International Journal of Information Movement *Vol.I Issue XII* *(April 2017)*
Website: www.ijim.in *ISSN: 2456-0553 (online)* **Pages 24-29**

LEARNING DISABILITY OF NUMERICAL PROCESSING-DEVELOPMENTAL DYSCALCULIA

Shashi Bala
Research Scholar
Desh Bhagat University Mandi Gobindgarh
Email: puneetdhiman.78@gmail.com

Abstract

Numerical processing is a methodical application of matter. It is so said because mathematics makes our life systematic and prevents chaos. Mathematics or numerical processing is an important part of our life without which the world cannot move an inch. But it is possible that a person of average intelligence (<85 on Arithmetic test and>90 on non verbal intelligence test) can have learning disability of numerical processing that is Developmental Dyscalculia. This article deals with types and symptoms of persons of Developmental Dyscalculia. It also tells about latest techniques to tackle this problem.

Keywords: Dyscalculia, Numerical processing, learning Disability

1.0 learning Disability of Numerical Processing-Developmental Dyscalculia

Learning disability in mathematics has not received as much attention from researches as disabilities in reading and language arts. This may be due to pervasive nature of skills in reading and writing in the school curriculum and the relative independence of math. It may also result from relatively lower incidence of problem. Most authorities place the incidence of mathematical disabilities at about 6 %(Lerner 1988, Geary 2000) with about one half of these students estimated to have problems with literacy skills as well. In schools of past when students with reading disabilities excelled in mathematics calculations this skill was probably the result of much practice with computational skills by their teachers because there were few provisions for appropriate work in reading and language available for them. It is clear now that some learning disabled students have specific disabilities in numerical processing and their teachers need to understand the impact of learning disability on mathematics.

Today's world requires us to process unprecedented level of numerical information. Numerical processing is a methodical application of matter. It is so said because the subject makes a man methodical or systematic. It makes our life systematic and prevents chaos .Certain qualities that are nurtured by mathematics are power of reasoning, creativity, abstract or spatial thinking, critical thinking and problem solving without which the world cannot move an inch. Be it a cook or a farmer, a carpenter or a mechanic, a shopkeeper or a doctor, an engineer or a scientist, a musician or a magician, everyone needs measurements in their day to day life. We use computations in day to day activities Many aspiring carriers require a solid foundation in mathematics. .

Math is everywhere! Mathematics is "a way of thinking, knowing and problem solvin1g"(Virginia, Early childhood development Alignment Project 2008,83)

In the 1996 UNESCO Report Learning : The Treasures within, Jacques Delors describes four "Pillars of Education" Learning to know, Learning to do and Learning to live together and Learning to be. 1. Most obviously, school teaches information of practical value: information of practical value: how to do simple arithmetic, grammer, capitals of the world or simple human biology. This broadly corresponds to Delors' Learning to know.

2. School also teaches discipline: working efficiently, reasoning, team work, keeping a schedule. This broadly corresponds to Delors' Learning to do and Learning to live together.

3. Finally many subjects in school have a cultural value, such as music and art, history and geography. Science and math's, as knowledge about our universe may also have an intrinsic value. This broadly corresponds to Delors' Learning to be.

Mathematics is one of few subjects that have the potential to range across all three of these areas and table below shows examples of what could be taught in each case.

Practical value(Numeracy)	Disciplinary value	Cultural value
*Numbers and calculations. *Algebra,Geometry,Functions	(Reasoning and Logic) *Finding new solutions to problems of a kind that have not been seen before. *Proof simple theorems using simple logic.	(Fundamental mathematics) *Puzzles, Number Theory, combinations. *History of mathematics. *Biographies. *Unsolved problems.

To make mathematics as engaging, interesting and relevant as possible the curriculum should be a combination of all three aspects.

2.0 Mathematics IN Real LIFE:

1. Prime numbers, for example, underlie digital cryptography and are used whenever an e-mail is sent or a secure website is accessed- from personal internet banking to secret services. This is done using a process called 'RSA cryptography' (Ron Rivest, ADI Shamir and Leonard Adleman) who first publicly described alogarithm in 1977.It is one of first practical public key cryptosystems and is widely used for secure data transmission. In such a crptosystem the encryption key is public and differs from decryptions key which is kept secret. In RSA, this asymmetry is based on the practical difficulty of factoring the product of two large prime numbers.

2. Fractals are some of 'least real' objects in geometry.

3. Vectors are used to define 3-dimensional environments in computer games.

4. Logic and set theory is very important in computer science.

5. Chatting or making calls: Everyone uses cell phones and it is no surprise that one needs to have basic knowledge about numbers, signs and digits before using it .

6. Measurements in the kitchen: Before cooking anything we always use the ingredients in their quantity and making the use of how much in kitchen.

7 Banking: Going to a bank means that you need to have proper accounts of money that you need to withdraw and deposits etc. No one without the basic knowledge about computations can do anything in bank hence making inseparable part of our lives. One should have basic knowledge of tens, hundreds, thousands, lakhs etc. to do credit and debit of money.

