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CHARACTERISTIC SYMPTOMS OF CHILDREN WITH LEARNING DISABILITY IN RELATION TO COGNITIVE FUNCTION

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ABSTRACT

According to Duncan et al. (2007), mathematics aptitude before to entering school is one of the greatest indicators of educational performance. This is because arithmetic is an essential skill in a contemporary society. The expenses associated with inadequate numeracy are difficult to determine, although they are significant. had been projected to amount to 763 million pounds annually inside the United Kingdom alone (Every Child a Chance Trust, 2009). Low numeracy might be associated to special seducational requirements, school failure, antisocial conduct etc.

Keyword: Low numeracy, contemporary society, mathematics aptitude,

INTRODUCTION

On the other hand, it is widely accepted that a lack of numeracy is not the only element that contributes to juvenile delinquency; rather, it is seen to be a component of a causal jigsaw that incorporates scholastic failure for the person, which is a risk factor. Therefore, difficulties in mastering fundamental mathematical concepts like arithmetic might potentially result in significant financial burdens for both the individual and society. Mathematical

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learning disability (MLD), also known as developmental dyscalculia (DD), mathematical disability (MD), and mathematical difficulties are all different names for the same phenomenon.

This phenomenon refers to difficulty in learning fundamental arithmetic or mathematics. MLD, or multiple lupus dysfunction, will be used throughout the rest of this thesis to refer to these challenges; nevertheless, there are a number of diverse perspectives on the factors that contribute to the development of MLD. A lack of numeracy may be the consequence of a wide variety of factors, such as inadequate education, an unfavorable family situation, or an untalented cognitive temperament. MLD is a term that may be used to describe the cognitive characteristics that are associated with deficient numeracy. What specific aspect of a person's cognitive capacity serves as the basis for numeracy? Existe-t-il un seul déficit qui sous-tend la MLD, or la MLD est-elle le résultat de plusieurs déficits? The collection of information concerning \sMLD might enable initiatives that would save our community both money and \shuman resources. To analyze these sorts of concerns, we first need to \sexamine the ideas around the cognitive skills that serve as the \sfoundation of arithmetic ability.

What are the underlying processes that lead to the development of children's arithmetic skills? How do young toddlers conceptualize and work with numbers? Which cognitive processes are necessary for the development of a child's mathematical ability? The following paragraph will discuss a number of pertinent hypotheses that provide explanations for concerns of this kind.

The capacity to represent numbers (for example, sets of things) in an analog magnitude way is not unique to humans; other animals possess this ability as well (Carey, 2009; Dehaene, 2011). The approximation number system (ANS) refers to the nonverbal capacity to communicate numerical quantity in an approximative manner (Butterworth, 2010; Dehaene, 2011; Feigenson, Dehaene, & Spelke, 2004; Piazza, 2010). The representation of numbers is contingent on the ratios between the elements; for instance, a set consisting of six things may be discriminated from a set consisting of eighteen items in humans right after birth (Izard, Sann, Spelke, & Streri, 2009). The capacity to differentiate between the ratios of 1:3 and 2:3 is one indication that the adult neural system (ANS) evolves very quickly during the first year of development. The ANS will continue to grow until the age of 20, at which point the ratio of 7:8 will be distinguishable (Halberda & Feigenson, 2008; Piazza, 2010).

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The Weber fraction is a measurement of the acuity of the ANS, and it is derived from Weber's law. The Weber fraction is the lowest observable difference between two stimuli, and it represents the ANS's ability to differentiate between very subtle differences (Piazza, 2010). The Weber fraction might be used to, for instance, the difference between 8 and 7 dots (Halberda & Feigenson, 2008). A simple formula for the internal Weber fraction is (A-B)/B, where A is the greater number and B is the smaller number.

On a mental number line, the numbers are spatially arranged with zero to the left and ascending numbers to the right (Dehaene, 2011). A frequent metaphor that is used to illustrate the operation of the ANS is a mental number line. There is a school of thought that holds that Arabic numerals and counting words are built upon the basis of the mental number line (Dehaene 2011; Piazza, 2010). The majority of the evidence supporting this hypothesis originates from a variety of numerical effects that have been discovered in experimental contexts. The term "distance effect" was coined by Moyer and Landauer in 1967 to describe the phenomenon in which it takes a longer amount of time to determine which digit is numerically larger when the numerical distance between the two digits being compared is smaller than when that distance is larger. This phenomenon was first observed (e.g., 5 – 6 vs. 5 – 9).

