

# Mathematical Disability: Dyscalculia & Developmental Dyscalculia

Arvind Dwivedi<sup>1</sup>

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Received 14<sup>th</sup> September 2018 | Revised 8<sup>th</sup> October 2018 | Accepted 19<sup>th</sup> December 2018

## Abstract:

*In present time, world needs us to procedure extraordinary altitudes of mathematical information. Smartphones, computers healthcare and financial data dealing out are just a few of the numerous modern hassles demanding our mathematical smoothness. It is important, for continuous growth of actual quantifiable mathematical and learning methods, that we should recognize the causes of relative incapacitating and extensive mathematical and measured deficiencies. Dyscalculia eventually arises from Developmental Dyscalculia and it can be for of a wide range of causes, from underprivileged type of teaching, to behavioral devotion problems, to low socio-economic status. Though, a subdivision of the kids having problems with mathematics, probably considering very serious lacks, appears to undergo from a growing condition that encounters the skill to procedure of simple mathematical amount of information. Several essentials like informative knowledge, IQ and other, incentive and reasoning aptitudes may deteriorate or test the development of mathematical ability abilities, one chief probability weakness is a growing disorder of learning that is precise to proficiency. The term Developmental Dyscalculia (DD) is considered as a disorder of learning that definitely alter the competence to reach the arithmetic skills related to school-level. The resulting article will summarize the existing condition of knowledge concerning DD, depict from a variability of experimental studies. In order to cover its awareness importance, things that has been outlined are behavioral characteristic, causes, difficulties, and focused the status of individual among primary and secondary DD in upcoming research connecting with the Dyscalculia.*

**Keywords:** *Dyscalculia, Mathematics, Struggle, Problem, Developmental Dyscalculia.*

## Authors:

1. Atarra Post graduate college Atarra, Uttar Pradesh, INDIA.

## Introduction

What is Dyscalculia and Developmental Dyscalculia?

Dyscalculia is kind of unique and explicit learning problems. There occurs a diversity of descriptions of dyscalculia. The variances in definitions imitate the different speculative and research viewpoints of diverse experts. Some experts define dyscalculia in terms of an underlying alleged genetic, constitutional or neuroanatomical ingenuousness in particular areas of the brain. While some definitions of dyscalculia are more wide-ranging and do not accept any genetic or underlying neuroanatomical factor. Dyscalculia is universally expressed as a disorder that disturbs the competence to attain mathematical skills. The beginners of Dyscalculics may have trouble understanding simple number perceptions, have problems in learning facts about number and processes and lack an instinctive grasp of numbers. Also if they yield a correct solution or use a precise process, they may do so automatically and deprived of self-assurance (**Appleford School**).

Developmental Dyscalculia (DD) is an illness of learning, disturbing the ability to attain school-level calculation skills and can possibly occur 3-6% of individuals among the population. Development in understanding the cause of DD seems the only option in order to overcome the problem. On the other hand, the current years have observed noteworthy development in the field, and an increasing body of neuroimaging and behavioral signal now consider to a fundamental scarcity in the depiction and treating of mathematical amount of information as a possible core inadequacy in DD. Addition with that, the formation of the current development in considerate Developmental Dyscalculia is the return of a difference between both the 'primary' and 'secondary' DD. The primary seems to deal with the compact growth of mechanisms of brain for treatment of mathematical stage of information, and later, references to mathematical deficiencies limiting from external effects like low socio-economic position, poor teaching, and behavioral courtesy problems or intellectual deficits as well as domain-general reasoning. The enlarged awareness of this variation accepted for further, in consolidation with longitudinal empirical research, deals with the abundant potential for ranging our empathetic of the illness and developing actual learning interventions. (**Price and Ansari, 2013**)

What are the grounds of Dyscalculia?

Research for investigating dyscalculia and its possible causing are least known because of least researches. For many of those experts who study that dyscalculia is a term reserved for definite individuals who do not have one or more of the factors that are already known, dyscalculia is well-thought-out to have a genetic factor. As for example, if one identical twin bears dyscalculia then there are chances of 70% that his twin will also be Dyscalculic, while for non-identical twins the likelihood is 55% only. These statistics designate that inheritance shows vital part but is not the complete answer to the actual problem. There is some immaturity in the inferior parietal cortex and its interconnections with further areas of the brain. (**Appleford School**).

