

# TREATING DYSLEXIC AND DYSCALCULIC STUDENTS

By

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## ABSTRACT

*This article focuses on the specific learning disabilities found in schools such as Dyslexia and Dyscalculia, the influence of dyslexia on dyscalculia and the need to adopt certain strategies that help cope with this problem. Learners with multifarious language-related or arithmetic-related disabilities are found in most schools. These children may face difficulties in one or more areas of academic skills such as reading, writing and arithmetic.*

*Learning disabilities like dyslexia and dyscalculia cut across class, age and intelligence and most schools have some dyslexic or dyscalculic children. Dyslexia is a learning disorder involving difficulty in learning to read or interpret words, letters and other symbols. Dyscalculia is a learning disorder that causes severe difficulty in making arithmetic calculations. Dyslexia and Dyscalculia are specific learning disabilities and require diagnosis as well as treatment apart from actual classroom teaching.*

*Children with these learning disabilities require special assistance on the part of teachers, educational specialists and even parents. The effects of learning disabilities can be controlled with appropriate support, guidance, and interventions at home and school. It is becoming imperative for teachers and educational specialists to devise certain teaching strategies that help educationally disabled children to overcome their problems and to enable them to learn well.*

*Keywords: Learning Disability, Specific Learning Disability, Dyslexia, Dyscalculia.*

## INTRODUCTION

Many children with special educational needs are found in various schools. These children may face difficulties in acquiring academic skills such as reading, spelling, writing, speaking, understanding, listening, thinking or arithmetic. Some of these children excel in many areas other than the problem area. Others are merely slow in acquiring school related skills. These children are described by a wide variety of labels such as learning-disabled, slow learners, educationally handicapped and children with specific learning disabilities.

A learning disability is a condition where a child's achievement is substantially below what one might expect for the child. Many of the children labelled as learning-disabled are identified as such because of their difficulty in learning to read, write or in doing arithmetic calculations. Learning disabilities are disorders that interfere with the development of these basic skills. These disorders damage a child's ability to learn. In addition to these primary characteristics of learning disabilities, there

are also secondary consequences of learning disabilities such as poor motivation, self-esteem, self-efficacy and metacognition. Learning disabilities do not include problems that are primarily the result of intellectual disabilities, emotional disturbances or visual and auditory disabilities.

Children with learning disabilities face a host of academic and non-academic difficulties. Non-academic difficulties include motor problems, perceptual problems, phonological processing difficulties and language problems. Academic difficulties include problems in reading, spelling, writing, and mathematics. Learning-disabled children may have average or above average intelligence and they also have normal hearing and vision. And also they may be slow learners, average learners or even gifted children. But they apparently cannot use information transmitted by the senses to the brain as accurately as most of the other children. Therefore they may do poorly in school or not as well as they can.

There is no specific cause of a child's learning disability. Scientists believe that most learning disabilities result from minor damage to the brain. A child may also inherit a learning disability. Even a child with a no physical or mental problem may develop a learning disability. Disabilities can also result from a lack of the early learning experiences that stimulate mental growth and development.

## **Dyslexia**

Dyslexia is a language-based learning disability. <sup>1</sup>It refers to a cluster of symptoms, which result in people having difficulties with specific language skills, particularly reading. Students with dyslexia usually experience difficulties with other language skills such as spelling, writing and pronouncing words. Dyslexia is a specific learning disability and refers to a wide range of difficulties with words read, words spelt, words pronounced, words written and association of meanings with words. It is a learning disability that causes difficulty in reading and spelling, but does not affect intelligence. It is basically a reading disability or inability to read which indicates that there is something wrong with the child.

The cause for dyslexia is unknown. It may be inherited or due to a damage of a certain part of the brain. It is generally recognized that many dyslexic children have a weakness in language processing. They tend to misuse words and often find it difficult to comprehend text. These children may also have both receptive and expressive language difficulty which results in inability to understand what others speak or inability in expressing their ideas clearly (Pollock & Waller, 1997).