If the digits being compared are close to each other on the mental number line, it is more difficult to discriminate between them (the discrimination takes more time), but if they are far ap

art on the mental number line, discrimination is easier due to the reduced degree of overlap (Deheane, 1992; Gallistel & Gelman, 1992; Moyer & Landauer, 1967). This effect lends support to the idea that there is an underlying mental number line with an analogue magnitude representation of numbers (Gallistel & Gelman, 2000; Whalen, Gallistel, & Gelman, 1999).

Another numerical impact that lends credence to the concept of an analog mental number line is known as the issue size effect (Dehaene, 1992; Hinrichs, Yurko, Hu, 1981). The term "issue size-effect" refers to the phenomenon in which it takes more time to compare numbers with bigger digits (for example, 9 vs 8) than it does to compare numbers with fewer digits (e.g., 1 vs. 2).

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Due to the logarithmic structure of the analogue mental number line, bigger digits have a higher overlap than smaller digits. This means that the number line gets more compressed when larger values are considered.

Many people see the relationship between the ANS and mathematics as a mapping between a core biological system and a precise symbolic system of numbers. This is one way to think about the connection (Feigenson & Halberda, 2013). This process of mapping has been explained by theoretical developmental models of number cognition, such as the ones that are shown below (for example, von Aster and Shalev, 2007; Geary, 2013).

Parallel individuation

The parallel individuation system is a working memory system that is used as the principal system to represent numbers in the lower range. This means that it is often used to represent numbers that are less than 3, and it is never used to represent numbers that are more than 4.

If the numbers in question constitute an object (also known as an object file), then the parallel individuation system will represent those numbers in a precise manner, whatever the sensory modality that may be involved. The object file system may also be referred to by its other name, the object tracking system (Carey, 2009). Because infants can discriminate between 2 and 3 items but not between 1 and 4 items, the parallel individuation system model can explain some of the data from habituation studies performed on human infants. This is because infants can tell the difference between 2 and 3 items, whereas the ratio between the numbers suggests that the ANS should be able to tell the difference between 1 and 4. On the other hand, when other factors like size and form are taken into consideration, newborns often do not show any discrimination based on numerical characteristics (Carey, 2009).

The parallel individuation model is not a system that only represents numbers; rather, this system may discriminate between other features, such as the sizes and forms of stimuli. This is because the parallel individuation model is not a system that only represents numbers.

Both the parallel individuation system and the autonomic nervous system (ANS) seem to be present in humans at an early stage of development; the environment, such as the amount of stimuli, most likely determines which system is engaged first (Carey, 2009). In contrast to the ANS, which is thought of as a domain-specific system (Piazza, Fumarola, Chinello, & Melcher, 2011), it has been proposed that parallel individuation is a component of a domain-general system. Parallel individuation is seen to be part of a domain-general system.

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Contextual elements may be able to provide an explanation for the interaction that occurs between the two systems. It is possible that activation of the anterior nucleus of the synapse (ANS) rather than the parallel individuation system is triggered for smaller numbers by attentional stress, working memory burden, or perceptual inputs that are close together (Hyde, 2011). 1981). The term "issue size-effect" refers to the phenomenon in which it takes more time to compare numbers with bigger digits (for example, 9 vs 8) than it does to compare numbers with fewer digits (e.g., 1 vs. 2).

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Domain-general talents

In what way can domain-general skills contribute to the maturation of mathematical capability? Research has shown a correlation between mathematical accomplishment and a number of other talents, including intelligence, linguistic skills, working memory, executive function/attention, attentional control, phonological awareness and ability, spatial ability, and processing speed (Alloway, & Passolonghi, 2011; Swanson, 2004).

These skills also overlap with one another, however to varying degrees depending on the situation.

The primary domain in which intelligence is described is that of mathematical development, namely in the same theoretical lineage as the introduction of the g-factor by Spearman (1904). In the field of numerical cognition, a typical study will often include some component of a test battery, such as the Wechsler's scales, that is used to estimate both verbal (crystallized) and/or nonverbal or perceptual (fluid) abilities as a proxy for intelligence. For example, the Wechsler's scales measure both verbal and nonverbal abilities (e.g., Geary, 2011). The working memory and executive functions are the primary areas in which the theoretical overlap with other structures may be found.

