

A REVIEW ON COGNITIVE RETRAINING TECHNIQUES IN CHILDREN WITH SCHOLASTIC SKILL DISABILITY

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ABSTRACT

In a rapidly changing world, the education system in India is re-shaping and refreshing itself day by day. The most sensitive part of curriculum change is change in the Assessment and Evaluation system. Poor scholastic performance is a problem among many school children in India. Combination of Manualized Cognitive Retraining Techniques and Remedial Training can benefit individuals with Specific Learning Disability and give best results in improving scholastic performance.

INTRODUCTION

Academic achievement assumes primary importance in the context of an education system aimed at progressive scholastic development of the child and human resources development at the macro level. The scientific rearing and education of a child is monitored on the basis of his academic achievement. The importance of academic achievement in one's life cannot be over emphasized [1]. The scores in the examination decide about the level of intelligence whereas the education is linked to the life chances, income and well being. Academic skills such as reading, writing and arithmetic/numeric are important to a child's success in academics and life. However, learning these skills is difficult for many children and experience significant delays in one or more academic areas. These difficulties of children seriously affect their academic and personal performance along with achievement. Scholastic

backwardness is being increasingly recognized as one of the important problems in children which is of concern to both parents and teachers alike [2].

Learning Disability

Learning disability is the largest disability among school going children. There is a severe discrepancy between ability and actual achievement. The characteristics of learning disabled children vary widely. Children with Learning Disabilities (LD) are those who, despite adequate ability, have great difficulties areas of academic achievement. These difficulties are characterized by problems in language, attention, perception, memory, auditory perception, language, visual perception, fine and gross motor coordination [3].

Specific learning disability (SLD) is a group of neuro developmental disorders manifesting as persistent difficulties in learning to read efficiently, write or perform mathematical calculations, despite having normal intelligence with conventional schooling, intact hearing and vision, adequate motivation and socio cultural

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opportunity [4, 5].

Characteristics of children with learning disabilities (II)

Most children with learning disabilities have (III) problems with two or more in academic achievement, cognitive functions such as; attention, memory, orientation, auditory perception, language and visual perception, fine motor coordination and gross motor coordination. Very few children with learning disabilities have problems in all of the above areas occasionally [6]. Children with poor scholastic performance become source of immense stress for parents and teachers which in turn, reduce the self – confidence of children. These children are at risk of developing stress related disorders and behaviour disorders. There are several causes for scholastic backwardness, which include specific developmental disorders of scholastic skills (SDDSS), below average (IV) intelligence, attention deficit hyperactivity disorder, (V) chronic illnesses, emotional disorders as well as problems in school and home environment [7, 8].

Specific Learning Disabilities (SpLD)

Specific Learning disability or Scholastic Skill disability is a generic term that refers to a heterogenous group of neurobehavioral disorders manifested by significant unexpected, specific and persistent difficulties in the acquisition and use of efficient reading (dyslexia), writing (dysgraphia) or mathematical (dyscalculia) abilities despite conventional instruction, intact senses, average intelligence, adequate motivation and socio-cultural opportunity [9].

The common types of Scholastic Skill Disability

(I) Learning disabilities in Reading (Dyslexia)

Dyslexia afflicts 80% of all children identified with SpLD [10]. Children with dyslexia have deficits in “Phonologic awareness” which consistently distinguish them from those who are reading impaired [11]. The children with specific reading disorder have significant impairment in the development of reading skills. Their performance in the reading will be below the level expected on the basis of age, general intelligence and school placement. They also experience significant impairment in the acquisition of reading in terms of accuracy and fluency [12].

There are two types of learning disabilities in reading

- Basic reading problems occur when there is difficulty in understanding the relationship between sounds, letters and words.
- Reading comprehension problems occur when there is an inability to grasp the meaning of words, phrases and paragraphs.

Signs of reading difficulty include problems with:

- Letter and word recognition
- Understanding word and ideas

- Reading speed and fluency
- General vocabulary skills

Learning disabilities in Writing (Dysgraphia)

Learning disabilities in writing can involve the physical act of writing or the mental activity of comprehending and synthesizing information. Basic writing disorder refers to physical difficulty forming words and letters. Expressive writing disability indicates a struggle to organize thoughts on paper.