<sup>2</sup>Dyslexia is characterized by difficulties with accurate or fluent word recognition and by poor spelling and decoding skills. A person with dyslexia can have problems in any one of the tasks involved in reading. Reading disabilities affect 2 to 8 percent of elementary school children. These children exhibit problems such as understanding words and grammar, building ideas and images or storing ideas in memory. A significant number of children with dyslexia share an inability to distinguish or separate the sounds in spoken words and in recognizing

the sounds associated with letters.

The impact that dyslexia has is different for each person and depends on the severity of the condition and the effectiveness of instruction or remediation. The core difficulty is with word recognition, reading fluency, spelling and writing. Dyslexics show difficulties including receptive and expressive language skills, phonological skills including phonemic awareness and also inability to rapidly name letters and names. The problems displayed by individuals with dyslexia also involve difficulties in acquiring and using written language. <sup>3</sup>Other problems experienced by dyslexics include slow rate of oral and silent reading, omission of letters or words while reading, substitution of letters or words while reading, insertion of letters and words, repetition of words when reading orally, excessive number of regressive eye movements, reversal of whole words due to difficulty in sequential memory, lack of phonetic ability or inability to use unfamiliar words, inability to memorise facts or to store ideas in memory, and excessive lip movement in silent reading.

## **Dyscalculia**

Dyscalculia is a learning disability that affects the ability to do arithmetic calculations. <sup>4</sup>It is a type of specific learning disability that refers to innate difficulties in learning or comprehending mathematics. It refers to mathematical reasoning abilities as well as difficulties with arithmetic operations. <sup>5</sup>Dyscalculia refers to a wide range of life-long learning disabilities involving mathematics. It is a condition that affects the ability to acquire arithmetic skills. Arithmetic involves recognizing numbers and symbols, memorizing facts, aligning numbers and understanding abstract concepts like place value and fractions. Any of these may be difficult for children with dyscalculia.

<sup>6</sup>Dyscalculia is a lesser known learning disability that affects mathematical calculations. According to Rao, dyscalculia is a condition which can be defined as the inability to develop mathematical concepts, difficulty in implementing calculation procedures or to reason with numbers (Karanth & Rozario, 2003).

Dyscalculia can occur developmentally as a genetically linked learning disability which affects a person's ability to

understand, remember or manipulate numbers or number facts. It occurs in pupils across the whole IQ range and the sufferers often have difficulties with time, measurement or spatial reasoning. There is no single form of mathematical disability and difficulties vary from person to person and affect people differently in school and throughout life. Young children with mathematics learning disabilities can have difficulty in number sense, in sorting objects by size or shape, and in comparing and contrasting certain mathematical concepts. Building a solid foundation in mathematics requires different skills. If basic mathematical skills are not mastered, school children may find it difficult in moving on to more advanced mathematical applications.

There are different symptoms of dyscalculia with severe difficulties in learning mathematics. Difficulty may be found in performing basic arithmetic skills such as adding, subtracting, multiplying and dividing. Dyscalculic learners confuse mathematical signs and symbols and have difficulty in grasping and remembering mathematical concepts, rules, formulae and sequences. When reading, writing and recalling numbers, they make several mistakes such as number additions, substitutions, transpositions, omissions and reversals.<sup>7</sup> The other symptoms of dyscalculia include inability to understand place value and to work with decimals, inability to estimate number quantities, inability to understand the concept of fractions, difficulties with measures and conversion of one measurement to another, difficulty in identifying similar signs and numerals, difficulty in identifying similar geometrical shapes, difficulty in drawing geometrical figures, difficulty in identifying three-dimensional figures, difficulty in conceptualizing time and judging the passage of time, difficulty in following directions, inability to organize objects in a logical way, inability to comprehend financial planning or budgeting, difficulty in converting one's arithmetic knowledge to actions, and difficulty with verbal use of mathematical concepts.

