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Cognitive Training and Reading Remediation

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Abstract

Reading difficulties are experienced by children either because they fail to decode the words and thus are unable to comprehend the text or simply fail to comprehend the text even if they are able to decode the words and read them out. Failure in word decoding results from a failure in phonological coding of written information, whereas, reading comprehension difficulties emerge out of difficulties in focusing on relevant information, perceiving the interrelationship among obtained information, strategic thinking, lack of vocabulary knowledge, inability to make inferences and lack of reflective knowledge of language while reading. Within the framework PASS model of intelligence, word reading has been found to be depending on successive processing, particularly at earlier grades, while reading comprehension depends primarily on simultaneous processing at any level. Planning and attention, on the other hand, are found to be essential at all levels of reading. The PASS Reading Enhancment Programme (PREP) and Cognitive Enhancement Training (COGENT) which are based on the PASS theory of intelligence, help remediate the word decoding and reading comprehension skills of children by improving the underlying cognitive processes using inductive method and discovery learning and have been proved to be more effective than the programmes based on direct instruction method. School psychologists and teachers, may take this as a challenge and help improve the reading skills of poor readers.

Key words: Word decoding, reading comprehension, PASS theory, cognitive training, PREP, COGENT

1. Introduction

Learning to read constitutes an intellectual advance of great significance that is valued in most societies. It speaks about the most intricate workings of the human mind and the most remarkable achievement that human civilization has ever shown in all its history.

In psychological terms, reading has been defined as "a process by which the child can on the run extract a sequence of cues from printed texts and relate these, one to another, so that he/she understands the precise message of the text. The child continues to gain in this skill, throughout his entire education, interpreting statements of ever-increasing complexity" (clay, 1972). In simple terms reading is the skill that helps the reader to transform the visual graphic information into meaningful units of thought.

2. Reading and Reading Disabilities

The process of reading starts with the visual perception and analysis of a grapheme, passes on to the recoding of graphemes into the corresponding phonetic structure, and ends with the comprehension of the meaning of what has been written. Proficiency in reading, thus, demands mastery over two different skills: 1) word reading, i.e., decoding and 2) comprehension, i.e. understanding the words and the sentences in the context. Accumulating evidences from different sources suggest that a reader must be phonologically mature, so that the morphophonemic representations of words in his personal lexicon match the transcriptions of the orthography. This in addition to the knowledge of syntactic and semantic structure of the written language helps the reader to understand the meaning of the text. But in learning to read what is more important is the linguistic awareness, also known as metalinguistic awareness of the reader, a skill which involves conceptual reasoning and enables the reader to treat language objectively and manipulate language structures deliberately and to use the information from the available sources flexibly during reading. The effect of linguistic awareness which depends upon one's cognitive maturity and operates over and above the influences of oral language as well as the reading ability, determines one's level of success in reading. Reading, therefore, is the biggest challenge that children face as they begin to go to school. With proper instruction, of course, most children learn to read easily. But

inspite of good instruction and in the absence of any form of physical, mental, sensory handicap, cultural disadvantage or even lack of motivation many children also "fail to read" and academically fall behind their competent counterparts constituting the so called group of "disabled readers" who very often are referred to as "poor readers" also.

Among the poor readers, two types are recognized: (i) Garden variety and (ii) Dyslexics. Garden variety poor readers show cognitive processing problems in many areas like putting things in sequence, seeing the relationship among words, objects or pictures, attending to the required information at hand. On the contrary, dyslexics show specific deficiencies in only a limited number of cognitive processes. The most important deficit concerns the ability to sequence, to put sounds and words in order that gives rise to the difficulty in converting written material to speech and spoken words to writing in these children which are the essential characteristics of dyslexia. Children who experience difficulty in identifying the words as in case of dyslexics, are quite likely to fail to comprehend the written text, even if their listening comprehension is intact. On the other hand, there are children as found among the garden variety poor readers, who face problems in comprehending the written text while their word reading skill is quite normal.

Basic to word decoding is the phonological awareness or phonological coding which is the ability to translate letters and patterns of letters into phonological forms. This is the ability to understand the grapheme-phoneme correspondence rule, i.e., the ability to pronounce phonemes that are written down. But phonological coding itself is dependent on some other basic skills of reading, such as, 'naming speed' or 'rapid automatic naming' (RAN), letter knowledge and phonological memory. Naming speed is the ability to recognize the letter. There is great deal of evidence that children with slow naming speed are poor readers (e.g, Kirby, Parrila, & Pfeiffer, 2003). Phonological memory, on the other hand, helps one to remember sequence of sounds in order and later recognize them. This is required for learning new words and remembering the words of sequence so that the sentences can be understood. A reasonable level of phonological awareness skill is required for learning to read and it continues to influence the development of reading skills in children during the elementary school years. Dyslexia has been found to result from a specific deficit in phonological coding (Adams, 1990; Stanovich, 1988; Torgeser, et al., 1994; Velution & Scanlon, 1987).