Dyscalculic Learner Features:

Dyscalculic beginners may show diverse personalities. They basically express no impression for numbers, pitiable skill to estimation and cannot even recognize whether an answer to a mathematical charge is sensible or not. The problems skilled by Dyscalculic beginners also comprises- remembering number evidences, , subitizing, including backward, estimating appreciative, sequencing and applying the concept of time, considerate money, way (left/right) and even occasionally noticing number arrangements and understanding and smearing calculation language also. Mathematics Nervousness may also have a critical part in the method these beginners make for the reason that it may block their skill to include in mathematics tasks. These adverse approaches may delay Dyscalculic beginners from the achievement of their full prospective. (**Zerafa, 2013**)

Behavioral Features

Conventionally, the defining features of DD have been defined as reduced recovery of mathematics realities from memory and tedious use of undeveloped control approaches. Though, a increasing body of behavioral and neuroimaging sign, developing over the previous period may propose that DD may be fixed in lacks of a neurobiological system for treating numerical levels and that it is this damage that, over the sequence of development and knowledge, gives development to the difficulties in the recovery of mathematics truths. Discussion still happens, yet, as to the part of the

territory of universal reasoning factors, like spatial consideration or working-memory, in the etiology of DD. (Price and Ansari, 2013)

## Arithmetic

The maximum reliably practical interactive symbol of DD is reduced arithmetic detail recovery. Typically developing children experience an evolving shift in their control tactics. They initiate by solving modest problems finished technical methods like counting, but eventually with the next coming grades, they already have established a stock of arithmetic truths in their memory, from which they can rapidly memorize the solution for specific given problem. While children with DD, typically flop to grow in fluent fact-retrieval mechanisms, unending into employ procedural approaches long after their typically emerging peers have developed to memory-based strategies. As a pointer of the severity of the fact-retrieval shortage in DD children. Naturally emerging children have been found to evoke a regular of three periods as many mathematics facts as those with DD (Price and Ansari, 2013).

## Processing Of Basic Number

In early works to observe undeveloped arithmetical handling in children regarding calculated learning complications. It was stated that typically emerging children don't display the similar intrusion from arithmetical information while trying two numbers obtainable in varied formats are same or not. The degree of numeric information is not inspired mechanically in DD children as it is in their naturally developing peers. The proposal of compact involuntary initiation of semantic numerical illustrations in DD. Absence of help from arithmetical evidence in DD kids at the time of numerical Stroop task. Absence of default processing the arithmetical information does not this one agree whether the important semantic description is summary, or whether there is a lack in the relation among the semantic illustrations and their symbolic referents (Price and Ansari, 2013).

## The mathematical language

Math's thinking is to a significant extent which is dependent on the language that is used in mathematics. This language prerequisites to be learned carefully in order for a child to be effective in math. For example, the division sign ( $\div$ ) can be defined in the following words 'divide', 'division', 'goes into', 'share', 'group', 'split', 'apportion',

'quotient' etc. In the same way, the number 3 can be described as follows 'three', 'one third', 'treble', 'triple', 'tri-', etc. (Appleford School).

## Anxiety

When it comes to math, even in the time where sophisticated technologies rule human mind many people still face difficulties in mathematics and is what we might call a mathematical anxiety. This is typically a secondary reaction to the child observing himself to be poor at math. It can be a collective problem which is self-reinforcing like, the more the child fails, the more nervous he gets, which then leads to more disappointment and depressed self-esteem. (Appleford School).

## Signs of Dyscalculic Children in Pre-School:

- Has anxiety knowledge to count, particularly once it approaches to allocating an amount to items in a group.
- Takes distress differentiating numeral signs.
- Has to consider extreme efforts for connecting a quantity to a real-life state.
- Takes anxiety learning numbers and escapes numbers time-consuming after other children of the similar age can count and think of figures in the correct order.
- Discover it tough to identify designs and categorize the items by size shape, or color.
- Playing games is avoided and involve counting, number, or type of other action that comprises calculated concept.

## Primary School Symbols of Dyscalculia in:

- Suffer while recognizing symbols and statistics. Such as creation of linking among '8' and the word 'eight'.
- Takes pain in writing numbers visibly or setting them in the right teaching or the right column.
- Takes anxiety considering with a plan to resolve a problems of questions related to math.
- Fight to recognize the words connected to math like 'less than' and 'greater than'.
- Have anxiety influential leftward from rightward and has a bad logic of direction.

