabic type of phonetic orthography, Mishra and Sahu (1992) observed that working memory capacity is related to superior performance in oral reading as well as in reading comprehension. It was also observed that the difference in
reading proficiency been high and low working memory groups of subjects was retained even after the effect of intelligence was partialled out.

Another very comprehensive study was conducted by Swain and Sahu (1994). The study aimed to look into the role of intelligence and memory factors in early reading in Oriya orthography. The study intended to make observation on two points of reading skill development: on the point of beginning reading, and on the point of relatively fluent oral reading. It also looked into oral reading and reading comprehension dimensions of reading performance. The study was based on a 2x2 factorial design. Two grade levels (i.e., Grades II and V) were orthogonally combined into two sex groups (i.e., boys and girls). Thus, there were four subgroups of subjects, 30 subjects in each group, and hence the total number of subjects was 120. A measure of abstract intelligence (Raven's progressive Matrices); measures of short-term memory (Digit span-forward and backward; letter span-forward and backward); Measures of working memory (non-language and grade-appropriate language-based measures); and measures of long-term memory (grade-appropriate thematic memory tasks) were administered to all the subjects. So far as reading tasks were concerned, an oral reading task was administered to Grade II subjects whereas Grade V students were administered with an oral reading task and reading comprehension tasks. The reading comprehension tasks for Grade V included cloze tasks and passage comprehension tasks. In order to get an overall picture of the subjects; reading competence, oral reading scores, cloze task scores, and passage comprehension scores were converted into their respective Z scores, and the
summation of these Z scores was taken as the indicator of their overall reading competence.

Results showed that sex group differences on variables observed were insignificant. Hence, data across sex groups were pooled together during further analyses. So far as inter-correlations between predictor measures were concerned, it was found that at Grade II level STM and LTM measures correlated positively and significantly. At grade V level, language-based working memory and RPM were found to belong to this cluster. Multiple correlations and backward stepwise regression analyses were done to assess the contribution of intelligence and different measures of memory on oral reading and reading comprehension processes. At Grade II level LTM, digit span (backward) and letter span (backward) came up to compose the best set of predictors for oral reading performance. At Grade V level letter span (forward) came up as the best predictor for oral reading performance. At this Grade level LTM, letter span (forward) and RPM made up the best set of predictors for cloze performance. LTM and digit span (backward) made the best set of predictors for passage comprehension. So far as the overall reading competence at Grade V level was concerned, RPM, LTM, and digit span (forward) composed the best set of predictors. Thus, STM measures were found to have significant contributions to oral reading performance of both grade levels; and LTM was found to be a significant component of the determiners when comprehension in reading is involved. However, findings have been interpreted in the light of cognitive commonality of predictor’s task demands and reading task demands.
A series of four important studies were conducted by Sahu (2000). Study I looked into the role of simultaneous-successive scanning and planning processes in oral reading in Oriya orthography. Subjects were drawn from Grades II and V. Grade II subjects were beginning readers and Grade V subjects were fluent oral readers. Sample consisted of 25 boys and 25 girls from each grade, and thus, total sample size was 100. All the subjects were administered with simultaneous, successive, and planning measures, and grade-appropriate oral reading tasks. Results showed that boys and girls did not differ on measures under observation. Data across sex groups were pooled together during further analyses. Multiple correlations showed that all the measure taken together contribute significant variance in correct oral reading. Stepwise multiple regression analyses showed that of all the predictor measures, planning measures made up best set of predictors. Results have been interpreted in the light of the fact that oral reading involves planned visual search through the text.