Working memory capacity and intelligence have both been the subject of discussion (see Ackerman, Beir, & Boyle, 2005; Beir & Ackerman, 2005; Kane, Hambrick, & Conway,

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2005; Oberauer, Schultze, Wilhelm, & Süb, 2005). Some researchers believe that the two are synonymous, while others disagree. According to the findings of a big research, intelligence was responsible for slightly more than half of the variation in mathematical ability (Deary, Strand, Smith, & Fernandes, 2007). In a great number of studies, researchers have discovered a connection between mathematical ability and both crystallized and fluid intelligence (see Geary, 2011 for a review).

REVIEW LITERATURE

By using the word "dyslexia," which Barlin understood to mean "very considerable difficulty in deciphering written or printed symbols," he was able to improve the concept of what it means to have a reading impairment. After then, a number of other words, such as acquired word blindness or word blindness, etc., were introduced; nonetheless, the phrase "learning disability" is now the most appropriate one. 38 James Hinshelwood published the first comprehensive clinical research of particular reading handicap in 1917. These studies found that the loss of reading ability was connected to injury to specific parts of the brain.

Samuel Orton came up with the idea that reading disabilities are caused by a delay or failure in establishing linguistic dominance in the left hemisphere of the brain later in 1937.

The terminologies that have been used to describe issues with learning have changed over the course of history, and there are still several variations in the terms and descriptions that are used. According to the ICD-10, learning disabilities are particular diseases of scholastic capabilities, but the DSM-5 refers to learning disabilities as distinctive learning disorders. When referring to the findings of other research, the terminology that the authors used are used here. The literature study was conducted in the field of learning disabilities and cognitive skills, with a particular emphasis placed on attention and memory, motor skills, spoken language skills, reading, writing, mathematical skills, and social and emotional skills.

The term "learning impairment" refers to the gap that exists between the general IQ or cognitive capacities of a person and their academic achievement.

The development of an individual's cognitive abilities enables them to think and learn. Children with learning disabilities and typical children will have similar cognitive abilities while they are young. The disparities between the two groups will be small.

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When a kid with a learning impairment advances to higher grade levels, the child's cognitive profile will begin to differ dramatically for the first time. We will certainly be able to narrow the gap between the two groups if appropriate assistance in the form of early intervention is provided. The research that follows focuses on the cognitive process, which encompasses attention, perception, memory, language, learning (reading, writing, and mathematics), and social emotional abilities.

According to the findings of a research that was carried out by Karin et al. in 2009, dyslexia and dyscalculia both have their own unique cognitive profile, with dyslexia being characterized by a phonological loss and dyscalculia being characterized by a number module insufficiency. The cognitive profile of dyslexia and dyscalculia was investigated by Karin et al. in their study titled "Dyslexia and dyscalculia: Two learning disorders with different cognitive profiles." The study was conducted on a sample of 109 children and was divided into three groups: dyslexia (21 children), dyscalculia (20 children), and dyslexia and dyscalculia (26 children), along with a control group of 42 children. They tested the individuals' phonological awareness, phonological and visual-spatial short-term and working memory, naming speed, and fundamental number processing abilities.

MATERIALS AND METHODS

STUDY DESIGN

The current investigation was of an exploratory and prospective nature, and it was built on the principle of purposive sampling. Its purpose was to investigate the cognitive processes and symptoms that are diagnostic of learning disabilities (LD). The purpose of the research was to identify and comprehend the nature of the issue that is linked with LD, as well as to acquire a grasp of the fundamental cognitive dysfunctions that are present in children who have LD.

STUDY SUBJECTS

Children with learning disabilities who were between the ages of 8 and 12 years old were chosen to take part in the research as the study's participants. The outpatient department of "The Institute for Communicative & Cognitive Neurosciences" (ICCONS) in Trivandrum, which is located in the state of Kerala, provided the volunteers for this study. Children who are often sent to the OP clinic at ICCONS by the individual instructors or counselors at their schools are those who struggle academically and have been identified as needing assistance

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by their parents. The data were gathered over the course of a period of three years, beginning in May 2016 and ending in April 2019.

