Math Anxiety in Elementary School Students: A Scoping Review

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Abstrak

Math anxiety merupakan salah satu faktor psikologis yang dapat memengaruhi proses dan hasil belajar matematika peserta didik sekolah dasar. Berbagai penelitian telah mengkaji faktor penyebab, dampak, dan strategi penanganan *math anxiety*, namun hasil penelitian tersebut masih tersebar dalam berbagai fokus kajian. Penelitian ini bertujuan untuk memetakan perkembangan penelitian mengenai *math anxiety* pada peserta didik sekolah dasar selama periode 2021–2025. Penelitian menggunakan metode scoping review dengan pendekatan PRISMA-ScR (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews*). Proses pencarian artikel dilakukan melalui database Scopus menggunakan kata kunci yang berkaitan dengan *math anxiety* dan peserta didik sekolah dasar. Hasil pencarian awal memperoleh 650 artikel. Setelah melalui tahap identifikasi, *screening*, *eligibility*, dan *inclusion*, diperoleh 10 artikel yang memenuhi kriteria inklusi untuk dianalisis. Hasil kajian menunjukkan bahwa *math anxiety* memiliki hubungan negatif dengan prestasi belajar matematika, terutama pada kemampuan berhitung, akurasi, kecepatan perhitungan, dan penyelesaian masalah matematika. Selain itu, *math anxiety* dipengaruhi oleh berbagai faktor kognitif dan afektif, seperti *working memory*, kemampuan penalaran matematis, motivasi belajar, persepsi kemampuan diri, lingkungan belajar, serta faktor gender. Beberapa penelitian juga menunjukkan bahwa siswa perempuan cenderung memiliki tingkat *math anxiety* lebih tinggi dibandingkan siswa laki-laki. Temuan lain menunjukkan bahwa kemampuan *problem solving* dan *mathematical reasoning* berperan penting dalam mengurangi dampak negatif *math anxiety*. Penelitian ini menyimpulkan bahwa *math anxiety* merupakan fenomena multidimensional yang perlu mendapatkan perhatian dalam pembelajaran matematika di sekolah dasar melalui penguatan kemampuan matematis, peningkatan kepercayaan diri, dan penciptaan lingkungan belajar yang mendukung secara emosional.

Keyword: Kecemasan Matematika, Siswa SD, Scoping Review, PRISMA-ScR

Abstract

Math anxiety is a psychological factor that can influence the mathematics learning process and outcomes of elementary school students. Various studies have examined the causes, impacts, and strategies for managing math anxiety, but these findings are scattered across various focus areas. This study aims to map the development of research on math anxiety in elementary school students during the 2021–2025 period. The study used a scoping review method with the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) approach. Articles were searched through the Scopus database using keywords related to math anxiety and elementary school students. The initial search yielded 650 articles. After going through the identification, screening, eligibility, and inclusion stages, 10 articles met the inclusion criteria for analysis. The study results indicate that math anxiety has a negative relationship with mathematics learning achievement, particularly in numeracy, accuracy, calculation speed, and problem-solving. Furthermore, math anxiety is influenced by various cognitive and affective factors, such as working memory, mathematical reasoning ability, learning motivation, self-perception of ability, learning environment, and gender. Several studies also show that female students tend to have higher levels of math anxiety than male students. Other findings suggest that problem-solving and mathematical reasoning skills play a significant role in mitigating the negative impacts of math anxiety. This study concludes that math anxiety is a multidimensional phenomenon that requires attention in elementary school mathematics learning through strengthening mathematical abilities, increasing self-confidence, and creating an emotionally supportive learning environment.

Keyword: Math Anxiety, Primary School Students, Scoping Review, PRISMA-ScR

INTRODUCTION

Mathematics is a fundamental subject in elementary education because it plays a crucial role in developing students' logical, critical, systematic, and problem solving thinking skills. At the elementary school level, mathematics learning provides the initial foundation for the development of students' academic abilities at subsequent levels of education. However, mathematics is still often

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perceived as a difficult, stressful, and fearful subject for some students. This condition can trigger negative emotional responses such as worry, nervousness, fear, and discomfort when facing mathematical activities, known as math anxiety.

Math anxiety is a psychological condition characterized by feelings of anxiety and fear when individuals encounter mathematics learning, such as when working on problems, participating in class, or facing mathematics assessments. Math anxiety is not only present in secondary and tertiary education but also begins to emerge in elementary school students. Research shows that students who experience math anxiety tend to have difficulty understanding mathematical concepts, have low problem solving skills, and demonstrate less than optimal mathematics learning outcomes.