Study II investigated into the information processing strategies of good and poor readers who were not matched for intelligence. If was intended to treat the effect of intelligence as a covariate. The study included along with other measures, two comparable measures of simultaneous and successive processing abilities, and used good and poor readers within the normal reading age. Sixty readers (30 good and 30 poor readers) between age of 9 and 11 years from Grade V of an urban school in Orissa, India, were given simultaneous and successive information-processing tasks, some of which were comparable. They were also tested with Raven's Progressive Matrices (RPM). The two groups did not differ on RPM scores, but the poor reader group took significantly
more time to complete the test. This implies a delay in visual scanning for poor readers. Good readers performed better than the poor readers on the simultaneous and successive tasks. When performance in these two tasks within the groups was compared, it was observed that the good readers scored significantly higher in the simultaneous than in the successive tasks, but the poor readers had almost equal scores in simultaneous and successive tasks. This observation points to the importance of simultaneous processing in oral reading.

Study III investigated the relationship between reading comprehension and information processing strategies of relatively fluent oral readers of Oriya orthography. The study was necessary because Oriya orthography has some significant differences from English orthography, and these differences could bear implications for the reading strategies and processes. Hence, it was envisaged that findings in the field of reading research using English orthography may not hold good for the readers of Oriya orthography. One hundred students of Grade V were taken as subjects in the present study. Reading comprehension tasks, simultaneous and successive information processing tasks, and non-verbal measure of intelligence were administered to all the subjects. Results show that good comprehenders were relatively more intelligent than the poor comprehenders. So far as their performance on simultaneous and successive information processing strategies were concerned, good comprehenders were better off on both types of coding tasks and these differences were found to be statistically significant in most cases even after the effect of intelligence was partialled out. However, no differential proficiency on either of these coding
strategies was observed, neither for the good nor for the poor comprehender group.

Study IV aimed to see the relationship between working memory capacity and reading proficiency in the context of Oriya orthography. Both oral reading and reading comprehension processes were taken into account. Fluent oral readers from Grade V were administered with working memory (language and non-language) measures; oral reading and cloze tasks; and Raven's Colour Progressive Matrices (RCPM). High and low working memory groups were generated on the basis of their pooled Z scores on both the measures of working memory. Results showed that high working memory group performs better than their low counterparts on oral reading and reading comprehension even when intelligence effect is statistically partialled out. Findings have been discussed in the light of the nature of working memory; and reading task demands as cognitive tasks.

All these studies implicate at the fact that working memory capacity can be measured through different working memory tasks; working memory capacities show significant relationship with different dimensions of language and related abilities; and reading being a special language related ability shows significant relationship with all the measures of working memory capacity.
Social Disadvantage and Reading Ability

Some theorists believe that social experiences are most important for cognitive development, and that social deprivation causes retardation. One such study was conducted by Howard, Hoops, and McKinon (1970) on language abilities of children with differing socio-economic backgrounds. The researchers investigated the effect of socio-economic status (SES) on some selected oral communication skills of 198 Kindergartners. Four subtests of Illinois test of psycholinguistic abilities (ITPA) and a portion of the preschool inventory were administered to all subjects on an individual basis. The results revealed that the high SES subjects scored significantly and consistently higher than the low SES children. In other words, the high SES children were linguistically more skilled compared to the low SES children.

Another important study was conducted by Misra and Shahi (1977) on prolonged deprivation and development of form perception. In this study, a random sample of one hundred 4-7-year-olds from a rural area was classified into three deprivation groups-high, middle, and low, on the basis of their scores on a scale for rating prolonged deprivation. The scale used data from interviews with parents concerning the social, cultural, economic, and religious experiences of the subjects. A comparison of the subjects' mean correct scores for recognition of letter-like forms indicated significant detrimental effects of deprivation at all age levels. Low deprivation subjects identified significantly more forms correctly than did high deprivation subjects.
One interesting study was conducted by Sahu (1979) on effect of social disadvantage on verbal competence and language achievement. In this study, a group of 210 socially advantaged and disadvantaged children was drawn from Grades III, IV and V. There were 35 subjects in each of the six resulting subgroups. The Indian adaptation of the WISC verbal sub-scales and the Language Achievement Test Batteries (LATB) were administered to each subject. It was observed that both social dimension variances and Grade variances were significant for WISC verbal scores. LATB scores showed favourable trends in the case of advantaged subjects. WISC verbal scores were significantly related to word reading, spelling, passage comprehension, and word fluency scores. A similar trend was observed for word comprehension scores in the case of advantaged but not in disadvantaged subjects.