- Takes exertion memorizing game scores and moreover contact numbers.
- Difficulty to classify the symbols of mathematics such as +, -, ×, ÷ and hence in utilizing them appropriately.
- With the help of fingers to calculate in its place of utilizing more erudite approaches.
- Takes anxiety in influential the time.

## High School and adults Symbols of Dyscalculia:

- Nervousness when it relate with counting and numbers.
- Struggles to apply mathematical concepts in everyday life. This comprises currency matters such as approximating the complete cost, working out a tip and working exact change.
- Takes anxiety determining things such as elements in a simple recipe. Would cover difficulty to dual or split amounts in a recipe.
- Fights with conclusion their method about and doubts about receiving lost.
- Face a tough time in miserly information observed on charts or graphs.
- Takes distress finding result of dissimilar methods to the similar problem of math.
- With absence of self-assurance in actions that need for guessing distance and speed, like learning to drive and playing sports.
- Put efforts to deliver scales like thermometers. ([www.dyslexiascotland.org.uk](http://www.dyslexiascotland.org.uk))

## Review of Literature

**Kosc (1974)**, discussed about the brain disorder that is dyscalculia and its development. This brain disorder cause difficulty in solving mathematical problems. Dyscalculia is varied from the other disabilities of the mathematics. The dyscalculia development is categorized as follows: lexical, verbal, diagnostical, prognostic, graphical and operational developmental dyscalculia. Kosc worked on eleven years old students from different schools like Bratislava and Czechoslovakia for finding the abilities and disabilities of mathematics. They also performed different tests for measuring the symbolic

functions in 66 suspected persons having dyscalculics with normal IQs. The outcomes of the applied tests were described briefly as: only 6% students from normal population have the sign and symptoms of developmental Dyscalculia.

**Rubinsten and Tannock (2010)**, explained about the negative response towards the mathematics which give the deleterious effects on the performance of mathematics in the common population. Though, the supposition that the math performance creates math anxiety directly which is not authenticated yet. Hence, the primary role is to investigate the impact of mathematics anxiety in performing the mathematical calculation and problems in children with specific insufficiencies in the gaining of math skills through the use of original affecting priming task as a secondary degree. Numerous studies have been done which concluded that the relationship between math anxiety and math achievement are negative. For example, it is found that the achievement in the low mathematics can leads to the high mathematics anxiety but initial mathematics anxiety not seem having the strong linkage with low mathematic achievement. After the analysis with primary school children, it was noticed that there was no clear relation between the mathematics calculation and anxiety aptitudes. In many publication of structural equation modeling, math anxiety does not have any effect on calculation ability. In the present work, our principle is that in Developmental Dyscalculia (DD; an insufficiency in processing numerical data) poor initial math skills may lead and give rise to math anxiety, generating a nasty series.

DD responded person are proceeded by negative primes as well as math related primes. An inverted outline was perceived in the control group. According to their outcomes, there is relation among arithmetic, emotion and low achievement in mathematics. They also proposed that arithmetic-affective briefing might be used as an ancillary measure of mathematics anxiety. Though not clearly discoursed or systematically studied, mathematics anxiety is thought as precise to math framework and hence different and happening in the deficiency of widespread anxiety who prolonged expectations about generalized anxiety and functioning reminiscence to mathematics anxiety. Accordingly, mathematics anxiety appears to be a very predominant individuality approach.

**Doyle (2010)**, examined the cognitive, neurological, and environmental characteristics of dyscalculia, specific learning difficulty in processing the numerical notions. The literature review regarding the etiology of dyscalculia, assessment and analysis methods, the global frequency of this situation and occurrence and type of intrusion plans are involved. In addition, the nature of dyscalculia was examined in the Irish framework, regarding the (a) the Mathematics curriculum structure, (b) learning support access, (c) fairness of Mathematics curriculum access, (d) sensible lodgings and State inspections, and (e) suggestions for conversion to higher education. Delivery of Mathematics provision in third level institutes is discoursed with the purpose to highlight features of best exercise which can be applied to other educational contexts. (PDF) Dyscalculia and mathematical problems: Suggestions for the changeover to Higher Education.