The ultimate purpose of reading is comprehension that includes learning and appreciation. Reutzel & Cooter (2007) defines reading comprehension as "the construction of the meaning of a written text through a reciprocal interchange of ideas between the reader and the message in a particular text". Thus, while word reading involves single words, comprehension involves a sentence or paragraph or even an entire discourse. In comprehending the text the reader breaks it down into meaningful sections, such as phrases, clauses, and sentences, analyse the sequence of words in each one of them to extract their meaning and finally relate the meaning of each successive phrase to the meaning of the preceding one so as to grasp the overall meaning of the content. This kind of syntactic analysis which is called 'parsing' is further facilitated by the knowledge of word class, punctuation, word meaning and affixes. All these, along with the word knowledge (i.e., an aggregation of the knowledge of self, personal history, the readers learning and culture and his/her inferences and reflections) help the reader to comprehend the text. Normally children learn to read and comprehend the text with minimum instruction. Skilled readers do it quickly, automatically and with little conscious effort or thought unless the passage is very complicated. But there is no derth of evidence that many children inspite of their good vocabulary, and adequate general mental ability show weakness either in reading comprehension only or both in reading and listening comprehension (Oak hill & Yuill, 1996).

What emerges out of these discussions is that reading and reading disabilities are the functions of linguistic competence of the reader that in turn is the function of his/her cognitive development. Hence, following a shift away from the study of cognitive abilities towards examining the cognitive processes, i.e., how cognitive functioning gives rise to behaviour, attempts have been made to explain reading behaviour in terms of proficiency in specific cognitive processes, namely, planning, attention, simultaneous and successes (PASS) processes that constitute the core components of the PASS model of intelligence and underlie all intellectual activities in human beings (Das, Kirby & Jarman, 1975, 1979; Pellegrino & Glaser, 1979; Naglieri & Das, 1990).

3. Reading, Reading Disabilities and PASS Theory of Intelligence

Deriving impetus from the clinical observation of Luria (1966, 1970, 1973) and receiving empirical support within the British factor-analytic tradition, the PASS model gives one of the most comprehensive account of human cognitive functioning in terms of three systems and four processes. The first system is the planning system, which involves executive functions (EFs) responsible for controlling and organizing, searching, goal-setting, selecting, constructing and executing plans or strategies, monitoring performance, evaluating the course of action and decision making. It is a higher order cognitive process, a synthesizer of all intellectual operations and therefore, the essence of human intelligence (Das, 1984), The second system is the attention system, which is responsible for maintaining arousal levels and alertness and ensuring focus on relevant stimuli to the exclusion of irrelevant ones. The third system is the information processing system which employs

simultaneous and successive processing to encode, transform and retain information. Simultaneous processing is engaged when the relationship between items and their integration into whole units of information is required. It assumes a predominant role in relational thinking, solving arithametic problems and in understanding comparative and logico-grammatical relationships (e.g., taller than, father's brother from brother's father). Successive processing, on the other hand, is required for organizing separate items in a sequence. It plays an important role in serial reproduction, spelling, perception of syntax, in human speech and also at the initial phase of reading and writing. The two modes of information processing are available to the individual, but selection of either or both the modes depends on his preferred mode of information processing, task demands and the interaction between the preferred mode and the task characteristics. Even the two modes of information processing can be invoked by a single task. For example, processing a series like 5-P-2-N-9-D exactly in the same sequence involves successive processing, but processing the numbers (529) and letters (PND) separately in two different categories of items would involve simultaneous processing.

The four processes can also occur at three levels, i.e., perceptual, memory and conceptual varying from one another in terms of abstraction they involve and thus, maintain a hierarchy with perception at the bottom, conceptualization at the top and memory in between.

The four processes are carried out in three different blocks, or areas of the brain. Thus, attention is located in Block 1 that involves brainstem, the diencephalon and the medical regions of the brain. Coding is the function of Block 2 that includes parietal, occipital and temporal lobes,whereas, planning is carried out in Block 3 that entails the frontal, especially the pre-frontal areas of the cortex.