In the context of elementary education, math anxiety is a crucial issue because elementary school is the initial stage in the formation of students attitudes, perceptions, and confidence in mathematics. Negative learning experiences during this stage can have long term impacts on students' motivation to learn and academic performance. Research by Ratri et al. (2023) found a relationship between math anxiety and elementary school students' ability to solve math problems. The higher a student's level of math anxiety, the lower their math problem solving ability.

Furthermore, several national studies indicate that elementary school students math anxiety levels remain in the moderate to high range. A survey conducted by Fadila (2024) showed that nearly 70% of elementary school students experience moderate to high levels of math anxiety. This condition is influenced by various factors, such as low self-confidence, unpleasant learning experiences, academic pressure, monotonous learning methods, and a classroom environment that overemphasizes accuracy and speed in solving problems.

Another psychological factor related to math anxiety is students' academic self-efficacy. Research by Safiyah and Widyastuti (2022) showed a negative relationship between academic self-efficacy and math anxiety in upper elementary school students. Students with low levels of self-efficacy tend to have higher levels of math anxiety. Furthermore, research by Yuliati and Zahrah (2023) also showed that female students tend to have higher math anxiety scores than male students, although the difference was not statistically significant.

In recent years, research on math anxiety has experienced significant developments both nationally and internationally. International studies show that math anxiety not only impacts students math performance but also impacts their psychological well-being, self-confidence, and interest in STEM (Science, Technology, Engineering, and Mathematics) fields. Research by Chen et al. (2023) revealed that certain student behaviors can predict the emergence of math anxiety. Meanwhile, Stella (2021) explains that math anxiety is a complex condition that can affect students cognitive processes, mental well-being, and mathematical thinking abilities.

Although numerous studies on mathematics anxiety have been conducted, these findings vary in focus and approach. Some studies focus on the factors that cause mathematics anxiety, others examine its impact on students mathematics abilities, and a few studies discuss strategies to reduce mathematics anxiety. However, few studies have specifically mapped the development of mathematics anxiety research in elementary school students in a comprehensive manner, especially in the last five years. Therefore, a study is needed that can identify, map, and analyze the development of research related to mathematics anxiety in elementary school students.

One method that can be used to map research development is a scoping review. The scoping review method allows researchers to identify various research findings, map key themes, examine research characteristics, and discover research insights that can be developed in future research. By using a scoping review approach, research on mathematics anxiety in elementary school students can be systematically analyzed based on research trends, causal factors, impacts, and management strategies.

Based on this description, this study aims to map research on mathematics anxiety in elementary school students through a scoping review approach. The results of this study are expected to provide a comprehensive overview of the development of research on mathematics anxiety, serve as a reference for further researchers, and contribute to teachers and education practitioners in designing mathematics learning that better supports the psychological conditions of elementary school students.

METHOD

This research employed a scoping review using the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) approach. The literature review procedure involved several stages: identification, screening, eligibility, and inclusion. During the identification stage, the researchers searched for scientific articles in the Scopus database. The articles ranged from 2021 to 2025 to ensure the articles align with the latest research on math anxiety in elementary school students. Keywords used in the search included "Math Anxiety," "Elementary School," "Mathematics Anxiety," and "Primary Students".

The initial search yielded 650 articles ready for selection from Scopus. Based on the initial selection process, 630 articles were excluded due to discrepancies in the title, abstract, research focus, and duplicate articles, leaving 20 articles.

In the screening stage, researchers screened articles based on research criteria, namely articles that focused on elementary school students, specifically discussed math anxiety, and were empirical research. At this stage, 10 articles were excluded because they did not meet the research criteria, leaving 10 articles suitable for further analysis.

In the final stage (inclusion), 10 articles were identified that met the criteria and were suitable for use as study material in this study. Next, the researchers extracted data, reviewed, analyzed, and drew conclusions from the selected articles to map the development of research on math anxiety in elementary school students over the past five years.

RESULTS AND DISCUSSION

Results

Based on the article search results using the PRISMA-ScR approach, 10 articles met the inclusion criteria and were eligible for analysis. The article screening process is presented in detail in Figure 1.