#### **Influence of Dyslexia on Dyscalculia**

Difficulties in reading may cause problems in doing mathematical calculations.<sup>8</sup> It is necessary to clarify the

relationship between arithmetic and reading disabilities. Some aspects of literacy and arithmetic draw on the same cognitive processes. It is possible that memory processes involved in learning letter clusters are those also used to learn arithmetic symbolism. Research studies show that rapid retrieval of abstract knowledge from long term memory is also likely to be shared both by literacy and arithmetic learning.

<sup>9</sup>As mathematics learning continues, schoolchildren with language processing disabilities may have difficulties in solving basic mathematics problems. Language processing disabilities can make it hard for a person to get a grasp of the vocabulary of mathematics. Without the proper vocabulary and a clear understanding of what the words represent, it is difficult to build up mathematical knowledge.

Children who have difficulty in literacy skills also have trouble with mathematics. It has been estimated that 40 percent of dyslexic children can also have trouble with learning Mathematics (Pollock & Waller, 1997). Poor phonological skills and the inability to visualize words or symbols lie at the root of the dyslexic child's problems. Symptoms including very poor reading skills, reversed word and letter sequences and illegible handwriting usually become evident in the early school days. This disability also affects the child's numeracy. The formation of numbers and their direction as well as learning multiplication tables and the order of arithmetical operations could pose a problem.

It has been estimated that 5 percent of elementary schoolchildren have a disability in reading while 6 percent have disability in mathematics. In the majority deficits, reading and calculation deficits are seen together (Karanth & Rozario, 2003). Disabilities in mathematics are as complex as those associated with reading and may be dependent on reading abilities. A difficulty with mathematics may be due to an individual's ability to process language or read numbers.

Dyscalculia is a lesser known disability, similar and potentially related to dyslexia or word blindness. It is like dyslexia for numbers which refers to the inability to visualize

words or symbols. But unlike dyslexia, very little is known about its prevalence, causes or treatment. Compared with dyslexia, very little research has been focused on the problems of dyscalculic children's difficulties and how to overcome them. Recent evidences show that dyscalculia is just as common as dyslexia and yet it is not as widely recognized by teachers, parents, school authorities or by the government. Hence dyscalculic learners require special education in the same way as dyslexia.

### Research Studies on Dyslexia and Dyscalculia

A brief summary of previous researches provides evidence that the investigator is familiar with what is already known and what is still unknown and untested (Best & Kahn, 2006). Research studies reveal that children with learning disabilities possess IQ more than average children. They may have difficulties in various language and numerical skills.

A study conducted by Bains, Devinder.K. (2001) reveals that Alphabetic Phonic Method and Multi-sensory Structured Linguistic Method were effective in improving the reading disabilities of dyslexic children. In the study conducted by Maite & Mete (2006), it is revealed that reciprocal method is the easiest division algorithm of fractions and it will be desirable if it is taught and learnt with proper understanding of its logic. A study conducted by Lugo (2004) explores how multimedia computer technology could be a potential supplemental teaching aid that teachers use in addition to traditional classroom instruction. Also it is revealed that certain practical methods and instructional designs can be implemented in the classroom to address the specific learning needs of dyscalculic learners (Michaelson & Thomas 2007).

In the study conducted by Tweedy (2007), it is found that critical reflection and rational knowledge play only a supportive role while affective (feeling and emotion) and presentational knowing (image and intuition) were much more central to the process of transformation of dyslexic students. A study conducted by Orly & Avishai (2001) reveals that dyscalculic population have difficulties in automatically associating letters with phonemes,

whereas dyslexic population shows the opposite pattern. In the study conducted by Hartmann (2007), it is shown that students with low mathematics achievement had more computational errors and fewer translation errors than students with mathematics learning disabilities who had conceptual difficulties in the areas of analyzing, reasoning and abstract thinking. A study conducted by Willburger. *et al.* (2008) suggests that the cognitive bases of dyslexia and dyscalculia are independent of each other. Also it is found that vocabulary instruction incorporating mnemonic strategies has consistently resulted in substantial increases in learning and retention for students with disabilities as well as non-disabled peers when compared with other approaches (Sanders & Parris, 2007).

