



## THE MATHEMATICAL SKILLS EXHIBITED BY DYSCALCULIA LEARNERS

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### *Abstract*

*This study is aimed to identify the Dyscalculia learners and to test their Mathematical Skills, Mathematics is a group related science, including algebra, geometry, and calculus; concerned with the study of number, quantity, shape, space and their interrelationships by using a specialized notation. Hence, the mathematical skills are considered for the study there are Arithmetic & Numerical Skill, Algebraic Skill, Geometrical Skill, Statistical Skill, Mathematical Linguistic Skill, and Logical Skill. The skills are assessed using Mathematical Skill questioners. Dyscalculic learners are identified using Dyscalculia Test; they may have difficulty in understanding simple number concepts, lack of an intuitive grasp of numbers, and have problems of learning number facts and procedures. For the present study 300 samples of IX standard students were collected using random sampling technique, among them 150 is found to be mathematically disabled / dyscalculia learners. The demographic variables such as Gender, Medium of Instruction and Type of School are analyzed with the research variable and arrived the major findings that there exist a significant difference between the groups and also there exist a significant relationship among the mathematical skills. Boys exhibit better Arithmetic & Numerical Skill, Statistical Skill, and Logical Skill and Girls exhibit better Geometrical Skill and Mathematical Linguistic Skill. Students who are studying in private institution are good in all mathematical skills compared to others. Dyscalculia learners are positively correlated in entire dimensions of mathematical skills.*

**Keywords:** *Mathematical Skills, Dyscalculia Learners*

### **INTRODUCTION:**

Mathematics is the mother of all sciences. The world of people cannot survive without application of Mathematics in day to-day life. Nature is the greatest Mathematician, many Mathematical concepts, pattern, laws, etc. are observed in the nature. Human needs are

related to different aspects of Mathematics in everyday life. Every person needs knowledge of Mathematics in day to day life for various purposes. Hence Mathematics learning is indispensable for successful living and survival of fittest.

All children must learn Mathematics to face the challenges of their life. Mathematics is made an essential subject from the beginning of the school education itself, school student had a fear psychosis towards mathematics. But since last few decades to make the elementary education a fundamental right for all children, treatment of the subject was made as far as possible learner friendly and relevant to child's real life situation. Accordingly all over the world Mathematics education in school, particularly at elementary stage has made a remarkable reformation by reforming curriculum, renewing textbooks and changing teaching-learning process.

Math knowledge, interest, and skills are basic to children's success in school and later life. Early math skills are highly predictive of later academic achievement in multiple subject areas. In the domain of Mathematics Knowledge and Skills, programs need to ensure that children who are dual language learners can demonstrate their abilities, skills, and knowledge in any language, including their home language.

The field of learning disabilities is the newest challenging sub area of the broader field of special education. Research indicates that social skill deficits are common in students with Learning Disabilities and that these deficits have a negative effect on learning disabled students relationship with both peers and teachers, as well as on their ability to function in the regular classroom environment (McConaughy et al, 1986).

### **Dyscalculia**

The term dyscalculia (from the Greek “dys” and latin “calculia”) means to count badly and is used to describe people who have difficulties with numbers. Compared to other learning difficulties, such as dyslexia, dyscalculia has received little attention from the scientific community, and the familiarity of the general public with this problem is relatively low (almost as if being bad at math is normal). However, it has been shown that dyscalculia can have a major and long lasting impact on one's life.

Dyscalculia is sometimes called number blindness. It is the name given to the condition that affects our ability to acquire arithmetical skills. Mathematics is a complex subject, involving language, space and quantity. Much research into the development of mathematical skills has focused upon counting or arithmetic, but even at early levels many complex abilities are involved in other skills viz.,

- (i) Understanding number words (one, two, twelve, twenty,) numerals (1, 2, 12, 20) and the relations between them.
- (ii) Being able to carry out mental arithmetic using the four basic arithmetical operations – addition, subtraction, multiplication and division
- (iii) Being able to carry out written multi-digit arithmetic using the four basic operations
- (iv) Being able to solve ‘missing operand problems’ ();
- (v) Being able to solve ‘word problems’ which set arithmetical
- (vi) Problems in realistic contexts, particularly using money and change.

National Joint Committee for Learning Disabilities (1981) defines, Learning disabilities is a generic term that refers to 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. Even though a Learning Disability may occur concomitantly with other handicapping conditions (such as sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (such as cultural differences, insufficient or inappropriate instruction, psychogenic factors), it is not the result of those condition or influences.

Dyscalculic learners may have difficulty understanding simple number concepts, lack of an intuitive grasp of numbers, and have problems of learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence.