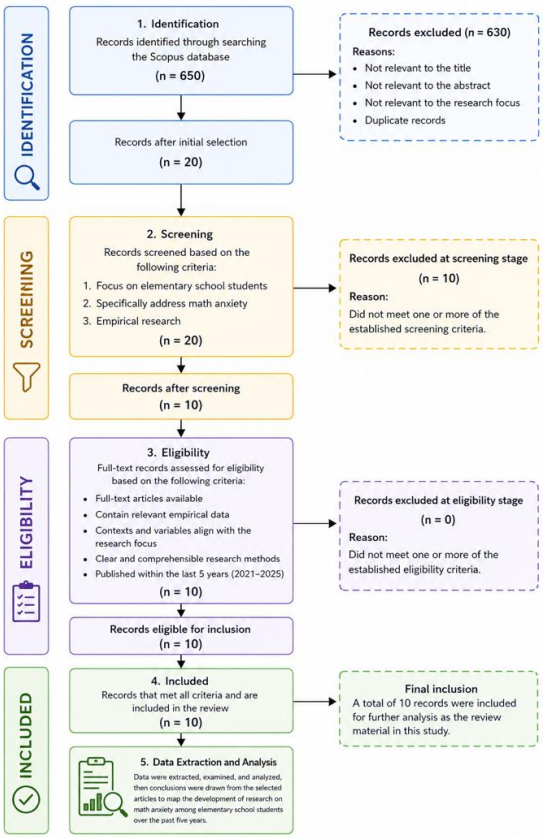

Figure 1. PRISMA ScR Flowchart

The articles were published between 2021 and 2025 and originated from various countries. The articles were sourced from the Scopus database and addressed math anxiety in elementary school students through various approaches, including correlational studies, longitudinal studies, experiments, meta-analyses, mediation analyses, and moderation analyses, which are presented in

detail in Table 1.

Table 1. Data Extraction

No	Penulis	Judul Artikel	Tujuan Utama	Metode	Subjek	Temuan Utama
1	Ashkenazi & Cohen (2021)	Developmental trajectories of strategy use in children with mathematical anxiety	To explore strategy selection in individuals with high math anxiety, and to examine the role of development in strategy selection.	Quantitative approach with cross-sectional comparative design.	94 students (31 2nd graders, 31 3rd graders, and 32 5th graders) were recruited from six local elementary schools in the Jerusalem area.	The results of this study indicate that math anxiety participants have an atypical developmental trajectory in strategy use.
2	Caviola et al. (2025)	Exploring the mediating role of academic anxiety in mathematics and reading performance among boys and girls: A comprehensive study of Italian fifth graders	Looking at the relationship between test anxiety and math and reading ability from a gender perspective.	Non-experimental correlational quantitative approach.	146,227 5th grade elementary school students in Italy, data taken from the INVALSI national test 2011-2017.	The results of this study indicate that female students consistently show higher levels of test anxiety than male students.
3	Gashaj et al. (2023)	Foundations for future math achievement: Early numeracy, home learning environment, and the absence of math anxiety	See how early numeracy skills, home learning environment (HLE), and math anxiety affecting the development of elementary school children's mathematical abilities longitudinally.	Quantitative approach to longitudinal studies.	85 children (mean age T1 = 6.4 years; T2 = 7.9)	The results of this study found that early numeracy skills, home learning environment, and mathematics anxiety significantly influence mathematics achievement in school.
4	Xie et al. (2024)	Gender differences in mathematics anxiety: A	To analyze gender differences in mathematics	Meta-analysis research using a quantitative approach.	83 articles, 91 independent samples,	The results of this study found that women

		meta-analysis of Chinese children	anxiety in Chinese children and identify factors influencing this relationship, such as: age, economic region, time period, and measurement instrument.		total participants 97,994 children in China.	showed higher levels of mathematics anxiety than men, and this difference was influenced by age, economic region, and the measurement instrument used.
5	Commodari & Rosa (2021)	General academic anxiety and math anxiety in primary school. The impact of math anxiety on calculation skills	Identify two interrelated dimensions of math anxiety that can significantly impair math performance: anxiety related to learning math and anxiety experienced during testing.	Correlational quantitative approach	204 elementary school students (120 boys, 84 girls), who were in third grade (age range: 8-9 years).	The results of this study indicate that math anxiety is negatively related to arithmetic performance in elementary school students. More specifically, math test anxiety is negatively correlated with numerical knowledge, calculation accuracy, and calculation speed, while math learning anxiety is negatively correlated with written calculation scores.
6	Lievore et al. (2024)	How trait and state mathematics anxiety could affect performance: Evidence from	Investigating innate and situational mathematics anxiety in children with Specific Learning	Experimental quantitative approach.	112 children and adolescents aged between 8 and 14 years were divided into two	The results of this study indicate that high trait math anxiety decreases math performance,

