



Systematic Literature Review: Math Anxiety in Mathematics Learning

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Article Info	Abstract
Article history: Received: December 16, 2024 Accepted: May 18, 2025 Published: May 31, 2025 Keywords: Anxiety indicator Math anxiety Mathematics learning This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. © 2025 Journal of Mathematics, Science, and Computer Education	Mathematics anxiety, or "math anxiety," is a phenomenon that is often experienced by students and can interfere with the learning process and daily life. This research aims to identify indicators of mathematics anxiety and understand its impact in the context of mathematics learning. Through the Systematic Literature Review (SLR) method, researchers analyzed 16 relevant articles from various sources, focusing on three main aspects of mathematics anxiety: cognitive, affective, and physiological. The research results show that math anxiety affects students' academic performance and can hinder several students' abilities in learning mathematics, such as understanding concepts, reasoning, problem solving, and others. By identifying and developing strategies to reduce the impact of mathematics anxiety, it is hoped that it can improve students' learning experiences in mathematics subjects.
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INTRODUCTION

Mathematics is one of the fields of study that is considered a challenge and a source of anxiety for many students. Math anxiety has become an increasingly prominent issue in the field of education. Many individuals, both children and adults, experience excessive pressure, fear, and worry when faced with math tasks or exams. In this article, mathematics anxiety is defined as the feeling of restlessness or discomfort experienced by students when facing situations related to mathematics (Asrawati, 2021; Istikomah & Wahyuni, 2018; Prahmana et al., 2021). Mathematics anxiety can also be defined as the feeling of nervousness and pressure when manipulating numbers and solving math problems, which can be disruptive both in daily life and during the learning process.

Based on the test results conducted in the research (Zulfikar, 2015), it can be concluded that math anxiety has a negative relationship with the mathematical critical thinking ability of seventh-grade students at SMPN 5 Kota Serang. In addition, a phenomenon was also found in the research (Putri & Hakim, 2022) at one of the high schools in Karawang, where it was discovered that even within a single class, the level of students' mathematical anxiety can vary. Some students appeared scared and became nervous every time math class was about to start. Some students intentionally skipped math class because they did not want to or did not like learning math. Additionally, some students felt pressured to the point of sweating profusely and stuttering or stumbling over their words whenever asked to explain their answers in front of the class.

In conclusion, each exhibits different symptoms of math anxiety. These symptoms can be classified into three dimensions: cognitive, affective, and somatic (Azizah et al., 2019;

([Cavanagh & Sparrow, 2006](#); [Moreno-García et al., 2017](#)). The attitude dimension explains a person's anxiety towards mathematics based on their attitude or perspective. The cognitive dimension explains math anxiety based on problem-solving abilities related to mathematics. Meanwhile, the somatic dimension describes a person's anxiety, whose symptoms manifest physically when interacting with mathematics.

Math anxiety should not be considered a minor issue since students who struggle to adapt to the subject may become fearful and unwilling to attend math classes. It can even result in a decline in students' performance and learning outcomes in mathematics ([Anita, 2014](#)). Math anxiety can hinder learning, negatively impacting academic performance, especially in mathematics. There is a significant negative relationship between the level of math anxiety and students' math achievement. A study shows that students with higher levels of math anxiety tend to perform worse on math exams, even if they are at the appropriate grade level ([Wu et al., 2012](#)). Other research also confirms that high levels of anxiety can negatively impact students' mathematical performance, disrupt cognitive processes such as working memory, and cause students to avoid situations related to mathematics ([Herawati et al., 2021](#)). However, it is important to note that although math anxiety is often considered a hindrance, some studies indicate that in certain situations, moderate levels of anxiety can motivate students to put more effort into their studies ([Batiibwe et al., 2020](#)).

Overall, understanding the symptoms and impacts of math anxiety in mathematics learning is very important for educators and researchers. By identifying these indicators of math anxiety and developing strategies to mitigate its impact, we can create a more supportive and effective learning environment for students. Therefore, the researchers comprehensively analyzed various literature to showcase the diverse research findings on math anxiety in mathematics education. The first step taken was to formulate the research questions. Here are the questions in this research:

RQ1: What are the indicators of math anxiety?