### **Typical Symptoms of Dyscalculia**

- **Counting:** Dyscalculic children can usually learn the sequence of counting words, but may have difficulty navigating back and forth, especially in twos and threes.  
Calculations: Dyscalculic children find learning and recalling number facts difficult. They often lack confidence even when they produce the correct answer. They also fail to

use rules and procedures to build on known facts. For example, they may know that  $5+3=8$ , but not realize that, therefore,  $3+5=8$  or that  $5+4=9$ .

- **Numbers with zeros:** Dyscalculic children may find it difficult to grasp that the words ten, hundred and thousand have the same relationship to each other as the numerals 10, 100 and 1000.
- **Measures:** Dyscalculic children often have difficulty with operations such as handling money or telling the time. They may also have problems with concepts such as speed (miles per hour) or temperature.
- **Direction/Orientation:** Dyscalculic children may have difficulty understanding spatial orientation (including left and right) causing difficulties in following directions or with map reading.

### **Problem of the Study**

The problem of the study is to analyze different Mathematical Skills exhibited by Dyscalculia Learners

### **Need for the Research**

Children of today are the citizens of tomorrow, and they are going to be the pillars of the nation. Hence it is essential to ensure that each pillar as a stronger one. Moreover, we cannot think of bringing about optimum human resource development without uplifting all categories of backward students. There is every possibility that each classroom has some learning disabled students. These students come to school regularly but they are likely to become dropouts, if their educational needs are not adequately met. The fact that the learning disabled students have near normal, normal or above normal intelligence envisages that these students should be identified as early as possible so that required intervention strategies can be planned at the earliest.

Mathematics has its roots deep in the soil of everyday life and it is basic in our highest technological achievements; almost every aspect of life is related with mathematics and its application. Indeed mathematics is abstract and the most hypothetical of science and hence it poses varied problems in learning mathematics.

Mathematics disabilities in students with normal mental ability have been recognized that they have never received the degree of attention that reading disabilities have received.

Various authors whose works provided suggestions relative to mathematics disabilities were primarily concerned with students considered to be brain injured. It is Johnson and Myklebust (1967) for the first time provided specific educational suggestions for normal students with mathematics problems without emphasizing the characteristics of brain injury. Since time, various authors have provided a section or chapter on the types of arithmetic or mathematics problems the backward children may experience and how to teach arithmetic skills.

Disability with Mathematics Learning, students need not spend their instructional time on acquisition of mastery in algebra, geometry and trigonometry. On the other hand, their valuable classroom time should be spent on mastery of those skills that are very much needed in adult life. Numeration, computation, measurement, problem solving and survival mathematics are the primary important skills to any student.

### **Objectives of the Study**

The objectives of Study are:

- To evaluate the performance of Dyscalculia Learners in Mathematical Skills.
- To identify Gender difference in different Mathematical Skills of dyscalculia learners.
- To find out the influence of Medium of Instruction on Mathematical Skills of dyscalculia learners.
- To study the Dyscalculia Learners studying in different Type of School and their Mathematical Skills.
- To study the relationship between different Mathematical Skills exhibited by Dyscalculia learners.

### **Hypotheses of the Study**

- There is no significant difference between Boys and Girls in performing Mathematical Skills.
- There is no significant difference between Tamil and English Medium students in different Mathematical Skills
- There is no significant difference between different Type of Schools in Mathematical Skills.
- There is no significant relationship between different Mathematical Skills.

## **Methodology**

Among the different methods of study, Normative method is used in this research. Normative survey method describes and interprets the present study. The investigator selected Secondary students (Standard IX) of Kancheepuram & Chennai District by using systematic random sampling technique in collection of data from students.

## **Variables in the Study**

The Mathematical Skills which consists of six dimensions viz., Arithmetic & Numerical Skill, Algebraic Skill, Geometrical Skill, Statistical Skill, Mathematical Linguistic Skill, and Logical Skill

Dyscalculia Test consists of ten areas viz. Mathematical Terms, Mathematical Symbols, Computation, Word problems, Visual Perception, Measurement, Money & Time.

## **Population of the Study**

The study complies 300 samples were collected from 10 different schools. The samples were selected at random. Samples were drawn from 9<sup>th</sup> Std students in and around Kancheepuram & Chennai District. From those 300 Samples, 150 are identified as a Mathematically Disenabled learners and which is used for the data analysis.

## **Tools Used**

The Mathematical Skills Questioner was constructed and validated by the investigator and guide. The questioner consists of 90 items, it is divided into six dimensions viz., Arithmetic & Numerical Skill, Algebraic Skill, Geometrical Skill, Statistical Skill, Mathematical Linguistic Skill, and Logical Skill and each dimension consist of 15 items, each item provided by objective type with four options.

The Dyscalculia Test consists of 10 different areas viz., Number Recognition, Basic Number Facts, Sequencing, Left-Right Recognition, Mathematical Terms, Mathematical Symbols, Computation, Word problems, Visual Perception, Measurement, Money & Time. Hence totally The Dyscalculia Test consists of 150 items. It is a test to diagnose the disabilities/difficulties faced by pupils in Mathematics. The tool is adapted (Malini Menon. P, 2002) and modified by the investigator and used for the present study.