Researches carried out within the framework of PASS model have established that planning, attention, simultaneous and successive processes are importantly involved in reading. Attention being the basic prerequisite of all intellectual functions helps the reader to focus on relevant information to the exclusion of irrelevant ones and makes way for efficient coding of information that may be either simultaneous or successive or both. In fact, a cyclical hierarchy of involvement of both simultaneous and successive processes is seen in the entire process of reading. But since phonological processing is importantly involved in word decoding, successive processing plays an important role in reading, particularly in the early stage. Simultaneous processing which helps in deeper level of semantic analysis of the information, seeing the interrelationship among separate bits of information and integrating them into larger units of information, on the other hand, plays an important role in comprehension at any stage of reading. Mastery over the two skills of reading, ultimately, makes way for emergence of appropriate reading strategies in which planning plays a critical role. Studies further reveal that a weakness in simultaneous processing in children is linked with comprehension difficulties, whereas, word decoding difficulties are associated with a successive processing weakness in beginning readers. Planning and attention, on the other hand are necessary at all levels of reading and their importance increases as a function of complexity of the reading tasks (Das, Naglieri, & Kirby, 1994 ; Das, Parrila and Papadopoulos, 2000 ; Kirby et al.,1996; Mahapatra, 1989, 1990, 2015a, 2015b ; Mahapatra & Dash 1999). The PASS processes, however, operate on a knowledge base that includes one's past experiences involving his/her learning, emotions and motivations and the performance (behaviour) emerges out of it (Das et al , 1994).

The PASS processes can be assessed with the help of a test battery known as Das-Naglieri Cognitive Assessment System (Naglieri & Das, 1997) These tests have been used for the understanding, assessment and intervention in regard to educational problems of children like reading disability, attention deficit and mental retardation. These tests are also used in studying cognitive changes in ageing and decision making in management (Das, Kar, & Parrila, 1996; Das & Misra, 2015) CAS is a highly reliable and valid measure of intelligence (Naglieri & Das, 1997; Johnson, et al., 2003).

4. Reading Remediation through Direct Rule Learning

Keeping in view the reading problems of disabled readers attempts have been made to remediate the same through the development of some training programmes. For example, attempts were made to teach phonological skills, particularly to the beginning readers since phonological coding is basic to word reading (Byrne & Fielding-Barnsley, 1993; Lundberg et al., 1988; Oloffson & Lundberg, 1983). The attempts were successful. But, considering the results of these studies it was concluded that intensive and sustained phonological awareness training by itself provides at best, limited, improvement, in subsequent reading (Wagner et al. 1993). Moreover, variables such as, length of the programme, group size and timing of treatment programme have been suggested as factors that endanger the outcome of phonological training (Byrne & Fielding-Barnsley, 1991; Share & Stanovitch,1995; Wagner, Torgesen & Rashotte,1994). Above all, there is no scope to learn appropriate reading strategies in all those direct rule learning methods, including the programmes like Reading Mastery (Engelmann & Bruner, 1995), PHAST (Lovett et al., 2000) or RAVE – O (Wolf, Miller & Donnelly, 2000).

Remediating reading comprehension difficulties by developing certain tasks, on the other hand, was more difficult. Unlike word reading, reading comprehension remediation involves teaching of specific strategies

for the same. Of the most useful strategies for improving reading comprehension are : 1) connecting, 2) constructing knowledge structure, 3) questioning, 4) noticing the important parts, and determining what is most important, 5) summarizing the available information, 6) making inference, 7) predicting, 8) challenging the text, 9) challenging one's own knowledge, 10) monitoring (noticing when one does not understand), 11) determining what one needs to know. 12) think- alouds.

In one of the study by Thea Leddy, Direct Instruction as well as some comprehension improvement strategies like a) think – alouds, b) questioning the test, c) using the prior knowledge, d) using graphic and semantic organizers were used to teach comprehension skills to children. It was found that although several of the strategies were time consuming, they helped the students to improve their comprehension skill. The researcher also showed the usefulness of the strategies not only for remedial students, but also for all the students in the class. Yet, the sample in the study included only the elementary students with a small size.

Similarly, programmes from "Essential skills Software" have been used to foster the development of reading skills. The programmes involve different modules to foster the development of phonological awareness, letter knowledge, word attach skill, word structuring and spelling, sentence structuring and grammar and comprehension providing opportunity for extensive practice. All the programmes are well-designed to facilitate the development of reading skills which appear to be helpful to those children who are most at risk for reading failure. Yet, it may be said that essential skills programmes are based on a skill-oriented conception of reading which holistically inclined, teachers may object. Moreover, most of the tasks in the comprehension module address relatively basic aspects of reading comprehension like responding to multiple choice questions after reading a passage, unscrambling words, word matching and word shape, but not the higher level aspects, like summarizing, questioning or even constructing the main ideas and thus seem to have limited relevance to comprehension.

