

## **DIFFERENT DIMENSIONS OF MATHEMATICS ANXIETY: A REVIEW**

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**Abstract**

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*Increasing mathematics anxiety among students at all level has gained the attention of academicians across the globe. It is a well-established phenomenon now a day, severely affecting mathematics achievement of school going children resulting in their escape from mathematics and allied subjects. In this context it became very important to study various aspects of mathematics anxiety for developing tools for its assessment and to develop measures to overcome its adverse effects. An attempt has been made in the present study to review contemporary research studies on mathematics anxiety among secondary school children and its predictors. The review includes research studies related to relationship between mathematics anxiety and mathematics achievement, causes of mathematics anxiety and its overcoming measures.*

**Keywords:** *Mathematics Anxiety, Mathematics Achievement.*



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Mathematics anxiety is very common problem of most of students; it is different from general anxiety. Richardson &Suinn defines mathematics anxiety as “mathematics anxiety involves feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations” (Richardson &Suinn, 1972).

Mathison defines it as “An irrational fear of mathematics that can range from a simple discomfort associated with numerical operations to a total avoidance of mathematics and mathematics classes (Mathison, 1977).” Harper and Daane define maths anxiety as “Intellectual factors that affect math anxiety include learning styles, persistence, self-doubt, and dyslexia.” (Harper and Daane, 1998). Thus mathematics anxiety should be considered at suitable perspective in low performance of students. Camen (1987) defined mathematics anxiety as a state of discomfort created when students are required to perform mathematical task. Vinson(2001) admits “mathematics anxiety is more than dislike towards mathematics.”(Vinson, 2001).

Mathematics Anxiety, initially described as ‘Mathemaphobia’ by a teacher who referred to her students’ striking emotional reactions towards Mathematical tasks and challenges (Gough, 1954). This phenomenon has gained increased attention of the scientific community.  
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In the present review article, an attempt has been made to present an overview of the current research on mathematics anxiety.

In the study of mathematics anxiety Hembree confirmed three predictions of Dreger and Aiken about mathematics anxiety and its associations with related constructs. They suggested that mathematics anxiety to be a unique construct, despite a definite relationship with general anxiety. They viewed mathematics anxiety as not entirely explained by general ability, i.e. intelligence and found that there is a negative correlation between academic performance and mathematics anxiety. The study reported the value of coefficient of Correlations between mathematics anxiety and general anxiety as 0.35, between mathematics anxiety and IQ  $-0.17$ , and, finally, between mathematics anxiety and mathematical achievement  $-0.27$  to  $-0.31$  (Hembree, 1990). In the study of Dreger and Aiken interrelation between mathematics anxiety and test anxiety which is considerable was ignored.

Dew and colleagues (1984) investigated mathematics anxiety's status as a unitary construct. The study reported that different assessment scores of mathematics anxiety are inter-correlated more strongly than they are correlated with test anxiety scores (Dew et al. 1984).

In their study on Mathematics Anxiety, Jain and Dowson(2009) described mathematics anxiety as result of "an inability to handle frustration, excessive school absences, poor self-concept, internalized negative parental and teacher attitudes toward mathematics and an emphasis on learning mathematics through drill without "real" understanding."

The study of Devineet. al. (2012) systematically classified variables which may be attributed to the development of mathematics anxiety. These three key variables were environmental variables, intellectual variables and personality variables. Environmental variables included negative experiences in class or in family contexts, teacher and parent personality traits as well as extrinsic expectations.

Turner et.al.(2002)found that that distant and unsupportive attitudes on the part of the teacher lead to avoidance on the part of the students which further leads to mathematics anxiety (Turner et al., 2002).

On the basis of their study on Mathematics Anxiety, Stuart concluded that the development of mathematics anxiety often takes its origin from a lack of confidence in situations involving the necessity to handle numerical information."(Stuart, 2000).

### **Research on Gender differences & Mathematics Anxiety**

A general common misconception is that females are not a good performer in mathematics and due to this, mathematics anxiety is higher in females than male. This took a lot of attention of researchers to research on the relationship between gender and mathematics anxiety. Results of research on relationship between gender and mathematics anxiety are not always in the same direction. Aiken (1970) pointed out, “no one would deny that sex can be an important moderator variable in the prediction of achievement from measures of attitude and anxiety. Measures of attitude and anxiety may be better predictors of the achievement of females than that of males.” (Aiken, 1970). Eccles and Jacobs (1986) state “gender differences in mathematics anxiety are directly attributable to gender differences in mathematics achievement (Eccles and Jacobs, 1986). Hembree (1990) and Devine et. Al. (2012) concluded in their research that females have higher level of mathematics anxiety than males throughout their entire schooling (Hembree, 1990; Devine and colleagues 2012). Some studies contradicted the impact of gender on mathematics anxiety.

