

# Mathematics Anxiety and its Impact on Academic Achievement

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## Introduction

In contemporary educational discourse, mathematics anxiety is emerging as a significant barrier to academic achievement, particularly among students at all levels. This phenomenon often manifests as intense feelings of apprehension when engaging with mathematical tasks, leading to a detrimental cycle that hampers students' performance and confidence in their mathematical abilities. Research indicates that mathematics anxiety is not solely an individual issue; rather, it is influenced by a variety of factors, including teaching methods and the attitudes of educators, which can exacerbate negative experiences related to mathematics (Gusm ASão et al.). Furthermore, understanding mathematics anxiety requires a multifaceted approach that considers both cognitive processes and external influences, as proposed by recent studies that highlight the need for interdisciplinary interventions (Cipora K et al.). By addressing the roots of mathematics anxiety and its effects, educators and researchers can work collaboratively to foster a more supportive learning environment, thereby improving academic outcomes for students grappling with this pervasive issue.

## Definition and prevalence of mathematics anxiety

Mathematics anxiety is characterized by feelings of tension and fear specific to math-related tasks, which can hinder one's ability to perform effectively in academic settings. This anxiety is prevalent across various age groups and demographics, with studies revealing that a significant percentage of adolescents experience worry and stress during mathematics classes and assessments, as evidenced by the Programme for International Student Assessment (PISA) findings. The roots of math anxiety often lie in environmental influences, such as negative attitudes from teachers and parents regarding mathematical abilities, as well as societal stereotypes that perpetuate the notion of math being inherently challenging (Cipora K et al.). This issue is compounded by the fact that mathematics anxiety not only disrupts immediate academic performance but also has long-lasting implications on educational and career choices (Cipora K et al.). Thus, understanding and addressing the prevalence of mathematics anxiety is crucial for fostering positive academic outcomes.

## Causes of Mathematics Anxiety

Understanding the causes of mathematics anxiety is essential for addressing its detrimental effects on academic achievement. Various factors can contribute to the development of this anxiety, including cognitive, emotional, and social influences. Cognitive aspects often focus on perceived mathematical ability, where students who frequently encounter difficulties may internalize a lack of capability, leading to heightened anxiety during math-focused tasks. Emotional factors, however, play a critical role, as many learners experience debilitating reactions to mathematics that may stem from negative experiences in their educational journey. According to (Sz Dűcs et al.), these emotional issues can create significant barriers to performance, often resulting in students shying away from further challenges despite their potential. Additionally, environmental factors such as societal perceptions and parental attitudes can exacerbate this anxiety, ultimately influencing students' overall attitudes toward mathematics and their academic persistence (Dowker A et al.).

## Psychological and environmental factors contributing to anxiety

Understanding the psychological and environmental factors contributing to anxiety, particularly in mathematics, reveals the complexities of student experiences. Individual cognitive processes, such as self-efficacy and previous encounters with mathematics, can heighten feelings of anxiety, leading to detrimental effects on academic performance. Environmental influences, including teaching methods and parental attitudes, further exacerbate these anxieties, creating a feedback loop of negative reinforcement. Research highlights that younger students experience greater math anxiety compared to their older counterparts, with females reporting heightened anxiety levels than males, especially prior to assessments (Bista R et al.) . Therefore, addressing both internal psychological barriers and external environmental conditions is crucial for developing effective interventions to mitigate mathematics anxiety and enhance academic achievement (Gusm ASão et al.)

### Impact of Mathematics Anxiety on Academic Achievement

Mathematics anxiety (MA) significantly influences academic achievement, often hindering students performance in mathematical tasks and assessments. Research has established that MA is not merely a benign emotional response but rather a complex construct that intertwines with cognitive processes and performance outcomes. For instance, the impact of MA on performance is compounded by factors such as working memory, which mediates how anxiety manifests during mathematical problem-solving activities. Studies indicate that both MA and test anxiety (TA) exert a substantial influence on mathematical achievement, with sociodemographic variables exhibiting modest moderating effects (Caviola S et al.) . Furthermore, the evolution of understanding MA has revealed its distinctiveness from other forms of anxiety and highlighted its deep-rooted implications for educational practice (Dowker A et al.) . As educators seek to mitigate the adverse effects of MA, it becomes imperative to implement strategies that foster a supportive learning environment conducive to students' mathematical success.

### Effects on student performance and learning outcomes

The detrimental effects of mathematics anxiety on student performance are both significant and multifaceted, contributing to a cycle of underachievement that can persist throughout educational experiences. Research indicates that high levels of anxiety can inhibit self-regulated learning (SRL), ultimately leading to poorer academic outcomes in mathematics (Harahap LES et al.) . Moreover, environmental factors, such as the attitudes of teachers and parents, may exacerbate such anxiety and influence students self-efficacy and motivation in math (Luttenberger S et al.) . Consequently, students may struggle with foundational mathematical concepts, which impedes their overall academic achievement and can dictate future educational and vocational choices. Addressing math anxiety is, therefore, essential in enhancing learning outcomes and fostering positive attitudes toward mathematics.

### Conclusion

In conclusion, the pervasive issue of mathematics anxiety (MA) significantly impedes academic achievement, affecting students across various educational contexts. The interplay of environmental, societal, and personal factors contributes to its perpetuation, as observed in notable studies that emphasize the role of teachers and parents attitudes towards math abilities, as well as societal stereotypes about gender and math performance (Luttenberger S et al.) . Furthermore, the ramifications of MA extend beyond immediate academic challenges, influencing long-term educational and career choices, thus highlighting the urgent need for effective intervention strategies (Cipora K et al.) . Addressing the complexities of MA through targeted support mechanisms can facilitate improved self-efficacy and motivation among learners, ultimately fostering a more positive educational experience and enhancing overall academic success.

### Strategies for reducing mathematics anxiety to improve academic success

Addressing mathematics anxiety is critical to enhancing academic success, as individual experiences and external factors intertwine to influence students performance. Strategies for reducing this anxiety include implementing pedagogical approaches that foster a supportive learning environment, emphasizing collaborative learning, and utilizing real-world applications of mathematics to engage students meaningfully. Additionally, integrating cognitive-behavioral techniques in the classroom can equip students with skills to reframe negative thoughts associated with math tasks. Research indicates that students with high mathematics anxiety often exhibit lower achievement levels, particularly highlighted by the findings

that sixth graders, who experience less anxiety, demonstrate higher mathematical performance compared to their older peers ( (Siebers WM) ). To effectively tackle mathematics anxiety, educators must adopt an interdisciplinary approach that combines these pedagogical tactics with psychological interventions, as suggested in current literature ( (Gusm ASão et al.) ).

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