



Mathematics Anxiety in School Children

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Abstract. Mathematics anxiety has adverse effects on the mathematical performance of school children. Studies on mathematics anxiety have revealed that school children from primary to secondary levels exhibit mathematics anxiety. The symptoms of mathematics anxiety are similar to those of anxiety disorders, which highlights the implications of mathematics anxiety on the well-being of school children. This research aimed to assess the effects of mathematics anxiety on the mathematical performance of school children and explore the factors affecting mathematics anxiety and the academic performance of school children in mathematics. For this purpose, this research reviewed the studies from the past five years, ranging from 2018–2022. The study concluded that mathematics anxiety adversely affects the performance of school children. The study examined the different theories which explained the association of mathematics anxiety with the performance of school children, suggesting that there is a bi-directional relationship in which high mathematics anxiety adversely influences the academic performance of school children, and their inferior performance further exacerbates their mathematics anxiety. School children from elementary to higher levels of schooling exhibited mathematics anxiety, which negatively affected their mathematical performance. Various factors, including cognitive, environmental and familial factors, were found to influence the development of mathematics anxiety and mediate the influence of anxiety based on mathematics on the academic achievement of school children.

Keywords: Mathematics anxiety · children · school-age · mathematical performance · academic achievement

1 Introduction

Mathematics anxiety influences the everyday performance of school children in solving mathematical equations. It can be stated as fears, stress and anxiety that adversely affect the capacity to solve mathematical equations in everyday life, and it evokes negative emotions in children with mathematics anxiety [1]. Mathematics anxiety not only includes fears concerning mathematical problems, but it also involves fears about precision, quickness, and a sense of being in a race while solving mathematical problems [2]. Research has demonstrated that elevation in mathematics anxiety is linked with poor performance in mathematics [3]. The primary aim of this paper is to assess the effects of

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mathematics anxiety on the mathematical performance of school children and explore the factors affecting mathematics anxiety and academic achievement in school children. For this purpose, research studies from the year 2018 to 2022 will be reviewed. This research will further our understanding of the influence of mathematics anxiety on the performance of school children, and explain the factors influencing mathematics anxiety in school children. In this paper, the different theories about mathematical anxiety were explained, and the linkage between mathematics anxiety and academic achievement was explored. In addition, the factors affecting mathematics anxiety in school children were also examined.

2 Introduction to Theories About Mathematics Anxiety

Over the years, different theories have attempted to explain mathematical anxiety in school children. Research conducted with primary to secondary children investigated the developmental trajectory of academic performance based on mathematics abilities and revealed that mathematics anxiety was developed or enhanced over the years in school children, especially around the age of 18 years [1]. This implies that school children performed poorly in mathematics tests, and faced difficulty in solving mathematical problems, which led them to develop mathematical anxiety. This is following the deficit theory which has explained that inferior mathematical skills led school children to perform poorly in mathematics exams and thereby, enhance their mathematics anxiety. Different from the deficit perspective, the debilitating anxiety approach describes that inferior mathematical achievement is a result of mathematics anxiety in school children because it temporarily diminishes the cognitive resources, including the working memory, that aids in dealing with mathematical equations [4]. This shows that fearful thought about mathematics while solving mathematical problems, affect the working memory, which further leads to inferior performance in mathematics tests. On the whole, it can be said that deficit theory and the debilitating anxiety approach have contrasting views about mathematical anxiety in school children.

Another approach which attempts to describe mathematics anxiety in school children is the reciprocal theory. The reciprocal approach to mathematics anxiety blends the views of deficit theory and the debilitating anxiety approach and states that the association of mathematics anxiety and academic achievement of school children is bi-directional [4]. This implies that school children avoid mathematics-related events due to mathematics anxiety, which further deteriorates their mathematical abilities, leading to inferior performance in mathematical tests. For example, a 6th grader finds it difficult to solve mathematical problems and develops mathematics anxiety. This leads him to reduce his engagement with mathematics problems, such as school homework, or any mathematics competition, which further affects his mathematical abilities, which in turn adversely affects his performance in mandatory mathematics tests. Mathematics anxiety evokes negative emotions in school children while performing mathematical activities, and they exhibit similar symptoms to those who have anxiety disorders [1]. Mathematics anxiety adversely affects the psychological well-being of school children, as they show similar symptoms to people with anxiety disorders. This emphasises the negative effects of mathematical anxiety on school children. On the whole, it can be said that the reciprocal

approach is another approach that aims to explain mathematics anxiety while blending the understanding from the deficit theory and debilitating anxiety approach.

3 Mathematics Anxiety and Academic Achievement

Mathematics anxiety is observed in school children, from primary to higher school levels. Previous research has reported that children in primary schools have mathematics anxiety [5–7]. This implies that school children develop mathematics anxiety even during primary schooling. The development of mathematical anxiety during primary school age further shows that their levels of mathematics anxiety may increase as they progress to higher levels of schooling. This could further affect their overall development and academic achievement throughout their school years. Primary school children with mathematics anxiety may have inferior mathematical abilities as they move to further stages of schooling. Another study examined the findings of a survey that was administered in 65 countries and revealed that one-third of the participants, consisting of school students of 15 years of age, reported anxiety and helplessness while engaging with mathematical problems [8]. This shows that students in secondary school levels also exhibit mathematics anxiety when they engage with mathematical problems which show. On the whole, it can be said that school children have mathematics anxiety which they can develop even during primary school and it may retain as they progress to superior levels of schooling.

