Dyscalculia: A Specific Learning Disability Among Children

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ABSTRACT

Dyscalculia is a broad term for severe difficulties in math. It includes all types of math problems ranging from inability to understand the meaning of numbers to inability to apply math principles to solve problems. Dyscalculia also known as ‘number blindness’ or ‘acalculia’ defined as a cognitive disorder manifested by disturbance of arithmetic ability. Approximately 6% of children who attend school bear from dyscalculia. Students with dyscalculia have difficulties in understanding what numbers mean, remembering math facts, and steps to complete math problems or may have difficulty with visual-spatial concepts used in making patterns or in geometry. They cannot understand basic operations like telling time, using money, addition, subtraction, multiplication and division and more abstract problems (for example, +, -, ×, or ÷). A dyscalculic may only be able to understand a few objects and may require more time to notice a change between groups. A child with dyscalculia will have average or above average intelligence but cannot achieve to that degree in the area of mathematics. It is a challenge to differentiate between a student who is simply struggling in mathematics and a student who suffers from dyscalculia. If the pupil was inclined to a lack of understanding mathematical concepts from the beginning due to poor instruction, this can develop some very unpleasant thoughts from the child’s point of view towards mathematics. This paper highlights that early prediction or identification of math difficulties, combined with well-targeted research based interventions, can diminish or prevent struggle with math learning in many children.

Keywords: Dyscalculia, Number blindness, Learning Disability.
INTRODUCTION

The term ‘Learning Disability’ was first coined in 1963 by Dr. Samuel Kirk, a psychologist, while delivering a speech at an education conference held in Chicago. The National Joint Committee on Learning Disabilities (NJCLD) defines learning disabilities as “a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning and mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction (Richardson SO.1992).

An understanding of how concepts of numeracy develop, and the manifestation of difficulties in the acquisition of such concepts and skills, is imperative. The term Dyscalculia is derived from the Greek word- dys (difficulty) and from the Latin word- calculia

Calculus - A small stone or pebble used for calculation. Essentially it describes a difficulty with numbers which can be a developmental cognitive condition, or an acquired difficulty as a result of brain injury.

Dyscalculia is a specific learning difficulty that has also been referred to as -number blindness, in the same way as dyslexia was once described as -word blindness. According to Butterworth (2003) a range of descriptive terms have been used for Dyscalculia, such as -developmental dyscalculia ,mathematical disability, arithmetic learning disability, number fact disorder and psychological difficulties in Mathematics.

Dyscalculia is difficulty in learning or comprehending arithmetic such as difficulty in understanding numbers, learning how to manipulate numbers, and learning math’s facts. It is generally seen as a specific developmental disorder like dyslexia. Dyscalculia is a mathematical learning disorder where the mathematical ability is far below expected for a person’s age, intelligence and education. Dyscalculia is a broad term that includes many different kinds of difficulties in learning mathematics. Children with Dyscalculia tend to be of normal intelligence. They will be noticed for their math’s difficulties without the accompanying literacy difficulties. Prof. Butterworth suggests that in fact, dyscalculics are really good at doing very complicated maths but still needs help with the basics. Arithmetic learning disorders (developmental dyscalculia) denote circumscribed and outstanding difficulties in the acquaintance of arithmetic skills. Importantly, dyscalculia is not a unitary concept and the associated cognitive profiles might vary widely between and within individuals (Kaufmann and Nuerk 2005; Wilson and Dehaene 2007).

Dyscalculia refers to a range of math learning disabilities. Students with dyscalculia have difficulties in understanding what numbers mean, remembering math facts, and steps to complete math problems or may have difficulty with visual-spatial concepts used in making patterns or in geometry. Dyscalculia may be related to language processing disorders which result in
difficulties learning math vocabulary needed to understand math concepts and to solve more complex problems.

Someone living with Dyscalculia will have difficulty in the areas of math reasoning, computation (addition, subtraction, multiplication and division), math memory, math writing, sequencing and math speaking, as well as visual-spatial orientation. A Dyscalculic will be challenged by both memory and retrieval difficulties, in addition to processing errors and will need to employ coping strategies his entire life. Children with learning disabilities are vulnerable to multiple risks, including persistence of the learning handicap, school dropout, and emotional instability; children with dyscalculia apparently face similar challenges. Therefore, treatment of dyscalculia should address the multiple facets of the disorder while focusing on educational interventions to improve study skills in general and strengthening number perception and arithmetic concepts. Research in this domain indicates that students with learning disabilities can improve their overall study skills and benefit from specific techniques and assistive technology for their individual problem.

**SYMPTOMS OF DYSCALCULIA**

- Difficulty working with numbers
- Confused by math symbols
- Difficulty with basic facts (adding, subtracting, multiplying and dividing)
- Often will reverse or transpose numbers (36: 63)
- Difficulty with mental math
- Difficulty telling time
- Difficulty with directions (as for playing a game)
- Difficulty grasping and remembering math concepts
- Poor memory for layout of things (for example, numbers on a clock)
- Limited strategic planning skills (like used in chess)
- Relies on physical supports such as fingers, tally marks
- Slowness in given answers to math questions
- Difficulty with estimation and approximation

**TYPES OF DYSCALCULIA**

- Verbal (interpretation of verbal math terms)
- Operational (performing basic arithmetic operations)
- Lexical (reading written math terms, symbols)
- Graphical (symbol manipulation)
- Ideognostic (mental calculations)
- Practognostic (pictorial representation)

**CAUSES OF DYSCALCULIA**

Dyscalculia is caused by the dysfunction of mathematical processes and areas in the brain. 6% of the pupil population suffers from dyscalculia, which is about the same number as dyslexics (LDAM, 2005). Studies have shown that numerical magnitude is processed in the intra parietal
sulcus, or the IPS, located in the parietal lobe of the brain. Data suggests that there is a disruption between the activity of the IPS and numerical distance in dyscalculic children (Ansari, 2008). The IPS in dyscalculic children is disconnected or may be somewhat deficient.