RQ2: How does math anxiety affect mathematics learning?

METHODS

The article prepared by the researcher uses the Systematic Literature Review (SLR). SLR is a research method used to identify, analyze, evaluate, and interpret all previous research results obtained by the researcher and research relevant to the research objectives ([Soebiartika & Rindaningsih, 2023](#)). In this method, the researchers review and systematically identify the journals following the established steps ([Triandini et al., 2019](#)). To complete this research, the researchers searched for and selected articles from journals through Publish or Perish. The keywords are mathematical anxiety, anxiety indicators, the influence of anxiety, and mathematics learning. The collected articles were published from 2019 to 2024, the last 5 years and 16 relevant articles were obtained. The steps in the search are divided into several processes, namely identification, screening, eligibility, and inclusion, in accordance with the guidelines in PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) ([Januari, 2024](#)). The population in this study is all research on math anxiety in mathematics learning. Based on the search results from Publish or Perish, a sample size of 16 articles was obtained, which research is relevant to the criteria and suitable for a systematic review.

After conducting some research, 16 articles were obtained that met the criteria in accordance with the research objectives: (1) Articles that contain explicit references that serve as titles and abstracts or keywords; (2) Articles indexed by Sinta or Scopus; (3) In Indonesian and English; (3) The type of research is not a Systematic Literature Review; (5) The focus of the study is the Influence of Math Anxiety in mathematics learning; (6)

published within the last 5 years. An initial search was conducted through Publish or Perish, resulting in 200 articles. In conducting data analysis on the 200 articles, a PRISMA approach was used until articles that met the predetermined criteria were found. The initial sorting by the researchers was done on articles with the same title (duplicates) or those that did not meet the criteria, totaling 68 articles, 53 articles published before 2019, and 26 articles not indexed, leaving 53. Next, the researchers found 37 articles that were incomplete and inaccessible. Finally, 16 articles meet the previously determined criteria to fulfill the purpose of this systematic review. The PRISMA diagram used in this study is shown in Figure 1.

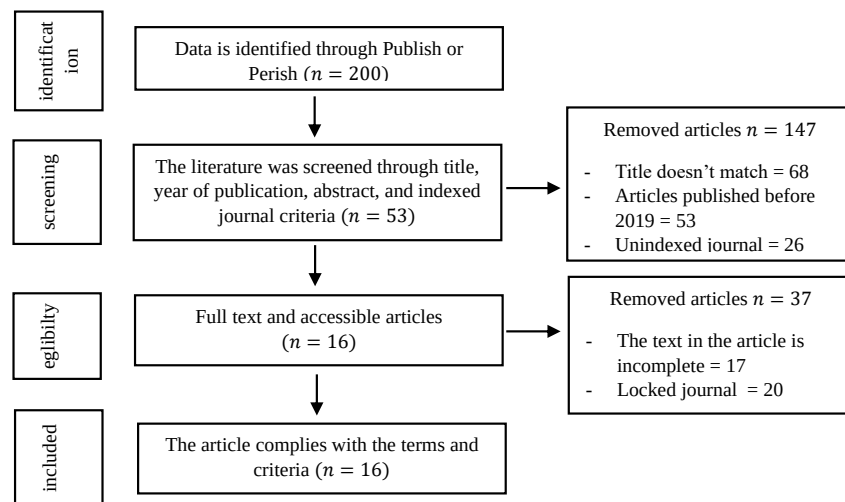


Figure 1 PRISMA diagram

RESULTS AND DISCUSSION

RQ1 : What are the indicators of Math Anxiety?