In another study, Ahmed (1980) examined the effects of socio-cultural disadvantage on creative thinking. Verbal and nonverbal tests of creativity were administered to 150 8th, 9th and 10th grade children in five Indian schools that were on a continuum from extremely advantaged to extremely disadvantaged. The subjects were categorized as being from advantaged or disadvantaged home backgrounds. Grade, school, and home background showed significant effects on creative thinking abilities, and all interactions were significant except for the grade and school. It has been concluded that socio-cultural disadvantage retards the development of both verbal and non-verbal creativity but that this deficit could be overcome by quality education.

Another very interesting study was conducted by Mohanty (1980) on the effect of socio-cultural disadvantage on intelligence, and short-term memory.
In this study a group of 200 socio-culturally advantaged and disadvantaged third and fourth grade children was administered the Raven's Progressive Matrices (RPM) and a short-term memory test. The socio-cultural dimension variance and grade variance were found to be significant for RPM, STM, clustering, and ratio of repetition index scores. The performances of socio-culturally advantaged subjects on all four measures were significantly better than that of their disadvantaged counterparts. The results suggested that disadvantaged subjects did not compensate for their handicap when they came from a limited home to wider school environment.

Sandeep and Pushpa (1981) conducted an experiment on the impact of deprivation on cognitive development in children. The investigators reviewed the literature on the impact of deprived cultural settings on various aspects of intellectual development including language development in children. It also examines whether deficiency in a deprived culture is due to lack of ability to encode the cues in the test stimuli. It has been concluded that efforts to add knowledge about the effects of social class and caste on mental ability would not have any tangible or socially useful educational outcome unless accompanied by simultaneously coordinated efforts to develop the curriculum, train teachers, modify the school organization, and improve methods.

Annamalal (1982) conducted a study on deprivation: its social roots and psychological consequences. The author discusses the present concept of language deprivation and questions the "apparent" linguistic deprivation among children belonging to the lower class. The article explores the reasons for problems faced by children from disadvantaged sections of society in school,
blaming the school for not taking into consideration the linguistic background of the child.

Abtoher study was designed by Sahu and Jena (1984) to investigate the effect of social disadvantage on the psycholinguistic abilities of children. The study aimed at identifying such psycholinguistic abilities of socially disadvantaged primary school learners by employing a 2x3 factorial design. Thirty pupils in each of the six resulting cells participated in the study. Three sub-tests of the Illinois Test of Psycholinguistic Abilities (ITPA) were used for collecting data. The results revealed that disadvantaged children, across the three grades as well as across all the three measures of psycholinguistic abilities, scores significantly lower than their advantaged counterparts.

Sahu and Devi (1982) conducted a nice study on the role of home environment in psycholinguistic abilities and intelligence of advantaged and disadvantaged preschool children. Each group consisted of 35 subjects. Quality and quantity of home stimulation was assessed by using Home Observation for Measurement of Environment (HOME) inventory. Psycholinguistic abilities were assessed by auditory reception, auditory association, and visual sequential memory tests of ITPA. Intelligence was assessed by Columbia Mental Maturity Scale (CMMS). Multiple correlation, taking ‘HOME’ variables as predictors, showed that they contribute significant variance to almost all the dependent measures, in case of both the groups of subjects. Step-wise regression showed that for advantaged group of subjects "stimulation through toys, games, and reading materials" contribute highest variance to the dependent measures. But
for the disadvantaged group of subjects, “physical environment” contributes highest to the dependent measures.