In the study conducted by Landerl. *et al.* (2008) reveals that dyscalculia is the result of specific abilities in basic numerical processing, rather than the consequences of deficits in other cognitive abilities. A study conducted by Robinson, Carol (2003) reveals that students with mathematics difficulties are able to use their phonological processing skills to compensate for observed weakness in number sense. Also it has been studied that verbal short-term memory is a significant predictor of oral reading fluency in adolescents with dyslexia, but the magnitude of its effect changes greatly with amount of expressive vocabulary knowledge. These findings provide some support for the changing nature of dyslexic symptoms across development and offer evidence in favour of a more dynamic developmental systems approach to the study of reading failure in adolescence (Rose & Tadd, 2007).

The above reviewed studies reveal that there are remedial measures to overcome the problems faced by dyslexic and dyscalculic learners. Hence there is a hope that certain strategies can be implemented to cater to the needs of learning-disabled children.

### Treating Dyslexia and Dyscalculia

Learning disabilities should not be regarded as an indication that an affected child cannot succeed against the achievement of some of history's famous

personalities. Some great men like Albert Einstein, Thomas Alva Edison, Winston Churchill etc had learning disability in their school days and later on they rose to the peak of excellence in their respective fields. There is a need to cultivate infrastructure to facilitate the detection and management of schoolchildren so that the students are diagnosed for the potential they have. It is therefore essential for dyslexic and dyscalculic children to receive the highest quality of education possible (The Hindu, October 30, 2008).

With more and more emphasis on classroom performance in this era of perfect competition, teachers and parents need to apply the best known techniques to make the children intellectually superior. To tap the full potential of children, we need to maintain the brain well. Nowadays, Brain Gym Exercises are becoming popular that help to keep the brain fully functioning to its optimum capacity. According to Dr. Paul Dennison, an educational therapist, the human body has acupuncture points which when activated will substantially improve the functioning of the brain. When properly applied, Brain Gym exercises help to overcome learning difficulties in reading, spelling or mathematics (The Hindu, October 13, 2008).

Helping the students to identify their strengths and weaknesses helps greatly in achieving academic success. Following identification, parents, teachers and other educators can work together to establish strategies that may help the students to learn more effectively. Repeated reinforcement and specific practice of straight forward ideas can make understanding easier. Many students need individual attention to fully grasp certain concepts. Such students can be made to work with a tutor, a parent or a teacher after school hours and they can be provided a place with few distractions. They need to be specially helped to overcome their problems through different attitudes and teaching methods.

Most individuals with dyslexia or dyscalculia need help from a teacher, tutor or therapist specially trained in using multisensory or structured approach to teaching. It is important for these individuals to be taught by a systematic and explicit method that involves several senses at the same time with visual, auditory, tactile and

kinesthetic elements. Special education services may help dyslexic or dyscalculic learners to overcome their problems. There is a great need to generate a base of qualified special educators equipped with skills to diagnose the learning disability and craft as a coping strategy (The Hindu, October 30, 2008).

Innovative use of technology may help dyscalculic learners to overcome their disability to a large extent. It is very essential for school teachers to adopt innovative methods of teaching to meet the needs of dyslexic and dyscalculic learners. The use of technology like computer-assisted instruction may be a help in effective learning. Data handling, graphical representation and visualization are important skills which can be taught productively to these children. Students' spatial reasoning and visualization can be enhanced through visual learning which fosters better understanding, organization and imagination (NCERT, 2005).

With early recognition and specialized approaches to teaching, most dyslexic or dyscalculic learners can be helped to learn normally. For the development of language and arithmetic skills, early intervention programmes are essential. Early intervention is needed for schoolchildren who are at a risk of developing a handicapping situation or other special need that may affect their development. Early intervention programmes help in provision of services to such educationally handicapped children for the purpose of lessening the effects of the condition. Since the child's early learning provides the foundation for later learning, early intervention would help to prevent the child from developing additional problems or disabilities (Reddy & Poornima, 2008).