**Dyscalculia and cerebral locations**- Developmental abnormalities in both cerebral hemispheres can lead to DD (O'Hare, Brown & Aitken, 1991). Right hemispheric dysfunction leads to difficulties understanding the properties of quantities, spatial learning problems (for example, understanding and using place value) and using arithmetic knowledge to solve real life problems. Left hemispheric dysfunction leads to difficulty comprehending the abstract meanings of numbers, sequencing numerically and maths operations.

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**DYSCALCULIA: WARNING SIGNS BY AGE**

<table>
<thead>
<tr>
<th>Young Children Trouble With:</th>
<th>School-Aged Children Trouble With:</th>
<th>Teenagers and Adults Trouble With:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Difficulty learning to count</td>
<td>1-Difficulty learning math facts (addition, subtraction, multiplication, division)</td>
<td>1-Difficulty estimating costs like groceries bills</td>
</tr>
<tr>
<td>2-Trouble recognizing printed numbers</td>
<td>2-Difficulty developing math problem-solving skills</td>
<td>2-Difficulty learning math concepts beyond the basic math facts</td>
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<tr>
<td>3-Difficulty tying together the idea of a number (4) and how it exists in the world (4 horses, 4 cars, 4 children)</td>
<td>3-Poor long term memory for math functions</td>
<td>3-Poor ability to budget or balance a checkbook</td>
</tr>
<tr>
<td>4-Poor memory for numbers</td>
<td>4-Not familiar with math vocabulary</td>
<td>4-Trouble with concepts of time, such as sticking to a schedule or approximating time</td>
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<td>5-Trouble organizing things in a logical way - putting round objects in one place and square ones in another</td>
<td>5-Difficulty measuring things</td>
<td>5-Trouble with mental math</td>
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<td></td>
<td>6-Avoiding games that require strategy</td>
<td>6-Difficulty finding different approaches to one problem</td>
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The primary aim of this paper is to explore learning difficulties associated with mathematics, particularly dyscalculia and develop intervention module for dyscalculic children. This study aims to determine how to identify and accommodate pupils who struggle with dyscalculia and assess them appropriately. Dyscalculia is a learning disability that affects a child’s comprehension of mathematics and number concepts. Like most learning disabilities, if dyscalculia is not addressed in early childhood, a person may struggle with calculations throughout life.

**ASSESSING FOR DYSCALCULIA**

Tools for assessing dyscalculia are still very limited. To date there are mainly three tools which can be adopted for assessing dyscalculia (Michaelson, 2007). These are:
1- Standardized tests,
2- Direct observation and
3- The Dyscalculia Screener (DS) (Butterworth, 2003).

However, further research is crucial in order to determine the reliability of such identification. Diagnosing pure cases of dyscalculia is difficult as there are many aspects of a child’s developmental stages that may interrupt on their grasp of numeracy.

**TREATING DYSCALCULIA**

**Observation in class:** Observing a child in context provides useful information about the child’s listening skills, motivation, independent learning skills and social skills.

**Evidence provided by the school:** It is helpful to see examples of the child’s work, school reports, IEPs and any records of achievement such as SATs scores, NC and P Levels. It is also important that any other factors that could be contributing to the child’s difficulties are considered such as access to appropriate learning opportunities, possible hearing or visual impairment, poor attendance, changes of school and emotional or motor difficulties.

**Information from Parents/Carers:** Involvement of Parents/Carers is an essential part of the assessment process. They can provide unique and detailed information which contributes to the picture of the whole child.

Help outside the classroom lets a student and tutor focus specifically on the difficulties that student is having, taking pressure off moving to new topics too quickly. Repeated reinforcement and specific practice of straightforward ideas can make understanding easier. Other strategies for inside and outside the classroom include:

- Use graph paper for students who have difficulty organizing ideas on paper.
- Work on finding different ways to approach math facts; i.e., instead of just memorizing the multiplication tables, explain that 8 x 2 = 16, so if 16 is doubled, 8 x 4 must = 32.
- Practice estimating as a way to begin solving math problems.
• Introduce new skills beginning with concrete examples and later moving to more abstract applications.
• For language difficulties, explain ideas and problems clearly and encourage students to ask questions as they work.
• Provide a place to work with few distractions and have pencils, erasers and other tools on hand as needed.
• Help students become aware of their strengths and weaknesses. Understanding how a person learns best is a big step in achieving academic success and confidence.

CONCLUSION

Dyscalculia may arise because of a wide range of factors, from poor teaching, to low socio-economic status, to behavioral attention problems. However, a subset of children with math difficulties, possibly with the most-severe impairments, appears to suffer from a developmental learning disorder that undermines the ability to process basic numerical magnitude information, and that impairment in turn undermines the acquisition of school-level arithmetic skills. This paper discussed about symptoms of dyscalculia, causes of dyscalculia, different types dyscalculia prevailing among children. In conclusion, dyscalculia is indeed a growing concern in the field of education, but unfortunately many are not aware that it is a barrier to a pupil’s performance in mathematics. It is very important that educators recognize the characteristics of dyscalculia early so remedial actions can be taken to help these pupils achieve success in mathematics. Professionals, school tutors, and parents should also be advised to assist children appropriately. Hopefully, with the information provided in this paper, people will have more of an insight of dyscalculia and the necessary procedures that can be taken to help these individuals.

REFERENCE