Out of 16 articles, only eight articles contain indicators of math anxiety, namely [Apriani & Kurniawati \(2024\)](#), [Asrawati \(2021\)](#), [Berliana & Galih \(2021\)](#), [Muhsana & Diana \(2022\)](#), [Putri & Hakim \(2022\)](#), [Rahmi et al. \(2020\)](#), and [Wardani \(2022\)](#). Some of the articles extensively use indicators from [\(Cavanagh & Sparrow, 2006\)](#), which categorize math anxiety into three aspects/dimensions: cognitive, affective, and physiological. [Apriani & Kurniawati \(2024\)](#) explain the definition of each aspect: (1) Cognitive aspect (knowledge), which is the aspect that describes a person's anxiety as shown by changes in their knowledge of mathematics. (2) Affective aspect (emotion), which is the aspect that describes math anxiety based on emotions. (3) Physiological aspect (physical), which is the aspect that describes a person's anxiety that leads to changes in cognitive processes or a participant's knowledge when interacting with mathematics learning. Then, each of these aspects consists of more specific indicators, which are the cognitive dimension: self-ability, self-confidence, difficulty concentrating, fear of failure; affective dimension: nervousness, displeasure, restlessness; physiological dimension: nausea, cold sweat, palpitations, headache [\(Wardani, 2022\)](#).

In another article, it is revealed that the indicators of math anxiety consist of (1) feelings of restlessness when facing math, (2) inability to solve math problems, (3) difficulty in understanding math formulas [\(Asrawati, 2021\)](#). Meanwhile, [Berliana and Galih \(2021\)](#) states that math anxiety is divided into nine aspects, which are tension, complaints about physiological issues, fear of one's thoughts, worry, restlessness, fear, memory disturbances, difficulty concentrating, disrupted sleep patterns, and nightmares or frightening dreams.

Some articles use questionnaires from the Abbreviated Math Anxiety Scale (AMAS) and the Math Anxiety Rating Scale (MARS46).

RQ2 : How does math anxiety affect mathematics learning?

Based on the articles the researchers have reviewed, it was found that math anxiety indeed impacts mathematics learning. Things affected by math anxiety are then classified, as shown in the Table 1.

No	Author Name	Title	Effect
1.	Nur Asrawati	Pengaruh Mathematics Anxiety Terhadap Hasil Belajar Matematika Siswa Kelas SMK Kartika Makassar	There is a negative influence between mathematics anxiety and students' mathematics learning outcomes, with a contribution of 23.4%.
2.	Nadya Wardani	The Effect of Mathematics Anxiety on Students' Learning Outcomes in Class X High School	The regression test results show that each increase in student anxiety levels will decrease student learning outcomes by - 0.199.
3.	Wahyu Hidayat dan Delifya B. Ayudia	Kecemasan Matematik dan Kemampuan Pemecahan Masalah Matematis Siswa SMA	In this study, math anxiety has a negative impact on the mathematical problem-solving abilities of high school students, amounting to 57.1%.
4	Tiffany Chandra & Lucia R. M. Royanto	Pengaruh Math Self-Efficacy dan Math Anxiety terhadap Performansi Matematika pada Siswa Kelas V SD	Students' Math performance increases by 0.205 points for every 1-point increase in math self-efficacy and decreases by 0.008 points for every 1-point increase in math anxiety.
5	Shinta Dwi Handayani	Pengaruh Kecemasan Matematika Terhadap Pemahaman Konsep Matematika	This study concludes that math anxiety positively influences understanding math concepts, although its impact is relatively low. Math anxiety can affect the understanding of mathematical concepts by 4.4%, while other factors influence 95.6%.
6	Kurnia Rahmi Yuberta, Widya Setiawati, Lely Kurnia	Pengaruh Math Anxiety Terhadap Kemampuan Pemahaman Konsep Matematis Siswa Berdasarkan Gender	Math anxiety has a negative impact on students' ability to understand mathematical concepts, both male and female, with a greater impact on female students.
7	Citra Berlian, Alpha Galih Adirakasiwi	Pengaruh Mathematics Anxiety Terhadap Hasil Belajar Matematika Siswa SMP di Masa Pandemi COVID-19	The results of the simple linear regression analysis show a significance value of 0.015, which is less than 0.05. This indicates that the higher the level of student anxiety, the lower their math learning outcomes.
8	Eleonora Doz, Alessandro Cuder, Sandra Pellizzoni, Federica Granello, Maria Chiara Passolunghi	The interplay between ego-resiliency, math anxiety, and working memory in math achievement	Math anxiety significantly impairs math performance in primary school children, primarily through its negative effects on working memory. It also highlights the potential of ego-resiliency as a protective factor that can help alleviate math anxiety and enhance academic achievement in mathematics.