8 Arts: Scales are used by artists while making paintings, designing collages as well as during performances. In all these cases the canvas, size of stage, space required etc. play a very important role and deciding all these aspects is literally impossible without the knowledge of millimeters.

9. Travelling: You surely need to travel as well as the estimated gallons of fuel that you need to use. Travelling via airplanes need to know arrival and departure times of their flights, something which involves the use of speed and distances to be covered to large extent.

10. Shopping : This is probably the most common use in which we make list of things we need to buy as well as make payments in the vend.

11.Gardening and mowing the lawn: Whether you are planning to sow seeds or count the number to sow or count the number of plants everything require numbers. You need to know of holes to be dug and number of seeds to be put in each hole.

All tasks require proper measurements. There is no denial in the fact that mathematics has become an everyday party of our life.

Since we are primarily thinking about school mathematics it is worth observing that many of the skills taught in mathematics are required in other subjects. This is clearly true for sciences, but for geography, where children may have to find the area of countries or distance between cities or politics where children may have to interpret data describing our life.

Finally I want to mention briefly that mathematics has an important social role. Basic arithmetic and estimation is necessary in everyday life. It may be worth noting that many of the jobs that advance technology and society as a whole from computer programming to electrical engineering, scientific research, company management or finance – require a significant amount of mathematics. An individual must agree that teaching mathematics has been of enormous practical value to society as a whole. Studying mathematics exercises our brain in a manner that is quite different from most other human activities. There is much research regarding the relationship between mathematics and brain. One particularly interesting example was given by Blaira, Gamsoub, Thornec and Bakerd in 2004. In [22] they propose that significant increase of mean IQ in the United states during the last century could be caused by or at least be related to the increased "cognitive demand of mathematics curricula for young students".

3.0 Learning Disorder Related With Numerical Processing

There is a learning disorder that specially affects the ability to acquire school level arithmetic skills. Dyscalculia comes from Greek and Latin and means COUNTING BADLY. The prefix DYS comes from Greek and means badly. The root calculi a comes from Latin CALCULARE which means to count and which is also related to calculation and calculus. It is widely acknowledge that dyscalculia was first discover in 1919 by Salomon Henschen a Swedish neurologist who found that it was possible for a person of high general intelligence to have impaired mathematical abilities . The term Dyscalculia was later coined by Dr. Josef Gerstman in 1940 .There is well established evidence for specialized neural circuits for numerical circuits for numerical processing in the parietal lobes of brain especially the left and right intraparietal sulci has less grey matter or less brain activity in specific areas of brain to process numerals.. It could be changed by experiences in the home (an environment which encourages attention to number), by teaching and by intervention programmers.

4.0 Types of Problems of Developmental Dyscalculia and Symptoms

Geary proposed three types of problems faced by the persons of developmental dyscalculia

4.1 SEMANTIC MEMORY PROBLEMS: In this group are students who have difficulty retrieving the addition and subtraction combinations and even when some facts are retrieved their rate of error is high. They may confuse signs in computation so they may add when sign calls for multiplication or subtract when sign requires addition In adding the combination 4+2 they cannot start with 4 say 4,5 to find sum but must say 1, 2,3,4,5,6 This has been called a problem in working memory that slows down and impairs the learning of basic combinations . They also hard to use extraneous cues that show a lack of basic concepts in quantity. Because of cumulative nature of knowledge in mathematics inadequate mastery of early skills interfere with these students learning more complex processes The students who is uncertain about time tables will be lost when asked to estimate quotients in long division or to reduce improper fractions or to deal with factoring in algebra .

4.2 PROCEDURAL DEFICITS: Some children with math disabilities make adequate progress at the beginning of schooling but experience difficulties when a series of operations is required. For ex. They may appear to be ready for long division they may have fairly accurate multiplication and subtraction skills and may be able to understand the principle of division well .However these students may be unable to follow the order and sequence of the series of steps required for long division.

4.3 VISUOSPATIAL PROBLEMS: This group of problems includes errors in dealing with place value in multiplication, division and decimals. Illegible or untidy handwriting that misaligns columns in basic computational processes.

5.0 Types of Developmental Dyscalculia

There are different types of developmental dyscalculia

1Verbal (Interpretation of verbal math terms)

2 Operational (performing basic arithmetic operations)

3 Lexical (reading written math terms and symbols)

4 Graphical (symbol manipulation)

5 Diagnostic (mental calculations)

6 Practognostic (pictorial representations)

5.1 SYMPTOMS

Delay in counting: five to seven year old dyscalculia children show less understanding of basic counting's principles.

Delay in using counting strategies for addition

Difficulties in memorizing arithmetic facts: Dyscalculic children have great difficulty in memorizing simple addition, subtraction and multiplication facts. This difficulty persists up to the age of 13

Lack of number sense : Dyscalculia children may have a fundamental difficulty in understanding quantity (11,12).They are slower at even very simple quantity tasks such as comparing two numbers(which is bigger 7 or 9)

Less automatic processing of written numbers: in most of us reading the symbol 7 immediately causes our sense of quantity to be accessed .In dyscalculia individuals this access appears to be slower and more effortful.