**Kaufmann et al. (2013)**, developing dyscalculia (DD) and its action are getting growing research consideration. According to UK, 22% of adults have mathematical problems adequate to enforce serious occupational and practical limits. It is improbable that all of these entities having mathematical problems have DD, but standards for diagnosing and detailing dyscalculia continue uncertain. Also, they mutual that, DD is often we consider, imperfectly-measured a mainly similar illness and supporter a developmental and differential perception on DD absorbed on identifying behavioral, cognitive, and neural sources of individual differences that contribute to our understanding of what DD is and what it is not.

The arithmetic problems can reproduce individual changes in both non-numerical functions and numerical functions. The numerical functions include numerous features of “number sense” like, comparing numerical amounts signified non-symbolically, spontaneous directing on the number, handling numbers, or connecting non-symbolic representations to symbols such as number words and Arabic numerals. These discrete changes in “number sense” may reproduce the alteration in neural paths elaborate in level quite basic features of numerical reasoning like single digit arithmetic. The studies of useful beginning through magnitude comparison reflect growing disparities over time and propose difference in expansion as good as but postponed courses.

**Skagerlund et al. (2014)**, the discussed about the examination about the developmental dyscalculia (DD) occurring children with diverse outlines of mathematical shortages has the different or similar perceptive backgrounds. The defective estimated numeral method of assumption and the contact shortage hypothesis were verified with the help of two diverse assemblies of kids’ having DD i.e. with age range up to 11–13 years old reflecting a category having arithmetic fact dyscalculia i.e. AFD and a category having general dyscalculia (GD). Numerous altered features of number amount handling were evaluated in the two groups and associated with age-matched naturally accomplishing children. The general dyscalculia type showed flaws with both non-symbolic and symbolic as well as amount processing, however the group named AFD showed difficulties concerning with representative number processing. These results offer evidence that the backgrounds of DD in children with dissimilar outlines of calculated problems separate. The children suffering with GD have deficiency in the inborn estimated number structure, while children suffering with AFD shows an access shortage. These conclusions have suggestions for assortment events of researchers when learning dyscalculia, as well as experts in the educational setting.

**Zerafa (2014)**, described Dyscalculia as a detailed learning trouble which hampers learners from emerging the basic amount of ideas which are required for getting hold of arithmetic. This work focused to discover approaches which would support children with dyscalculia cover up with some of their hurdles. 15-minute sessions were agreed out with every child, with the help of Catchup Numeracy programme. The Post-assessment was then carried out. The conclusion recommended that suitable interference can allow dyscalculic beginners to confirm at obtaining the basic concepts required for learning of mathematics. Moreover, it was considered that related involvement could significantly focused the major domain of children, developing a more positive attitude and raising self-esteem to the learning of mathematics. The learners of Dyscalculic exhibit numerous different mannerisms. Though, this specifies as they frequently and commonly have ‘no feel for numbers’, poor capability to calculate and cannot appreciate whether a result to a mathematical task is sensible or not. The problems practiced by dyscalculic learners comprise: estimating, subitising,

understanding and applying the concept of time, counting backwards, remembering number facts, considerate money, sequencing, direction (left/right), observing number patterns and considerate and relating language of mathematics. These conclusion authorize other research with the help of Catchup Numeracy programme and other programme which emphasizes on numerical knowledge and comparable conceptual. The detailed work on involvement approaches is certainly critical but it appears that with the right involvement of strategies helpful in inspiring results may be noted. Mathematics Anxiety plays a significant part in the way of these learners accomplish with the reason it may hunk their capability to involve in mathematics responsibilities.

### Conclusion

The focused disorder i.e. named as ‘primary developmental dyscalculia,’ must not be overlapped with ‘secondary developmental dyscalculia,’ which discussed to the mathematical inadequacies stopping from outside influences like the one detailed in the

above discussion. In its place, the primary DD is connected with the decreased expansion of the mechanism of brain for production out mathematical amount of information and is thus resolute by endogenous neurodevelopmental essentials. It is also considered that examination in this sector is in comparative beginning while comparing to research examining regarding growing dyslexia, and hence, developed to date is stimulating, considering possibilities of profitable upcoming remunerations. The important steps in make the most of the conclusions of present work and are for further studies to emphasis on the fundamental association i.e. 11 Price and Ansari: Dyscalculia Published by Scholar Commons, 2013 among mathematical amount of treating and further skills of math, and on the part of of growth in the intention of real interference tools. The importance detailed about the intellectual causes for DD are recently badly unstated. It is important to bestated that DD frequently co-occurs through other problems related to learning like Attention Deficit Hyperactivity Disorder (ADHD) and Developmental Dyslexia.



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