Mathematics anxiety adversely affects the mathematical performance of school children. A research study assessed the influence of mathematics anxiety on understanding and comprehending concepts based on mathematics in school children in which 25 schoolchildren studying in 5th grade were provided with seven training sessions of multiplication-related problems [9]. The study revealed that mathematics anxiety has a significant and adverse influence on both the mathematics performance, as well as the mathematics learning of school children, especially among those with elevated levels of anxiety based on mathematics [9]. This shows that the academic learning and performance of school children in mathematics tests are severely impacted due to mathematics anxiety. The learning of 5th-grade students was affected because mathematics anxiety affected their learning during the training sessions. The fear of mathematics affected the capacity of school children to learn mathematical concepts and deteriorated their mathematical skills. Those students who had less or no mathematics anxiety effectively used their working memory and exhibited effective learning which provides implications for reducing mathematics anxiety to improve the mathematical learning of school children [9]. Mathematics anxiety further results in impairment in mathematical achievement in school children, particularly in those who have high mathematics anxiety. On the whole, it can be said that mathematics anxiety negatively influences the mathematical performance of school children.

4 Factors Affecting Mathematics Anxiety and Academic Achievement

Cognitive factors and environmental factors affect academic achievement and mathematics anxiety levels in school children. General cognitive ability includes the capacity for reasoning, planning, solving abstract issues, abstract thinking, understanding difficult concepts, and retainment and manipulating complex information [10]. Research has revealed that general cognitive abilities influence academic achievement in mathematics, and levels of anxiety based on mathematics in school children because the capacity to relate second-order connections logically and systematically is necessary for solving mathematical problems [10]. This shows that cognitive factors, including general cognitive abilities, influence the mathematical ability of school children which further affects mathematics anxiety levels. General cognitive abilities aid school children in engaging in tasks that require planning, reasoning, solving abstract problems, and learning difficult concepts, which is required in mathematics learning. Those school children who possess general cognitive abilities can effectively solve mathematical problems, which will enhance their mathematical performance and may lower or diminish their mathematical anxiety. A research study reported that environmental factors, such as classroom learning, the relationship of school children with their teachers, and their familial context, affect the anxiety levels based on mathematics, and mathematical achievement of school children [11]. This shows that the environment of school children plays a crucial role in their mathematical performance and influences their levels of mathematics anxiety. On the whole, it can be concluded that cognitive factors and environmental factors influence mathematical achievement and levels of mathematics anxiety in school children.

Familial factors also influence mathematics anxiety in school children. Research has revealed that mathematics anxiety and levels of education in parents have a linkage with mathematics anxiety in school children [12]. The attitude of parents towards mathematics influences the performance of school children in mathematics and thereby has associations with mathematics anxiety [12]. This implies that the education level of parents with higher education and their attitudes towards mathematics influence the attitude and beliefs of their children about mathematics. Lack of higher education and fearful attitude in parents can lead their children to develop mathematics anxiety, and further deteriorates their mathematical performance. Parents model their anxious and fearful emotions towards mathematics problems and tests, which transfers to their children leading them to develop mathematics anxiety [12]. Children grow up while observing and learning the behaviour of their parents. Those parents who have anxious and fearful thoughts about mathematics model certain behaviour, such as not helping their children with mathematics-related homework and their behaviour gets transferred to their children. In this way, children develop mathematics anxiety because of their parents. On the whole, it can be said that familial factors, including the levels of education of parents, and the parental attitude towards mathematics, affect mathematics anxiety in school children.

5 Conclusion

From the overall analysis, it can be concluded that mathematics anxiety adversely affects the performance of school children. Different theories have explained the linkage of mathematics anxiety with mathematical achievement. Deficit theory has explained that inferior mathematical skills lead to inferior academic achievement in mathematics which enhances mathematical anxiety in school children. The debilitating anxiety approach has described that mathematical anxiety deteriorates the mathematics performance of school children. The reciprocal approach has blended the views of both approaches suggesting that the mathematics anxiety of school children and their academic achievement in mathematics have a bi-directional relationship as they influence one another. School children from primary to higher levels of schooling have mathematics anxiety, which negatively affects their mathematical performance. Various factors, including cognitive, environmental and familial factors affect the development of mathematics anxiety and mediate the influence of mathematics anxiety on the mathematical performance of school children. There are some limitations to this research. The study only briefly examined the influence of mathematics anxiety on the health and well-being of school children. In addition, the role of cultural factors on mathematics anxiety has not been taken into account. Future studies can assess the health implications of anxiety based on mathematics on school children, and can further examine the cultural factors that may affect the anxiety levels of school children based on mathematics.

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