Another similar interesting study was designed by Mohanty and Sharma (1993) to find out the effect of social disadvantage and age on intellectual ability and working memory capacity of children. Socially advantaged and disadvantaged children were drawn from Grades II and V, with 25 children in each of the four resulting sub-groups. Raven’s Colored Progressive Matrices (RCPM) Non-Verbal Working Memory (NVWM) test and Verbal Working Memory (VWM) test were administered. Social dimension variances and grade variances were found to be significant for RCPM, NVWM, and VWM scores. The scores on both the measures of cognitive abilities (i.e., intelligence and working memory) showed favourable trends for socially advantaged subjects.

Another interesting study was designed by Mohanty and Sharma (1995) to investigate the impact of social disadvantage and working memory competence level on planning. The study involved a 2x2 factorial design having 20 children from Grade V of Oriya medium primary schools per cell. The factors were two levels of social dimension (social advantage and disadvantage), and two levels of working memory competence (less competent and competent), respectively. Analysis of results revealed superior performance of socially advantaged and working memory competent groups of subjects in visual search and matching number tests of planning compared to the performance of socially disadvantaged and working memory less competent groups of children. Moderate to high significant positive correlations were found between working memory and various components of visual search and number matching across
socially disadvantaged and advantaged, and working memory less competent and competent groups of children.

Das and Mohanty (1995) designed a study to investigate the role of home environmental variables in cognitive competence of urban, slum and tribal preschool children. The study consisted of 120 subjects within the age range of 3 to 6 years, 40 subjects in each group. Analysis of data revealed that the middle class urban homes were found to be superior to both slum and tribal homes; the slum homes were found to be better than the tribal homes. Moreover, the results showed that invariably the middle class urban preschool children out performed both the slum and the tribal preschool children in all the measures of cognitive competence (i.e., psycholinguistic abilities, intellective functioning, and memory). Moreover, the slum preschool children were found to be better performers compared to the tribal preschool children in all the measures of cognitive competence. Thus, the urban preschool children were cognitively most competent, and the tribal children were least competent among the three different sub-cultural groups studied.

Another interesting study was designed by Devi and Mohanty (1997) to investigate the effects of intervention training on the cognitive and psycholinguistic abilities of socially advantaged and disadvantaged preschool children. This study involved a 2x2x2 factorial design with repeated measures on the third factor. The first two factors (i.e., social dimension, and training groups) were between factors having 40 subjects, within the age range of 4 to 6 years, in each cell. The third factor was a within factor (i.e., test conditions). The cognitive abilities were assessed by Torrance Test of Creative Thinking (TTCT)-figural
forms, Columbia Mental Maturity Scale (CMMS), figure copying, and draw-a-child tests. The psycholinguistic abilities were measured by six subtests of Illinois Test of Psycholinguistic Abilities (ITPA), such as auditory reception, auditory association, auditory sequential memory, visual reception, visual association, and visual sequential memory. All these tests were administered to all four resultant groups of subjects prior to and 24 hours after the respective intervention training or no training. The results revealed that socially disadvantaged preschool children, irrespective of differential treatments and testing conditions, were inferior to their socially advantaged counterparts in the cognitive abilities and psycholinguistic abilities. Furthermore, intervention training, irrespective of social dimension and testing conditions, facilitated both the cognitive and psycholinguistic abilities of preschool children. It was also found that subjects showed better performances in all the measures studied in the post intervention testing condition compared to their performances in the pre-intervention testing condition.

Another interesting study was designed by Mohanty (1998) to find out the effects of social disadvantage and age on the intelligence and working memory capacity of children. Socially advantaged and disadvantaged subjects were drawn randomly from Grades II and V, with 25 children in each of the four resulting subgroups. Social dimension and grade/age contributed significant variances to Raven's coloured progressive matrices and to nonverbal and verbal tests of working memory. Results showed favourable trends for socially advantaged subjects, and were interpreted as generally supporting cumulative deficit hypothesis. The RCPM yielded high positive correlation with nonverbal
rather than verbal measures of working memory which was found to be dependent on the age-related differences in storage and processing of information.