SAMPLE

Basis Of Sample Size:

Following the inclusion and exclusion criteria, the total number of cases that were recorded during the months of May 2016 and April 2019 were chosen for the research. The sample included 77 children who were diagnosed with LD. There were 68 boys and 9 girls in the age range of 8 to 12 years old, making the total number of LD sufferers 77. The control group consisted of fifty seven students ranging in age from 8 to 12 years old and studying in the third through seventh grades. These children did not have any kind of learning difficulty. The non-learning district (NLD) served as the comparison group and was purposefully chosen from a local school.

Children diagnosed with a learning disability by a multi-disciplinary team of professionals consisting of a Neurologist, Psychologist, Speech-language pathologist, and clinical Linguist based on ICD-10 classification will make up the study's population. This team will use the classification system to make their diagnoses. From the outpatient department of "The Institute for Communicative and cognitive Neurosciences-ICCONS" in Trivandrum, Kerala, we purposefully chose 96 youngsters who had been identified with learning disabilities. The ICCONS catchment region has a strong representation of the sample from all of Kerala's districts, hence it is an excellent choice for research. Because ICCONS is a state government funded Institute with a premier status, individuals from all of the districts in Kerala and beyond the state are referred on a regular basis. As a result, a genuine representation of the State is assured in the sample that is picked. ICCONS is a multidisciplinary specialty institute that caters to the treatment, rehabilitation, and remedial needs of children who have Neuro-development disorders such as Learning Disability, Autism Spectrum Disorders, Cerebral Palsy, Intellectual Disability, etc.

ICCONS was established to treat, rehabilitate, and remediate the needs of children who have Neuro-development disorders. Only 77 of the original 96 youngsters took part in the research since 19 of them did not meet the criteria for inclusion in the study. This leaves the sample size at 77. Table I contains the specifics of the sample's age-wise categorization and reveals, among other things, that the proportion of female children who have LD is much lower than

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the percentage of male children who have LD, which stands at 11.68 percent. According to the male to female ratio found in a variety of research, ladies are much less impacted than men.

The Age Wise Classification Of The Study Group.

Sl	Sample	Age	M	F	Total
1	Learning Disability	8	15	5	20
2		9	17	0	17
3		10	18	2	20
4		11	8	2	10
5		12	10	0	10
	Total		68	9	77

DATA ANALYSIS

Following the end of the data collecting process, all of the findings were examined with the goals and objectives of the research taken into consideration, while concurrently referring to the conclusions based on the corresponding hypotheses.

It was determined which symptoms are typical of children who have a learning disability (LD), and based on those symptoms, a checklist was constructed. The checklist was then compared to children who do not have a learning disability (NLD), on the basis of hypothesis number 4.1. Table presents the findings of the study.

Characteristic Symptoms - Depicting The T-Value Between Study Group (LD) And Control (Non LD-NLD) Group.

Sl No	**Variables**	**Group**	**Mean**	**SD**	**t- value**	**Significance**	**Df**
1	Attention	LD	2.27	1.31	11.66	.000**	132

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		NLD	0.33	0.55			
2	Memory	LD	4.17	1.56	17.79	.000**	132
		NLD	0.46	0.83			
3	Motor	LD	0.95	1.06	6.59	.000**	132
		NLD	0.11	0.31			
4	Speech & Language	LD	2.66	1.91	10.79	.000**	132
		NLD	0.21	0.49			
5	Reading	LD	2.49	.80	14.11	.000**	132
		NLD	0.51	.80			
6	Writing	LD	4.58	1.40	16.73	.000**	132
		NLD	0.93	1.02			
7	Mathematics	LD	2.90	1.96	10.26	.000**	132
		NLD	0.40	0.73			
8	Socio emotional characteristics	LD	2.91	1.61	10.19	.000**	132
		NLD	0.58	1.03			

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The results of the t-test that were run to determine whether or not there was a statistically significant difference between the LD group and the NLD group with relation to the typical symptoms specified in the checklist are shown in table 4.1. The findings indicate that there is a significant difference between the LD group and the NLD group in all of the variables that were included in the checklist. This difference is significant at the 0.01 level. As can be seen in Figure 4.1, the mean score of the children diagnosed with LD is much higher than the mean score of the children diagnosed with NLD.