Difficulty using finger counting

Difficulty in decomposing numbers (10 is made of 6 and 4)

Has trouble telling his left from his right and has a poor sense of direction.

Has difficulty remembering phone numbers and game scores.

Has trouble in telling time.

Lacking confidence in activities that require estimation of speed and distance. So they feel difficulty in playing sports and learning to drive.

5.2 The following are not symptoms of dyscalculia

1 Reversals of numbers: This is a normal developmental stage through and is no cause for alarm in itself.

2 Difficulty remembering names: no evidence to suggest that long term verbal memory has anything to do with dyscalculia

Inability and disability: Inability means you cannot do something because you do not have the skills or knowledge to do something. Disability means you are not able to do something because of a physical or mental problem. For e.g. I have an inability to speak Spanish because I have never learned the language (but it is possible I could). A person in a wheel chair who cannot walk however needs an elevator because s/he has a disability that prevents walking up stairs.

6.0 Techniques: Following techniques can be used to tackle the problem of developmental dyscalculia

6.1 BABAKUS: It is a calculator that combines the best qualities of western slide ruler with those of eastern abacus. Babakus is an excellent proficiency training tool for those deficits in counting as well the method is highly scalable to fit each student level of understanding.

6.2 NUMICON: The Numicon shapes make numbers real for children because they can see them and touch them. The shapes make odd and even numbers very apparent and they help children to understand addition, subtraction, multiplication and division. There are kits available for groups of children.

6.3 NUMBERSHARK: It is a motivating computer programme that uses 45 games to teach and reinforce numeracy and improve understanding and use of numbers. The wide variety of carefully designed games provides many ways in which to practice at a chosen level and to build skills in very gradual steps. The games focus on the number system and sequencing (very useful for dyscalculia), addition, subtraction, multiplication, division, fractions, decimals, percentages.

6.4 CONCRETE MODELS: Using concrete models is the first step in building the meaning behind the mathematical concepts. These models include a variety of math manipulative measuring tools, building blocks, fractional boards, peg boards, chips, marbles, 2D and 3D charts and shapes, dice and stripes that students can handle during a lesson. Research base study show that students who use concrete materials develop more precise and more comprehensive mental representations.

7.0 References:

1. Bird R (2011) *The Dyscalculia Research Book*. Sage Publications New Delhi 110044
2. Edybum d (2003) Measuring Assistive technology outcomes in Mathematics. *Journal of special Education technology 18(4) pp 76*-79
3. Geary D C Bow Thomas and Y .Yao 1992 Counting knowledge and skill In cognitive addition: A comparison of normal and mathematical Disabled children. *Child Psychol 54(3) 372-391*
4. Geary Mathematical disabilities: cognitive, neuropsychological and genetic components. *Psychol Bull 114 (2)*
5. Gersten, R.B.Clarke and M.M.M.Mazzocco.2007.Historical and Contemporary perspective on mathematical learning disabilities. *In Why Is Math So Hard* F*or Some Children*? Brookes Publishing
6. Hanich Performance across different areas of mathematical cognition in children with learning difficulties. *Journal of Educational Psychology 93 (3)*
7. Kumar S Praveen & Raja B. W. D (2008) Minimizing Dyscalculia Problems through visual learning. *The Primary Teacher 24, 87-93*
8. Kumar s Praveen & Raja B.W.D. Minimizing Dyscalculic problems through Visual learning. *The Primary Teacher 24, 87-93*
9. Landeral K A. Bevan and B Butterworth 2004 Developmental dyscalculia And basic numerical capacities: A study of 8-9 year old students. *Cognition 93 99-125*
10. Lewis C Hitch G J Walker P (1994) The Prevalence of specific arithmetic Difficulties and specific reading difficulties in 9 to 10 year old boys And girls. *Journal of child psychiatry 35:282-293*
11. Mussolini C.S.Mejias and M P Neal 2010 Symbolic and nonsymbolic number Comparison in children with and without dyscalculia. *Cognition 115(1)*
12. Parsons s. and J.Bynner 2005 *Does Numeracy Matter More*. NRDC (National Research and Development Center for Adult Literacy and Numeracy), Institute of Education
13. Passolunghi M C. and L N. S. Siegel 2004 Working memory and access To numerical information in children with disability in mathematics J Exper. *Child Psychol 88(4) 348-367*
14. Pellegrino, Goldman 1987. Information processing and elementary Mathematics. *J Learn Disable* 20:23-32
15. Rotzer, Kucian, Martin, Klaver and Aster 2009 Dysfunctional neural Network of spatial working memory contributes to developmental dyscalculia. *Neuropsychologia* 47 (13)

16. Rubinstein and Henik 2005 Automatic activation of internal magnitudes. A study of developmental dyscalculia. *Neuropsychology 19 (5*)
17. Russell, Ginsburg 1984 Cognitive analysis of children's mathematical difficulties. *Cognition & Instruction 1; 217-244*
18. Sekuler and Mierkiewicz 1977 Children's judgments of numerical inequaility.*Child Development* 48 630-633
19. Shalev R S Gross Tsur V 91993) Developmental Dyscalculia and medical Assessment. *Journal of Learning Disabilities*.