Mohanty and Dash (1997) conducted a study to investigate the effects of Socio-Economic Status (SES) and age on the working memory and spelling competence of children. The low SES and high SES subjects were drawn randomly from Grade II (lower age) and Grade V (higher age), with 20 children in each of the four resulting subgroups. Both SES and age levels contributed significant variances to the language-based and non-language measures of working memory, and also to the test of spelling competence. Results showed favourable trends for high SES and higher age children, and were interpreted as generally supporting the cumulative deficit hypothesis. The three measures used yielded high positive inter-correlations among themselves. Both working memory capacities and spelling competence were found to be dependent on the age-related differences in storage and processing of information.

Kumkar and Raju (1999) present their views on how to foster the reading habit among young children. The value of books even in this electronic age is immense. Books are not just simple repositories of information; they can influence a child's outlook on life from a very tender age. Hence, the importance of encouraging the child to read. Parents, teachers, and librarians have an important role to play in encouraging children to read and in creating an interest in reading. In this context, the role of libraries has been discussed in detail.
In an article Ediger (2001) describes the ways in which a teacher can help pupils in ongoing lessons and units in science. Teacher’s assistance is needed in subject matter comprehension and creative use of information. It is important that prior to the teaching of the subject matter pupils should be diagnosed for their reading ability. They should also be familiarized with the new vocabulary by relating it to the background information of the readers as well as through illustrations in the science text. Pupils may require help in associating individual graphemes with related phonemes for word recognition. Contextual cues, configuration cues, structural analysis and picture clue use can aid in reading the printed text as well as in comprehending the subject matter. Referring to Library books and using the latest technology can assist pupils in reading and comprehending new concepts. Peer reading approaches, pupil interaction, conferences, etc., are some of the methods used for ensuring the quality of comprehension of major facts, concepts, and generalizations. Since reading is the main method of learning the subject matter of science, it is the responsibility of the teacher to attend to the individual needs and interests of the pupils for effective reading and understanding of the subject matter.

Bhakta, Hackett, and Hackett (2002) conducted a study to find out the prevalence and association of reading difficulties in a population of South Indian Children. As part of an epidemiological study of neuropsychiatric disorders, a random sample of 1192 children (age 8-12 years) residing in Calicut district was administered the Malayalam Graded Reading Test. The prevalence of reading difficulty was 8.2 per cent and it was associated with younger age, poverty, male sex, less educated parents, psychiatric disturbances, school failure, poor school
attendance, poor physical health, poor motor coordination and impaired vocabulary and visuospatial reasoning. The findings supported a multi-factorial causal model of reading difficulties in this children population.

Thus, the above findings indicated that social disadvantages, socio-cultural deprivation, or low socio-economic status have adverse effects on the reading abilities of children. This might be due to the poor intelligence, poor memory capacity, and poor perceptual abilities of the socially disadvantaged children.
STATEMENT OF THE PROBLEM

The preceding review of literature shows that reading processes, both oral reading and reading comprehension, are affected by various factors; important among them are: lateral asymmetry and developmental lag, brain injury and brain dysfunction, cognitive development, phonological processing, linguistic processes, memory processes, social disadvantage, etc. Recent researches point out that with children of average intelligence, linguistic abilities, as manifested in terms semantic, syntactic and phonological access and use, play important role in determining acquisition of reading skill and its subsequent development. Besides, it has also been pointed out that memory processes, particularly short-term memory (STM) and working memory (WM) capacities play significant roles in determining reading processes.

Almost all the studies, barring a few, reviewed have been done in the context of English orthography, which is an alphabetic type of non-phonetic orthography. Orthographic variations might bear implications for reading skill acquisition and its development (Stevenson, Stigler, Lucker, Hsu, & Kitamura, 1982). Hence, studies in other types of orthographies are needed to establish pan-orthographic universalities and orthography-specificities in reading processes.