No	Author Name	Title	Effect
9	Rachel G. Pizzie and David J. M. Kraemer	Strategies for remediating the impact of math anxiety on high school math performance	The detrimental effects of math anxiety on academic performance demonstrate that targeted interventions, particularly those focused on improving study skills, can effectively mitigate these negative impacts, especially for highly anxious students.
10	Hili Eidlin-Levy, Elad Avraham, Laurain Fares and Orly Rubinsten	Math anxiety affects career choices during development	Math anxiety directly predicted high school and university career choices but not primary school students. The effect of gender on career choice for university students was not direct but mediated by math anxiety.
11	Yurike Ika Apriani, Annisa Dwi Kurniawati	Pengaruh Math Anxiety Terhadap Kemampuan Berhitung Dalam Menyelesaikan Permasalahan Sintesis Matematis Siswa Kelas IV MI	The results of the statistical test with simple linear regression analysis show that a significance value of $0.013 < 0.05$ was obtained, which indicates a significant influence between variable X (math anxiety) and variable Y (calculation ability) in solving mathematical synthesis problems for fourth-grade students at MI Kanzul Huda Ponorogo. The contribution of math anxiety to calculation ability is 12.3%, while the remaining 87.7% is influenced by other variables or factors not examined by the researcher.
12	Hesti Lestari, Rozi Fitriza, Halen A	Pengaruh Kecemasan Matematika (Mathematics Anxiety) Terhadap Kemampuan Pemecahan Masalah Peserta Didik Kelas Vii MTs	The number of the influence of math anxiety mathematics on problem-solving ability problem-solving at 86.3% categorized as having a high impact.
13	Bakir Haryanto, Hari Setiadi	Pengaruh Math Anxiety, Self-Efficacy, Tingkat Pendidikan Ibu, Dan Sumber Belajar Di Rumah Terhadap Capaian Literasi Matematika Siswa Indonesia	Students who experience worry, fear, and anxiety tend to achieve low scores in mathematical literacy.
14	Citra Nurani Putri1, Dori Lukman Hakim	Dimensi Math Anxiety (Kognitif, Sikap, Somatik) Terhadap Kemampuan Pemahaman Konsep Matematis Pada Materi SPLTV	Mathematics anxiety impacts students' ability to understand mathematical concepts, and the influence goes in opposite directions.
15	Safina Putri Diana, Mulin Nu'man	Pengaruh Self-Regulated Learning dan Math Anxiety Terhadap Hasil Belajar Peserta Didik	Math Anxiety and Self-Regulated Learning positively influence the learning outcomes of female and male students.
16	Novila Muhsana, Hafsa Adha Diana	Pengaruh Kecemasan Matematika Terhadap Kemampuan Penalaran Matematis Berbasis Soal PISA	The relationship between math anxiety and students' mathematical reasoning ability is negative, with a very low or very weak correlation.

Out of the 16 articles reviewed, 4 discuss the impact of math anxiety on students' math learning outcomes. Her research (Asrawati, 2021) stated that mathematics anxiety negatively influences students' mathematics learning outcomes, with a contribution of 23.4%. Furthermore, (Wardani, 2022) found that student anxiety would have a negative impact on their learning outcomes, with regression test results showing that an increase in student anxiety levels would result in a decrease in student learning outcomes by -0.199. The results of the study conducted by Berliana & Galih (2021) also show a significant influence between math anxiety and students' math learning outcomes, with indications that the higher the level of students' anxiety, the lower their math learning outcomes. The three articles prove that math anxiety has a negative relationship or influence on learning outcomes, meaning that the higher the students' mathematical anxiety, the lower their learning outcomes will be. Meanwhile, in the study conducted by Diana et al. (2020), the opposite result was obtained, showing a positive influence between Math Anxiety and Self-Regulated Learning on academic achievement for female and male students. Therefore, it can be said that math anxiety does not always have a negative impact on students' learning outcomes, but it can also motivate students to work harder in their studies.