The low achiever in Mathematics are screened by getting achievement score (School Exam Mark) in all subjects were collected from that those who are possess low achievement in Mathematics and also in Dyscalculia Test as well are considered, as a Learning Disabled in Mathematics or Dyscalculia Learners.

### Analysis of Data

**Table 1** - Dyscalculia Learners in relation to Mathematical Skills

Research Variable	N	Mean	Standard Deviation	Mean Percentage
Arithmetic & Numerical Skill	150	7.35	3.04	49.00
Algebraic Skill	150	6.48	0.48	43.18
Geometrical Skill	150	6.99	2.27	46.69
Statistical Skill	150	7.66	1.55	51.03
Mathematical Linguistic Skill	150	6.86	1.53	45.71
Logical Skill	150	7.57	2.13	50.44
<b>Total Mathematical Skills</b>	<b>150</b>	<b>42.90</b>	<b>4.60</b>	<b>47.67</b>

The perusal of Table 1 reveals that the Mean and Standard Deviation of the Total Mathematical Skills for the Entire Sample were 42.90 and 4.60 respectively.

**Table 2** – Dyscalculia Learners in relation to the Mathematical Skills with respect to Gender.

Research Variable	Boys (N = 69)		Girls (N = 81)		t value
	Mean	SD	Mean	SD	
Arithmetic & Numerical Skill	7.63	3.12	6.62	2.84	2.07*
Algebraic Skill	6.50	0.43	6.46	0.52	0.47
Geometrical Skill	7.16	1.68	7.95	1.86	2.73**
Statistical Skill	7.97	1.51	7.47	1.60	1.98*
Mathematical Linguistic Skill	6.33	1.64	6.98	1.44	2.55*
Logical Skill	7.92	2.04	7.18	2.21	2.12*
<b>Total Mathematical Skills</b>	<b>42.51</b>	<b>4.70</b>	<b>44.23</b>	<b>4.51</b>	<b>2.28*</b>

\*\* Significant at 0.01 level

\* Significant at 0.05 level

From the Table 2, the t- value calculated for Total Mathematical Skills & its dimension with respect to Gender it is found that Boys and Girls differed significantly in Total Mathematical Skills and its entire dimensions except Algebraic Skill.

**Table 3** - Dyscalculia Learners in relation to the Mathematical Skills with respect to Medium of Instruction.

Research Variable	Tamil Medium (N = 73)		English Medium (N = 77)		t value
	Mean	SD	Mean	SD	
Arithmetic & Numerical Skill	8.06	2.79	6.68	3.13	2.86**
Algebraic Skill	6.49	0.49	6.70	0.47	2.59*
Geometrical Skill	6.95	1.48	6.22	2.81	1.99*
Statistical Skill	7.35	1.64	7.98	1.47	2.47*
Mathematical Linguistic Skill	7.00	1.47	6.52	1.08	2.26*
Logical Skill	7.41	2.02	8.09	2.11	2.03*
<b>Total Mathematical Skills</b>	<b>42.06</b>	<b>4.06</b>	<b>43.49</b>	<b>4.08</b>	<b>2.16*</b>

\*\* Significant at 0.01 level

\* Significant at 0.05 level

From the Table 3, the t- value calculated for Total Mathematical Skills and its dimension with respect to Medium of Instruction it is found that Tamil Medium and English Medium students differed significantly in Total Mathematical Skills and its entire dimension.

**Table 4** - Dyscalculia Learners in relation to the Mathematical Skills with respect to Type of Institution.

Research Variable	Govt School (N = 58)		Aided School (N = 49)		Private School (N = 43)		F ratio	Groups Differed Significantly
	Mean	SD	Mean	SD	Mean	SD		
Arithmetic & Numerical Skill	7.06	2.09	7.97	2.26	7.08	3.05	3.10*	(1,3)
Algebraic Skill	6.25	0.49	6.46	0.46	6.24	0.47	3.70*	(1,3)(2,3)
Geometrical Skill	6.49	2.11	7.43	2.08	6.91	1.85	3.82*	(1,3)
Statistical Skill	7.45	1.82	7.85	1.44	7.03	1.29	3.62*	(2,3)
Mathematical Linguistic Skill	6.04	1.60	6.72	1.64	6.75	1.32	3.68*	(1,3) (1,2)
Logical Skill	6.76	2.03	7.97	2.24	7.02	1.88	3.90*	(1,3) (2,3)
<b>Total Mathematical Skills</b>	<b>41.06</b>	<b>4.64</b>	<b>42.99</b>	<b>4.65</b>	<b>43.94</b>	<b>4.29</b>	<b>3.96*</b>	<b>(1,2) (1,3)</b>

\* Significant at 0.05 level

From Table 4 it was found that the Total Mathematical Skills was high (43.94) for the students who are Studying in Private School and the same was low (41.06) for those whose are Studying in Government School. Further analysis of difference between Type of School



Institution tested through Turkey-HSD reveals that the Total Mathematical Skills of the Students who are studying in Government School differed significantly with Students who are studying in Aided and Private School. Were the students who are studying in Government School was scored less than those of Aided School and Private School. Whereas the Students who are studying in Aided and Private School did not differ significantly with one another even at 0.05 level.