Orthographies can be broadly divided into three categories, i.e., logographic, syllabic, and alphabetic (Taylor, 1981; Varshney, 1985) forms on the basis of pronounce-ability and meaningfulness of individual characters. A logographic or ideographic writing system is one in which the units of writing
stand for a word or a morpheme, i.e., for a meaningful unit. A syllable system is one in which the units stand for syllables and are independently pronounceable. The alphabetic system refers to one in which the units of writing represents phonemes of the language. Normally, these alphabets are not pronounceable as such. Chinese is an example of the logographic system; Japanese is an example of the syllabic, and English is an example of the alphabetic writing system.

Moreover, writing systems can be divided into phonetic or non-phonetic categories on the basis of their non-variance or variance in their grapheme-to-phoneme conversion system (Wagner & Torgesen, 1987). A phonetic orthography has invariant mode of grapheme-to-phoneme conversion. Phonetic mapping of each character remains the same irrespective of the word context in which it appears. When the grapheme-to-phoneme conversion varies depending upon the word context in which the letter appears, as in case of English orthography, the system is called as a non-phonetic system. In such cases characters do not have singular phonetic mapping, but are dependent on the word context.

Thus, viewing from these angles writing systems could be logographic, syllabic, or alphabetic, and at the same time phonetic or non-phonetic in nature.

Oriya Language and orthography: its Unique Features

The Government of India officially recognizes 18 different languages, which are: Assamese, Bengali, Gujrati, Hindi, Kannad, Kashmiri, Konkani, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Sanskrit, Sindhi, Tamil, Telgu, and Urdu. Hindi is used as the National official language whereas English
continues to be the subsidiary official language. These 18 different languages can, in fact, be grouped into four major linguistic families: Indo-Aryan, Dravidian, Austro-Asiatic, and Tibeto-Chinese (Oomen, 1973). Pattanayak (1985) views Oriya as a member of Eastern sub-branch of Indo-Aryan branch of Indo-European language family languages belonging to a particular linguistic group bear a great deal of similarity to each other.

Assamese, Bengali, Gujrati, Hindi, and Oriya belong to the group of Indo-Aryan languages. They are basically different regional deviations of one basic language, i.e., Sanskrit. Though these five different languages have different scripts, they share a good deal of commonality among themselves. Pattanayak (1969) views that all scripts current in India today, except Roman and Perso-Arabic, are diverse styles of one single system of writing. It is “Brahmi” which is the mother of all the scripts used by Indian languages.

Oriya is the officially recognized language of the State of Orissa. It has two major local dialects; Sambalpuri Oriya and Cuttaki Oriya, spoken by Western and Eastern people of Orissa, respectively. The tribal people of Orissa speak many tribal languages, which include Kondh, Kui, Kolha, and many other languages. Inspite of these differences, children are taught to read and write in standard Oriya language, which happens to be the media and book language. This standard language is used in textbooks, newspapers, magazines, and also in electronic media.

The Oriya orthography in use at present has 47 letters, out of these 12 are vowels and 35 are consonants. The typical way of writing Oriya consists of
making two different circles, a smaller one, and a bigger one on the top of it. Distinguishing features are made in other or both of these circles, and make up letters. Apart from 47 letters in Oriya writing system vowels can be symbolically added to different consonants. When vowels are symbolically appended to a consonant, it is called a \textit{Matra}. Addition of a \textit{Matra} slightly changes the phonic sound of the consonant. These \textit{Matras} in combination with different consonants provide for a wide variety of spelling possibilities, which, in turn, provides a very wide scope for meaning differences of different words.

Moreover, some consonants represented in the form of symbols could also be appended to other consonants. When a constant symbol is used along with another consonant, it is called a \textit{Phala}. Addition of a \textit{Phala} to a consonant goes to make a compound consonant or a conjunct character. \textit{Matras} and \textit{Phalas} are appended to consonants in the form of super-scripts, side-scripts, or sub-scripts. Super-scripts are put on the top of the letter; side scripts are put either in the left or right side of the letter, and sub-scripts are put below the letter. However, addition of a \textit{Matra} or \textit{Phala} changes the phonemic representation of the concerned letter.

