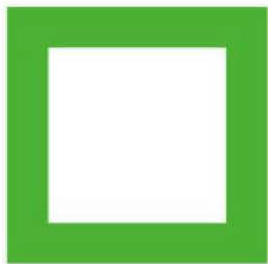


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**DYSCALCULIA, CAUSES, INTERVENTION AND PAKISTANI SCENARIO**

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# ABSTRACT

Dyscalculia is a learning disability that affects many children and adults. It has negative consequences for the children, youth and society at large. Research evidence has shown a number of causal factors responsible for dyscalculia.These are impairments in number sense also called "core deficit hypothesis", accessing numerical magnitudes from symbols known as "access hypothesis" and neurological impairment in the horizontal intra parietal sulcus. Many researchers have developed game based intervention programs showing their effectiveness in improving children numerical abilities. Research and interventions evidence to alleviate dyscalculia is very scarce in Pakistan. Future research directions and suggestion have been mentioned to carry out and to improve dyscalculic children's numerical abilities.

# KEYWORDS

Dyscalculia, Numerical cognition, Horizontal intra parietal sulcus (HIPS), Approximate number system (ANS).

# INTRODUCTION

Number skills are very important for human beings. Poor numeracy skills result in restricted job access, unemployment, low paying manual workers, lifelong struggle at workplace and in dealing with day to day demands of life, poorer educational access, homelessness,low self-esteem etc. Deficiency innumericalskillsis called dyscalculia. It is very critical to identify the dyscalculic children as soon as possible, so that the reasons and required interventions could be identified and implemented to avoid lifelong effects of being low at math. Researchers have used different terminology for defining dyscalculia such as developmental dyscalculia'·', mathematical disabilities'·', arithmetic learning difficulties•·' and math learning difficulties'.

Developmental dyscalculia has been defined as "mathematical ability that falls substantially below then expected level for the individual's chronological age, measured intelligence and age appropriate education. It interferes with academic achievement and daily living activities that require math skills"•. Developmental dyscalculia is a structural disorder, resulting from genetic or congenital disorder in

those parts of the brain involved in mathematical cognition without a general difficulty in cognitive functions1°.Dyscalculia appears in early school years in children as delay in learning, counting and arithmetic strategies, and continues into adulthood. Dyscalculic adults were significantly slower and low on accuracy in answering simple

arithmetic problems, counting sets of objects even after controlling for co morbidity factors and above average IQ.

# CAUSES OF DYSCALCULIA

Developmental Dyscalculia (DD) is not an outcome of dysfunctions in general domain or basic cognitive abilities like semantic or working memory, spatial abilities or linguistic abilities'·". There is well established behavioral, neuropsychological and neuro imaging evidence for domain specific and brain based impairmentsas cause of dyscalculia.

Human shares approximate representation of numerosity with non-human animals' ". Approximate number system (ANS) is already present in newborns infants"·" and its acuity increases over the period ofdevelopment1•·11• ANS isimportant for the acquisition of mathematicalknowledge".Symbolic tasks such as subtraction or approximation activate and map on to the number sense". Number sense is correlated and predictive of later math achievement"·" Number sense can be measured through non symbolic tasks like arrays of dots or sequence of sounds/tones, involving addition, subtraction, comparison, and estimation'..,.\_An impairment of approximate number system (ANS), is the core deficit of DD"·"·". Children with dyscalculia or math learning difficulties (MLD) have impaired ANS acuity'· "· "·••. However, the core deficit is not alwaysfound by other researchers"·...

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| Children with MLD have problem in representation of closer There is no systemic research evidence reflecting upon the studies magnitudes like discriminating a set of five objects from six and carried out on Pakistani children and adults.  respond to these sets as if they were the same as compared with the  normally developing children45• Deficit in number sense is related to Few studies have been conducted in Pakistan on overall learning structural or functional impairment in the horizontal intra parietal disabilities in terms of validation of checklists to measure learning sulcus (HIPS) region. disabilities. Researchers conducted a validation study of learning disabilities checklist in public schools of Pakistan, and reflected on  Alternatively, researchers think that DD results because of deficit to overall coexistence of reading, writing and mathematical disability•'. automatically linking and mapping symbols on to magnitude However, this study did not specifically reflected on dyscalculia. No representations called "access hypothesis", reflecting a specific studies have been found specifically on the topic of dyscalculia with impairment in symbolic processing"·'•"'•. Children with MLD were respect to Pakistani population. So it is extremely important to slower at accessing the quantities from numerical symbols as identify the current situation of dyscalculia, its causes with research compared with their peers, suggesting a mapping deficit,.·"·". evidence and plan intervention studies for Pakistani children Children with dyscalculia showed impairments on reaction time and suffering from dyscalculia.  accuracy while processing arithmetic facts'.  **REFERENCES**  There are specialized brain areas in the parietal lobe responsible for  numerical and arithmetic abilities'0• Horizontal Intra Parietal Sulcus 1. Butterworth B.Dyscalculia Screener. London: Nelson Publishing (HIPS) gets activated in number sense tasks such as estimating, Company Ltd;2003.  subtracting approximating and comparing the size of numbers in the 2. Landerl K, Bevan A, Butterworth B. 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