### Implications

Parents need to be aware of the various learning blocks the children face in their day-to-day life and how they hamper their progress. Learning disabilities like dyslexia and dyscalculia are highly prevalent among the schoolchildren and they have become hindrances in today's educational scenario. Awareness about learning difficulties alone helps parents to give appropriate



remedial measures to the children and create the kind of climate which is conducive to their learning.

The dynamics of teaching has changed with the times. It is necessary that teachers have to change their roles and understand the psychology of each and every child rather than considering them as a herd. The teacher has to identify the challenges faced by the children instead of discouraging them with senseless homework and needs to be a facilitator rather than be a mere instructor. The role of the teacher is that really imparting positive vibes to the students.

Schools can implement certain academic accommodations and modifications to help the educationally backward children to catch up with the rest of the class. For instance, introducing language laboratories or mathematical laboratories may go a long way in helping these learners to resolve their problems. Students can benefit from conversations and also pronunciation of words through tapes, earphones etc. They can also benefit from visual representations of pictures, diagrams etc and through the use of various media.

Various educational services may help dyslexic and dyscalculic learners to overcome their problems. Special educational programmes can be designed to meet the special needs of these learners in the light of recent researches. With proper parental care and teachers' guidance, dyslexics or dyscalculics can be made to read, write or to do arithmetic calculations in correct ways. In addition, these educationally disabled students need a great deal of structured practice and immediate corrective feedback to develop their word recognition skills or numerical skills.

It is to be noted that very few research studies have been done in the field of learning disabilities like dyslexia or dyscalculia. Language skills and arithmetic skills are indispensable for academic excellence and so researches in these areas are becoming increasingly needed. It is imperative that researchers come forward to study these learning disorders and adopt certain ways and means to treat these academic sufferers.

## Conclusion

Diagnosis and care of developmentally disabled children in most schools are both deficient to say the least. There is close to no effort on the part of parents, teachers or educational specialists at correct treatment or adoption of strategies to remove the learning blocks that hamper their educational progress. It is possible for these children to be enabled and equipped with the skills they need and to empower them to catch with the rest of their peers through different teaching strategies. It is highly desirable that our schools sensitize their staff to the need to develop in these children the skills they normally fail to develop.

## Footnotes

<sup>1</sup>[http://www.idonline.org/article/Dyslexia\\_Basics](http://www.idonline.org/article/Dyslexia_Basics) (Accessed on 10 Oct 2008)

<sup>2</sup>[http://www.idonline.org/article/Learning\\_Disabilities%3A\\_An\\_Overview](http://www.idonline.org/article/Learning_Disabilities%3A_An_Overview) (Accessed on 10 Oct 2008)

<sup>3</sup>[http://www.slowlearner.co.in/learning\\_disability.htm](http://www.slowlearner.co.in/learning_disability.htm) (Accessed on 10 Oct 2008)

<sup>4</sup><http://en.wikipedia.org/wiki/Dyscalculia> (Accessed on 16 Sep 2008)

<sup>5</sup><http://www.nclid.org/index.php?option=content&task=view&id=463> (Accessed on 16 Sep 2008)

<sup>6</sup><http://www.as.wvu.edu/~scidis/dyscalcula.html> (Accessed on 29 Sep 2008)

<sup>7</sup><http://www.discovery.co.uk/shopping/pdf/F007.pdf> (Accessed on 16 Sep 2008)

<sup>8</sup><http://www.edfac.unimelb.edu.au/eldi/selage/documents/MLDR-Dyscalculiatypes.pdf> (Accessed on 10 Oct 2008)

<sup>9</sup><http://www.idonline.org/article/Dyscalculia> (Accessed on 10 Oct 2008)

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