5. Cognitive Training in Reading Remediation

Taking into consideration the limitations of the above mentioned remedial programmes, researchers felt the necessity of cognitive-based training programmes. This is known as cognitive education as it involves the application of cognitive theory and methods of education in remediating reading difficulties in children. (Ashman & Conway, 1997). It is argued that unless cognitive processes underlying reading are the focus of remediation, remediation will not be successful in promoting transfer to broader aspects of reading (Das et al., 1994). Hence, some such attempts have been made through the development of two programmes called PREP and COGENT which are based on PASS theory of cognitive functioning. (Das, 1999 ; Das, 2004). Both the programmes use an inductive method and encourage discovery learning rather than direct instruction. The two programmes have been discussed below.

5.1 *PASS Reading Enhancement Programme (PREP)*

PASS Reading Enhancement Programme (PREP) which is based on the PASS theory of intelligence is used for poor readers in Grade 2 - 5. It consists of ten tasks that vary considerably both in content and in what they require from the child. All tasks involve a global training component and an additional curriculum related bridging component. The global component consists of structured non – reading tasks that require the application of simultaneous or successive strategies. These tasks also provide children with the opportunity to internalize strategies in their own ways, thus, facilitating transfer. The bridging component involves the same cognitive demands as its global component and provides training in simultaneous and successive processing strategies that are linked to reading and spelling (Das et al., 1994).

PREP aims at promoting the use of cognitive strategies, i.e., simultaneous and successive as well as planning and directing the participant's attention selectively to information available (Das, Georgioce & Jhonson, 2008; Naglieri & Rojahn, 2004). PREP remediation is structured in such a way as to promote inductive inferencing and internalization of principles and strategies rather than deductive rule learning (Das, Mishra, & pool, 1995). Such a procedure encourages "ownership" of the strategies that the individuals can apply, thereby ensuring transfers to broader aspects of reading. Moreover, "verbalization" is used in the process of training which helps the learner to recognize and identify the existence of the different facets of a problem and thus, facilitates discovery learning. In contrast to direct instruction programmes, such as, Reading Mastery (Engelmann & Bruner, 1995),PHAST (Lovett et al.,2000) or Rave-O (Wolf, Miler, & Donnelly, 2000), PREP avoids explicit teaching of specific reading skills. But ultimately the skills of reading develop along with the underlying cognitive processes. Several studies in India and abroad have proved the efficacy of PREP by bringing improvement in word identification, pseudoword decoding and reading comprehension following its use in English (Das, Mishra & Kirby, 1994; Mahapatra, Das, Stack-Cutler & Parrila, 2010; Papadopouls et al.,

2003), in Greek (Papadopoulos, Charalambous, Kanari & Loizou, 2000) and in Spanish (Molina, Garrido, & Das, 1997).

5.2 *Cognitive Enhancement Training (COGENT)*

The other programme, Cognitive Enhancement Training (COGENT) is a cognitive and reading stimulation programme. Based on broad developmental theories and the PASS theory of intelligence, the programme has been found to be extremely important to cognitive and language development of children. COGENT is intended for children aged four to seven who need to be prepared for reading, but is also used for older children who have not acquired the prerequisite skills for reading. COGENT prepares children for receiving PREP in case they still require reading intervention.

COGENT provides training in basic cognitive skills through five different modules and facilitates the cognitive development of both normal children and children with special needs such as those with limited exposure to literacy, mild developmental delay, language impairment and children at risk for developing dyslexia and other learning difficulties. The tasks of the different modules aim at improving the phonemic awareness, rhyme discrimination, sound blending, naming speed, working memory, language processing, vocabulary building, inferencing, comprehending as well as the PASS processes. Studies in western set-up as well as in India have proved the efficiency of COGENT (Das et al., 2006; Hayward et al., 2007).

Both PREP and COGENT go deep into the foundations of literacy. Interactions with parents, grandparents, teachers and educational therapists become effective by developing self-awareness, that might be missing in home literacy or in community or even in school learning. It proves, what Vygotsky (1962) means by saying that learning occurs in collaboration with others and the source of self-awareness and control first arises externally through social interaction and then, is internalized Moreover, with the development of self-awareness the learners who are frustrated by the difficulties they experience with reading are quite likely to be relieved of the anxiety and fear of punishment. Thus, where instruction does not work, remediation like PREP and COGENT do work because the children are engaged in these programmes as active and reflective learners.

6. Conclusion

It is felt that, children with intellectual handicap of one kind or another actually face dual handicaps. The first one is that of intellectual deficiency that prevents them from learning, and the second one is that of negative reaction from society to their handicapping condition (Das, 1995). From this point of view, reading disability imposes incalculable social and economic consequences upon the individual as well as the society. Parents and teachers, are, therefore, required to be conscious about this hidden handicap of their children if they fail to attain academic success. And Professor PREP and Professor COGENT are always there to help these children.

Amelioration of reading difficulties in children, is, considered imperative because it makes way for acquisition of academic skills. And acquisition of academic skills is barely essential if ‘success’ depends upon one’s way through school.

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