In addition, Oriya orthography provides for combinations of different consonants, which are called \textit{Yuktakshyars} (Praharaj, 1936, Padhi, 1971). These \textit{Yuktakshyars} can be viewed as cluster graphemes.

Apart from \textit{Matras}, \textit{Phalas}, and \textit{Yuktakshyars}, there are a few characters in Oriya orthography involving doubling of a single consonant. Such a character is written by putting the original consonant first and by making a
symbolic representation of the same consonant below it. Such doubled characters retain the original phonic representation of the consonant but with a greater emphasis on it.

These "Matras", "Phalas", "Yuktakshyars", and doublings making conjunct consonants or cluster graphemes make writing in Oriya orthography difficult, and its reading complicated, though they contribute to the richness of the writing system and also to that of the language. Linguistic nuances and shades of expressions in literature and other forms of creative writings make use of this facet of the writing system. Richness of Oriya literature owes a lot to these subtleties in its writing.

Oriya writing system can be viewed to be alphabetic in nature because each Oriya letter, like in any alphabetic writing system, stands for a phoneme. It is syllabic in nature because each Oriya letter is pronounceable by itself. It is phonetic in nature because the phonetic conversion of each letter remains the same irrespective of its usage. Thus, Oriya orthography can be viewed to be an alphabetic-syllabic type of phonetic orthography.

**Comparison of Oriya Orthography with English Orthography**

English and Oriya writing systems are both alphabetic in nature and follow a left to right directionality in writing and reading.

English writing system being an alphabetic type of writing system each alphabet stands for a phoneme. The writing system consists of five vowels and twenty-one consonants. But, unlike Oriya writing system, alphabets are not
pronounceable by themselves. Though each letter has a name, the name is not the invariable phonic sound of the given letter. Combinations of alphabets make pronounceable units or syllables. Words in English Orthography vary in regard to spelling-to-sound mapping. Some words (e.g., 'cat') have a simple pattern where each phoneme is represented by a single letter; in other cases more complex but nevertheless rule-governed relationships apply (e.g., 'pine') where the terminal vowel lengthens in the middle word; in yet other cases the relationship between spelling and sound is quite obscure (e.g., 'yacht') (Snowling, 1991). Thus, grapheme-phoneme correspondence is not invariant in English orthography. Each alphabet has a name but its phonemic representation depends upon the word context in which it appears. Hence, unlike in Oriya writing system, English does not have a built-in phonetics nor is the grapheme-phoneme correspondence invariant.

Implications for Reading Strategy

So far as oral reading is concerned, English being an alphabetic non-phonetic type of orthography would possibly demand a wholistic view of the word before it is phonetically mapped. This is necessary since letters do not have invariant sound representations rather their pronunciations are dependent upon the word context in which they appear, and on the orthographic rules of the writing system. Thus, phonemic conversion of individual letters would not render a correct oral reading of the whole word.

On the other hand, Oriya orthography being an alphabetic-syllabic type of phonetic orthography has almost invariant sound representations of letters.
Thus, phonemic conversion of individual letters contained in a word may lead to a correct oral reading of the whole word. Hence, a wholistic view of the word may not be necessary for a correct reading.

These differences in reading strategies can have implications for the short-term memory capacity demand and working memory capacity demand for successful oral reading of isolated words in these two orthographies. English orthography might be demanding greater capacities than the Oriya orthography. And, Oriya orthography, on the other hand, might be producing a larger number of word-callees (i.e., readers who just give the phonemic representation of words without understanding them) than English orthography. But, so far as reading comprehension is concerned such differences between English and Oriya orthographies may not be observed. Because comprehension would demand retention of all the bits of information over a time span till the responses are given. Such a process would demand equal working memory capacities across both the orthographies. The present study was done in the context of Oriya orthography.