Symptoms of a written language learning disability revolve around the act of writing. They include problems with:

- Neatness and consistency of writing
- Accurately copying letters and words
- Spelling consistency
- Writing organization and coherence

Learning disabilities in Maths (Dyscalculia)

Learning disabilities in math vary greatly depending on the child’s other strengths and weaknesses. A child’s ability to do math will be affected differently by a language learning disability, or a visual disorder or a difficulty with sequencing, memory or organization.

A child with a math based learning disorder may struggle with memorization and organization of numbers, operation signs and number “facts” (like $5+5=10$ or $5\times 5=25$). Children with math learning disability revolve around the act of writing. They include problems with:

- Neatness and consistency writing
- Accurately copying letters and words
- Spelling consistency
- Writing organization and coherence

The mathematical and cognitive performance of students with mathematics learning disabilities are significantly lower compared to age or grade matched students with no learning disabilities [13, 14].

Prevalence of Learning Disability

Specific Learning disability affects up to 10 percent of school children according to a study conducted among US Children [15]. In a review of Indian studies on prevalence of learning disability, prevalence of various types of deficits of scholastic skills were reported to be 3-10 percent among students population [16]. In this review, studies had screened students for dyscalculia, dyslexia and different type of learning disabilities in the States of Karnataka, Kerala and Tamil Nadu. In another study from rural India, prevalence of specific learning disability was reported to be 13 per cent in primary school children [17]. In a study from northern region, one per cent of children attending an outpatient clinic of a tertiary hospital were found to be having specific learning disability [18].

The incidence of dyslexia has been reported to be 2-18%, of dysgraphia 14%, and of dyscalculia 5.5% in primary school children in India [19, 20, 21]. Studies



confirm that large a large percentage of school drop outs in India are due to unsatisfactory academic performance [22]. The prevalence may be the same or slightly more than the western figure of 20 % of the child and the adolescent population [23].

Cognitive Training

SpLD, an invisible handicap, constitute an important cause of poor school performance in students and are presumed to be due to central nervous system dysfunction. Cognitive training is essentially a computer-based “mental workout”. It might resemble a video game in that the exercises are interactive and presented on computer screens. The main difference between cognitive training and traditional “video games” is that cognitive training exercises are specifically designed to enhance cognitive processes (e.g., memory, attention, and sensory processing) [24].

Previously, it was believed that cognitive capacities (e.g., intelligence, memory, attention, and sensory processing) are fixed at a young age. However, there is now evidence that cognitive capacities are adaptable [25] and that cognitive training (i.e., exercising the brain) can effectively improve these capacities. For example, cognitive training has been shown to enhance processing speed [26], attention [27], and working memory [28]. Cognitive training rests on neuroplasticity, which is the idea that the human brain is capable of forming new neural connections and neural reorganization [29]. Research has also shown that 12 weeks of cognitive training with a Tetris-like game resulted in more cortical thickness in the temporal, parietal, and frontal cortices [30]. These results are corroborated by other studies that found increased neural activation in the parietal and frontal lobes [31].

Research confirms that cognitive training can improve academic performance. One study tested the effects of cognitive training on performance with a sample of 22 young adolescents who suffered from poor working memory [32]. Results showed the students experienced significant gains in working memory and academic performance, and the gains were sustained for six months after treatment. Another study tested the effects of cognitive training with a sample of 1305 students between the ages of eight and fifteen [33]. Results showed that cognitive training led to improvements in processing speed, attention, memory, mental flexibility, and problem solving; all of which are processes necessary for academic success [34].

In the last decades, the popularization of computers has led to a growing interest in their use for the cognitive problems related to aging: computerized test batteries for neuropsychological assessment [35, 36, 37] and computer-based cognitive training (CBCT) programs have been developed. CBCT promises a series of advantages over traditional cognitive training (TCT), on

the basis of pen-and-paper exercises. It allows setting the initial level of task difficulty according to the individual's baseline competency and gradually increasing it as patients improve their performance, resulting in a continuous cognitive challenge. In addition, CBCT enables the standardization of intervention [38].