**Table 5** - Relationship between Total Mathematical Skills and its dimensions

Total Mathematical Skills Vs	Correlation Value (r)	Remark
Arithmetic & Numerical Skill	0.610**	High Correlation
Algebraic Skill	0.015	Negligible correlation
Geometrical Skill	0.419**	Marked Correlation
Statistical Skill	0.285**	Slight Correlation
Mathematical Linguistic Skill	0.484**	Marked Correlation
Logical Skill	0.457**	Marked Correlation

**\*\* Significant at 0.01 level**

From the Table 5 it was found that the Total Mathematical Skills is positively correlated with its entire dimensions except Algebraic Skill.

### Findings

- Gender wise analysis reveals that Boys show better Arithmetic & Numerical Skill, Statistical Skill and Logical Skill. Girls show better Geometrical Skill, Mathematical Linguistic Skill and Total Mathematical Skills.
- Analyzing Medium of Instruction it reveals that Tamil Medium Students show better Arithmetic & Numerical Skill, Geometrical Skill, and Mathematical Linguistic Skill. English Medium Students show better, Algebraic Skill, Statistical Skill, Logical Skill and Total Mathematical Skills.
- Analyzing Type of Institution it reveals that, in Total Mathematical Skills and its entire dimension except the Statistical Skill the Students who are studying in Government School differed significantly with Students who are studying in Private School.

- It is also found that, in Total Mathematical Skills and Mathematical Linguistic Skills Students who are studying in Government School differed significantly with Students who are studying in Aided School.
- It is also found that, in Algebraic Skill, Statistical Skill and Logical Skill Students who are studying in Aided School differed significantly with Students who are studying in Private School
- From the correlation analysis it is found that there is a significant positive relationship between Total Mathematical Skills and its entire dimensions except Algebraic Skill.

### **Discussion**

Form the mean value it's clear that the dyscalculia Learners shows a low Mathematical Skill and among the Boys and Girls, Boys should be given practice in Geometrical Skill & Mathematical Linguistic Skill and Girls need to trained in Arithmetic & Numerical Skill, Statistical Skill and Logical Skill. By nature girls are good in shape formation so only they are making nice rangolis, and also they are good in language fluency hence they exhibit better geometric and mathematical linguistic skill than boys.

Language problem is less for the students who are studying in Tamil medium it's because they can understand word problems better by studying through mother tongue, hence the language problem less for them compared with studying through other language. Students studying in English medium should develop better Mathematical Linguistic Skill, Geometrical Skill, and Arithmetic & Numerical Skill and also the students who are studying through Tamil medium should be trained to develop Algebraic Skill, Statistical Skill and Logical Skill

The student in private institution shows better mathematical skills in all dimension compared with students from other schools. It's because private schools are providing various subject related opportunities to develop their skills and which is lack in other schools hence they exhibit better mathematical skills than others

The relationship between Total Mathematical Skills with its entire dimensions shows that, except Algebraic Skill entire dimensions positively contributed to Total Mathematical Skills. Hence if we concentrate to give practice according to the individual need and lackness they can be able to attain better mathematical skills and which lead them to treat their disability in learning mathematics.

## **Educational Implication**

Preparing students for continued education, adult responsibilities, independence and employment have always been the goals of school education. In examining the dyscalculia learners a variety of educational techniques and procedures will be needed to improve the educational and social need and progress of the dyscalculia learners.

The research in mathematics education has laid great emphasis on looking for the elusive best method. This research has paved the way of formulation of certain basic principles for the teaching of mathematics, but the work has not led to any statement of the best method, or the characteristics of the best teachers. Two of the basic principles that serve as guides for teaching both normal and backward students are the need for a logical constructed sequence of mathematical content, and the benefits of making use of concrete manipulative in order to facilitate retention and transfer of concepts and skills learned. In addition to those two, individualization of instruction is also very effective to learning disabled students.

## **Conclusion**

Many skills that the adults need and use in daily life have a basis in mathematics and the teachers should emphasize the utility value of mathematics in day to-days life. It is indispensable that varied mathematical skills are needed for our survival that is they required in one's life. The teachers of learning disabled learners should, incorporate adequate activities in their instructional programmes to develop such skills which is needed for survival.

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