Objectives

Barring the few studies mentioned in the review of literature section, the nature of the relationship among reading proficiency cognitive factors and social disadvantage is yet to be determined. It can be argued that oral reading may require a different set of skills compared to comprehension. It is important because it is possible that in Indian orthographic system, particularly in Oriya orthography, many children in early period learn to read orally, i.e., decode the
direct correspondence between the alphabets and the corresponding sounds but may not comprehend what is written. Reading is also taught as a simple decoding skill. Therefore, the primary objective of the study under report would be to find out the cognitive contributors to reading proficiency of socially advantaged and disadvantaged children across two grade levels. The present study has been designed to achieve the following specific objectives:

1. To investigate whether socially disadvantaged children, irrespective of their Grade, would be inferior to their socially advantaged counterparts in their cognitive abilities (i.e., non-verbal intelligence, verbal and non-verbal working memory, short-term and long-term memory).

2. To investigate whether socially disadvantaged children, regardless of their Grade, would have poor reading proficiency compared to their socially advantaged counterparts.

3. To examine whether there would be developmental changes in the cognitive abilities and reading proficiency of children, irrespective of their social dimension, from Grade II to Grade V.

4. To find out the inter-correlations among the variables measuring the cognitive abilities of Grade II and Grade V children, regardless of their social dimension.
5. To find out the inter-correlations among the variables measuring the cognitive abilities of social advantaged and disadvantaged children regardless of their Grade level.

6. To find out the multiple correlations among the variables measuring the cognitive abilities as the independent measures and the reading proficiency scores as the criterion measure for Grade II and Grade V children, irrespective of their social dimension.

7. To find out the multiple correlations among the cognitive abilities as the independent variables and the reading scores as the criterion variable for the socially advantaged and disadvantaged children, regardless of their Grade level.

8. To investigate into the relative contributions of cognitive factors to the reading proficiency of Grade II and Grade V children, irrespective of their social dimension.

9. To investigate into the relative contributions of cognitive variables to the reading proficiency of socially advantaged and disadvantaged children, irrespective of their Grade level.

10. To examine whether the relative contributions of the cognitive factors to the reading proficiency of Oriya medium primary school children would remain unchanged irrespective of their Grade level and social dimension.
Hypotheses

In view of the conflicting and contradictory findings, as mentioned in the review of literature, it is difficult to formulate any definite hypothesis. However, basing on earlier researches regarding the effects of Grade levels and social dimensions on the cognitive abilities and reading proficiency of children, the following hypotheses would be formulated, keeping in view the above objectives and design of the present study.

1. The socially disadvantaged primary school children, irrespective of their Grade, would be inferior to their socially advantaged counter-parts in their cognitive abilities (i.e., nonverbal intelligence, verbal and nonverbal working memory, short-term and long-term memory).

2. The socially disadvantaged primary school children, regardless of their Grade, would have poor reading proficiency compared to their socially advantaged counterparts.

3. There would be some developmental changes in the cognitive abilities and reading proficiency of children from Grade II to Grade V, irrespective of their social dimension.

4. The variables measuring the cognitive abilities of Grade II and Grade V children, irrespective of their social dimension, would show significant inter-correlations among themselves.
5. The variables measuring the cognitive abilities of socially advantaged and disadvantaged children, regardless of their Grade level, would show significant inter-correlations among themselves.

6. There would be significant multiple correlations among the cognitive measures and reading measure for Grade II and Grade V children, irrespective of their social dimension.

7. There would be significant multiple correlations among the cognitive variables and reading variable for socially advantaged and disadvantaged children, regardless of their Grade level.

8. There would be a differential contribution of cognitive measures to the reading proficiency of Grade II and Grade V children, irrespective of their social dimension.

9. There would be a differential contribution of cognitive factors to the reading proficiency of socially advantaged and disadvantaged children, regardless of their Grade level.

10. The relative contributions of the cognitive factors to the reading proficiency of primary school children would not remain unchanged regardless of their Grade level and social dimension.