Frenzel et.al. (2007) and colleagues reported that the achievement inequality in mathematics due to gender variable is small and declining (Frenzel, Pekrun, & Goetz, 2007). In this context the study of Alireza Pourmoslemiet. al is of great importance. Alireza Pourmoslemiet. al. (2013) took a sample of 275 students using random sampling method. Out of these students, 162(58.9%) were female and 113(41.1%) were male. They measured students sample’s mathematics anxiety by the help of Revised Mathematics Anxiety Rating Scale (RMARS) developed by Plake and Parker in 1982 (Plake B.S and Parker C.S, 1982). The evaluation of mathematics anxiety scores showed significant difference between males and females. The women scores were higher than men. In this study no significance difference was observed between mathematics anxiety scores of males and females. Thus this study indicates that the mathematics testing situations caused more anxiety in females than male in the sample (Alireza and colleagues, 2013)

The above discussions indicate a need for more investigation and research to be carried out in order to understand the Mathematics Anxiety and gender differences.

**Developmental Dyscalculia (DD) and Mathematics Anxiety:** ‘Dyscalculia’ is a form of Learning Disability, refers to the Child’s inability to count and perform Mathematical calculations. There is no one universally accepted definition of dyscalculia and, despite considerable research, the findings regarding the numbers of pupils and causes of dyscalculia

vary widely. In Shalev and Gross-Tsur defined Dyscalculia (2001) as ‘Dyscalculia is characterised by incomplete procedural knowledge and inefficient strategies to solve numerical problems. (Shalev and Gross-Tsur, 2001).’ They viewed Developmental Dyscalculia (DD) as a specific learning disability of mathematics, in which intelligence and language abilities are intact. Furthermore, researchers reported that Developmental Dyscalculia has no apparent co-morbidity with other learning or neuro-developmental disorders such as dyslexia or attention deficit/hyperactivity disorder (Shalev&Gross-Tsur, 2001). In addition to these they also found that Developmental dyscalculia is a common cognitive disorder; its prevalence in the school population is about 5-6%, a frequency similar to those of developmental dyslexia and attention-deficit-hyperactivity disorder. Unlike these, however, it is as common in females as in males. Developmental dyscalculia frequently is encountered in neurologic disorders, examples of which include attention-deficit-hyperactivity disorder, developmental language disorder, epilepsy, and fragile X syndrome. The long-term prognosis of developmental dyscalculia is unknown; it appears, however, to persist, at least for the short-term, in about half of affected preteen children. The consequences of developmental dyscalculia and its impact on education, employment etc is yet to be explored.

Landerlet. al.(2004) studied Developmental dyscalculia and basic numerical capacities on 8-9 years old students and found that Children with dyscalculia only had impaired performance on the tasks despite high-average performance on tests of IQ, vocabulary and working memory tasks. Children with reading disability were mildly impaired only on tasks that involved articulation, while children with both disorders showed a pattern of numerical disability similar to that of the dyscalculia group, with no special features consequent on their reading or language deficits. They concluded that dyscalculia is the result of specific disabilities in basic numerical processing, rather than the consequence of deficits in other cognitive abilities(Landerl, Bevana and Butterworth, 2004).

In nutshell, several research studies on mathematics anxiety and related problems shown that mathematics anxiety has its root in early childhood mathematics related experiences of the students which may detrimentally affect not only how young children perform mathematically, but also how much mathematics they learn in future. There is no enough data on the prevalence and manifestations of mathematics anxiety in younger populations, on how the different variables that were previously identified to be related to

mathematics anxiety interact in the course of development, and on the longitudinal effects of mathematics anxiety. In Indian context very less number of research has been conducted on Mathematics Anxiety. Future studies on mathematics anxiety that combine multi-method research designs with longitudinal approaches may be of great help in determining models of mathematics anxiety, its determining factors, and its detrimental effects for the individual and development which in turn lead to development of appropriate overcoming measures.

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