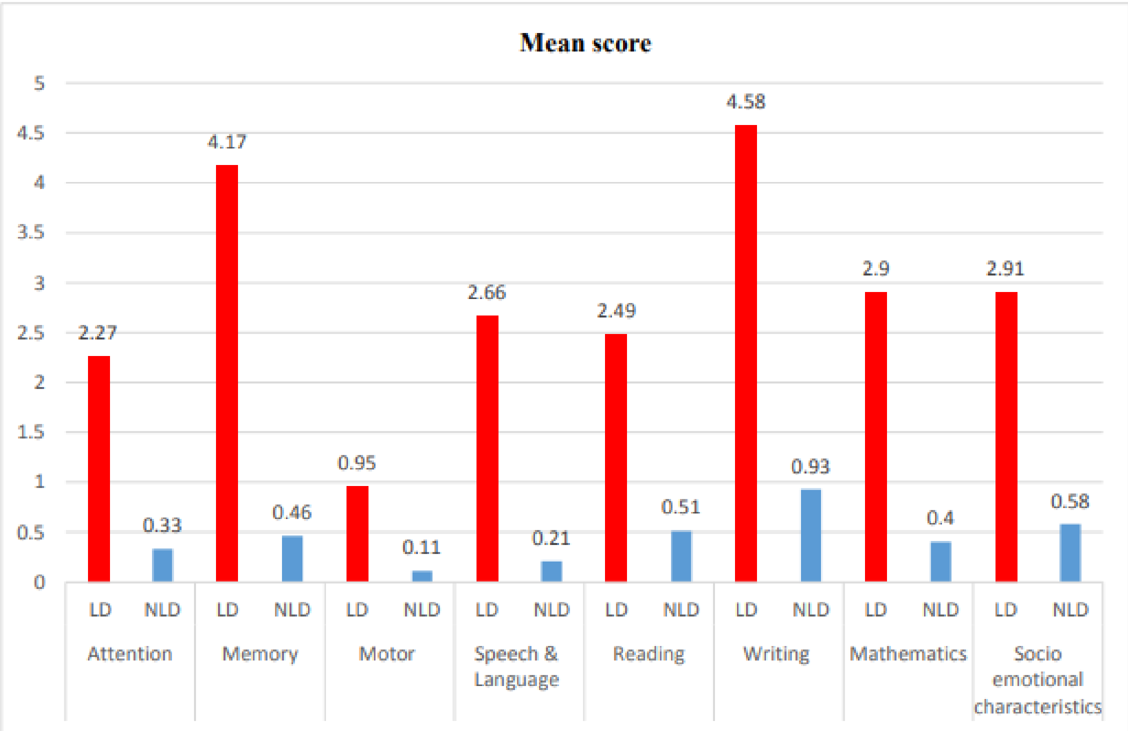

Fig. 4. 1 Mean Score Of The Characteristic Symptoms

The cognitive functions of children with LD and NLD were assessed using WISC-IV and BVRT based on hypothesis 2. The results are shown in the table 9 to 14

CONCLUSION

A learning impairment is a kind of unique developmental issue that may impact general or particular learning abilities, as well as one's overall academic performance. Because medical intervention has its own set of limitations, the only kind of intervention that is now available is scientific, evidence-based instruction that is linguistically and psychologically oriented. It is very necessary to have a comprehensive grasp of the cognitive domain that is

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being targeted by the training in order for it to be successful. First and foremost, early identification and diagnosis are helpful in initiating early intervention, which has a favorable outlook in terms of alleviating the challenges that are connected with learning.

The primary goals of the current research were twofold: first, to develop a primary screening tool in learning disabilities (LD) for early identification of children at the school level by teachers and parents; and second, to profile children who have learning disabilities in terms of their cognitive abilities.

The purpose of this study was to create a profile of the cognitive functions that are present in children who have learning disabilities (LD), as well as to investigate the possibility of a correlation between the associated cognitive functions and the symptom characteristics of learning disabilities (LD). Last but not least, a comprehensive and simple screening tool in the form of a checklist was developed. This tool depicts the key behavioral symptoms as the characteristics behavior of LD, and it establishes the reliability and validity of the symptom characteristics by correlating them with the relevant cognitive functions found among children who have LD. The research was carried out with the following three primary goals in mind:

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