- Dharma Jairam et al [39] has studied the effect of cognitive training on Academic efficacy using Lumosity, a commercially available web-based cognitive training program from www.lumosity.com (Lumos Labs Inc., San Francisco, CA). Training sessions consisted of four game-like exercises designed to target cognitive domains including attention, working memory, processing speed, and problem solving. Participants can undergo the cognitive training on their personal computers at times convenient to them. Upon logging in to the website, the program delivers four exercises and immediate visual and auditory feedback is provided regarding performance. It includes following exercises: (a) Speed Math (b) Memory Matrix (c) Playing Koi (d) Rain Drops. The experimental groups cognitive performance was evaluated via Lumosity's Brain Performance Index (BPI).

- Nisha V et al [40] studied the efficacy of Computer Assisted Cognitive training in the remediation of Specific Learning disorders using BRAIN TRAIN® a software - Judith Falconer, Parker Co. (US). It consists of an integrated set of 52 computer programs designed to assist in remediation of a wide range of cognitive and behavioral deficits commonly seen in individuals with brain injuries (through trauma, stroke, encephalopathy, aneurysm, etc.) or those who are developmentally disabled. For the purpose of this training, the remedial tasks can be mainly targeted at attention, visuo-spatial ability, visual perception, working memory, visual discrimination, speed of information processing and visual memory.

- A recent research by Owen et al [41], has shown that computerized cognitive training leads to significant improvement in cognitive functions namely, reasoning, memory, planning, visuo-spatial skills and attention in 11,430 adult participants.

- Shahzadi Malhotra et al [42], have studied the efficacy of retraining techniques in children with learning disability using the cognitive rehabilitation software programmes like PSCogRehab 95, Challenge of the Mind. The manualized cognitive retraining over thirty six hours has helped to partially remediate cognitive deficits in children with learning disability and improved their scholastic performance. This software was designed to enhance and develop cognitive functions across various domains like – attention skills, executive skills, memory skills, visuospatial skills, problem solving skills, communication skills and psychosocial skills.

- Cognitive training has been shown to enhance processing speed [43], attention [44], and working memory [45]. Cognitive training rests on neuroplasticity, which is



the idea that the human brain is capable of forming new neural connections and neural reorganization [46].

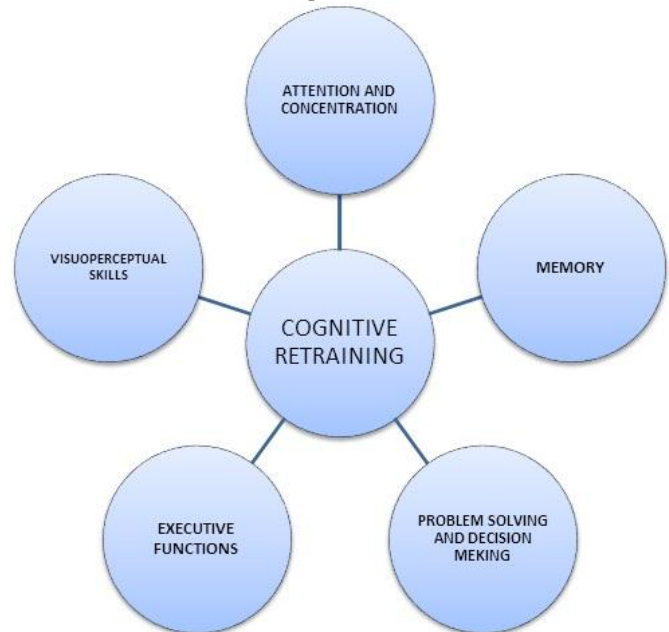
To obtain advantageous outcomes with Computer Assisted Cognitive retraining (CBCT), careful planning and analysis of performance data must be observed. Scientific studies have shown that CBCT can have

significant effects on attention, impulse control, working memory and complex reasoning skills for both adults and children with cognitive impairments. By improving these skills, a child can gain confidence and function more effectively in school, home and every other place.

Fig 1. Why Address SLD?



Fig 2. Cognitive training to enhance various Neuro-cognitive Domains



CONCLUSION

Education is one of the most important aspects of human resource development. There is an urgent need in our country to increase awareness of this invisible handicap and develop centers for its proper assessment and accurate diagnosis. Poor scholastic performance is a problem among many school children in India. The causes

for the same are not elicited many a times. Specific learning disabilities could be coming in the way of academic progress in these children. All the stake holders like parents; teachers should screen the underperforming students for the presence of specific learning disabilities and initiate treatment and support mechanisms.

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