Math anxiety also has an impact on the high or low ability of students to understand mathematical concepts. The higher the level of math anxiety, the lower the student's ability to understand mathematical concepts (Rahmi et al., 2020). In line with what was stated by (Putri & Hakim, 2022) math anxiety has an opposing effect on students' ability to understand mathematical concepts. Which means that students with low levels of math anxiety have higher levels of conceptual understanding ability, and vice versa. Meanwhile, the findings in the study (Handayani, 2019) are quite the opposite, where each increase of one level of anxiety will increase the level of students' mathematical concept understanding by 0.106. She concluded that math anxiety positively influences the understanding of mathematical concepts, although the influence is relatively low. However, the positive influence of math anxiety on understanding math concepts is relatively small, only 4.4%, while other factors influence 95.6%.

Additionally, math anxiety also affects students' mathematical problem-solving abilities. Math anxiety has a negative impact on high school students' mathematical problem-solving abilities, with an influence of 57.1%, while 42.9% of problem-solving abilities are influenced by factors other than math anxiety (Hidayat & Ayudia, 2019). That means the influence of math anxiety on mathematical problem-solving is greater than other factors. It was also stated (Lestari et al., 2020) that mathematics anxiety negatively influences mathematical problem-solving abilities. The extent of the influence of mathematics anxiety on problem-solving ability is 86.3%, categorized as having a high impact.

The following two articles show that math anxiety impacts academic performance, particularly in mathematics learning. Math anxiety has a negative effect on math learning performance (Pizzie & Kraemer, 2023). In line with what Chandra and Royanto (2019) stated, students' academic performance in mathematics decreases by 0.008 points with an increase of 1 point in math anxiety. This means that math anxiety has a negative impact on students' performance in learning mathematics.

In another article, math anxiety affects other mathematical abilities or mathematics-related things. For example, there is a negative influence on students' arithmetic ability in solving mathematical synthesis problems, with math anxiety contributing 12.3% to arithmetic ability (Apriani & Kurniawati, 2024). Meanwhile, according to Haryanto & Setiadi (2021), Indonesian students have the highest math anxiety and the lowest level of mathematical literacy. In addition, there is also a relationship between students' math anxiety and their mathematical reasoning ability, which is in the opposite or negative

direction, with a very low or very weak level of correlation (Muhsana & Diana, 2022). Then, according to (Doz et al., 2024), statistically, there is a significant negative correlation between math anxiety and visuo-spatial working memory. Finally, math anxiety affects career choices for high school and university students but not for elementary school students (Eidlin-Levy et al., 2023). Thus, from that explanation, it can be said that math anxiety has more negative impacts than positive ones. From the 16 articles reviewed by the researcher, only 1 article stated that math anxiety positively influences mathematics learning, specifically on students' learning outcomes.

The results of the study on the influence of math anxiety on learning show that this anxiety generally has a negative impact on students' abilities and learning outcomes. Most of the reviewed studies indicate that the higher the level of math anxiety, the lower the students' achievements in calculation, problem-solving, and understanding of mathematical concepts, mathematical reasoning, mathematical literacy, and math learning outcomes, and it also affects students' career choices. Although some findings indicate the potential positive aspects of math anxiety, the majority of research emphasizes that its negative impact is more dominant. Thus, it can be concluded that math anxiety has a more negative impact in the context of math learning.

CONCLUSION

Math anxiety is a significant problem that affects many students in learning mathematics. This research identifies that math anxiety can be categorized into three main aspects: cognitive, affective, and physiological. The indicators that emerge from this anxiety include feelings of restlessness, inability to solve problems, and physical reactions such as cold sweats. The results of observation show that the level of anxiety varies among students, with some students experiencing more severe symptoms, such as avoiding math lessons or having difficulty concentrating.

The impact of math anxiety not only affects the final results of students' academic performance but can also hinder several abilities of students in math learning, such as conceptual understanding, reasoning, problem-solving, and others. Therefore, it is important for educators to understand the symptoms and impacts of math anxiety and to develop effective strategies to reduce its effects. By creating a comfortable and supportive learning environment, it is hoped that students can overcome their anxiety and improve their performance in mathematics.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

All authors have made significant contributions to this study. Conceptualization, CNP and MS; methodology, CNP; data collection, CNP; results and discussion, CNP; writing—original draft preparation, CNP; review and editing, MS. All authors reviewed and approved the final version.

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