		children with and without Specific Learning Disorders	Disorder, aged between 8 and 14 years, compared with undiagnosed participants matched for age, gender, and IQ.		groups: 56 (33 boys) with Specific Learning Disorder, and 56 (28 boys) a comparison group without learning disorders.	self-perception of ability increases performance, state anxiety patterns differ between SLD and non-SLD children, and time pressure can increase math anxiety.
7	Szczygie et al. (2024)	Math anxiety and math achievement in primary school children: Longitudinal relationship and predictors	Predicting mathematics achievement (Deficit Theory), mathematics anxiety predicts mathematics achievement (Debilitating Anxiety Theory), or whether mathematics anxiety and mathematics achievement have a reciprocal relationship (Reciprocity Theory).	Quantitative approach to longitudinal studies	337 Polish primary school students.	The results of the study support the Reciprocity Theory regarding the relationship between math anxiety and math achievement. Math anxiety was predicted by general anxiety, knowledge of math symbols, and gender. Math achievement was predicted by fluid intelligence, working memory, and knowledge of math symbols.
8	Mohring et al. (2024)	Mathematics anxiety and math achievement in primary school children: Testing different theoretical accounts	Testing predictions from two leading theories, namely the disturbance theory and the competence decline theory, using a comprehensive and integrated approach.	Correlation, regression, mediation analysis.	Children aged 6 to 8 years (N = 163).	The results of the study revealed a negative, albeit small, relationship between children's math anxiety and accuracy in solving arithmetic

						problems.
9	Cuder et al. (2023)	The relationship between math anxiety and math performance: The moderating role of visuospatial working memory	To explore whether the interaction between mathematics anxiety and working memory would affect performance in numerical operations (i.e., mathematical fluency tasks) and mathematical reasoning (i.e., mathematical reasoning tasks) in a group of elementary school children.	Correlational quantitative approach with moderation analysis.	210 students who are in their last 3 years of primary school in northern Italy.	The results showed that visuospatial working memory appeared to moderate the relationship between math anxiety and math performance when math fluency tasks were considered, suggesting that participants with higher levels of working memory were more negatively affected by math anxiety.
10	Supriadi et al. (2024)	The role of learning anxiety and mathematical reasoning as predictor of promoting learning motivation: The mediating role of mathematical problem solving	Analyzing the relationship between learning anxiety, mathematical reasoning, mathematical problem solving, and learning motivation.	Quantitative approach Cross-section design The analysis used Structural Equation Modeling (SEM).	345 elementary school students in Lampung Province, Indonesia, selected using a stratified random sampling method.	Research results show that higher learning anxiety can also increase learning motivation. Learning anxiety influences mathematical problem-solving abilities. Students with better mathematical reasoning abilities tend to be more effective in solving math problems. Good reasoning abilities make students

						more confident, feel successful, and are more motivated to learn math. Mathematical problem-solving abilities mediate the relationship between learning anxiety, mathematical reasoning, and learning motivation.

A summary of the screening results indicates that the primary focus of the research was the relationship between math anxiety and mathematics achievement, problem-solving strategies, working memory, gender, learning motivation, and mathematical reasoning ability.

Discussion

1. The Relationship Between Math Anxiety and Mathematics Learning Achievement

Analysis of several articles indicates that most studies found a negative relationship between math anxiety and elementary school students' mathematics achievement. Math anxiety causes students to experience difficulties in completing math assignments, particularly in the areas of numeracy, calculation accuracy, and speed.

Commodari and La Rosa (2021) found that math anxiety was negatively correlated with elementary school students' numeracy skills. More specifically, anxiety about math exams was associated with low numerical knowledge, calculation accuracy, and calculation speed, while anxiety about learning math was associated with low written calculation skills. These findings suggest that math anxiety can hinder students' academic performance both in assessment contexts and in everyday learning processes.

Similar findings were also reported by Mohring et al. (2024), who found a negative relationship between math anxiety and the accuracy of solving arithmetic problems in children aged 6–8. This study explained that students with high math anxiety tended to use higher-order mental strategies less frequently, resulting in lower math performance.

Furthermore, a longitudinal study by Szczygiel et al. (2024) showed that the relationship between math anxiety and math achievement is reciprocal. Low math achievement can increase math anxiety, while high math anxiety can also worsen future math achievement. These findings support the reciprocal relationship theory, which explains that math anxiety and math achievement influence each other continuously.

2. The Role of Cognitive Factors in Math Anxiety

Several studies in this review indicate that math anxiety is closely related to cognitive factors, particularly working memory, problem-solving strategies, and mathematical reasoning ability. Ashkenazi and Cohen (2021) found that students with high levels of math anxiety exhibited atypical developmental trajectories in their use of mathematical strategies. This suggests that math anxiety not only impacts the final outcome of math tasks but also influences students' thought processes when selecting problem solving strategies.

Research by Cuder et al. (2023) showed that visuospatial working memory moderated the relationship between math anxiety and math performance. Students with high working memory capacity were more negatively impacted by math anxiety when working on rapid arithmetic operations. This occurs because students with high working memory typically use more complex mental strategies, making anxiety more likely to interfere with their thinking processes.

In addition to working memory, mathematical reasoning ability is also an important factor. Supriadi et al. (2024) found that students with better mathematical reasoning abilities tended to have better mathematical problem-solving abilities. Mathematical reasoning helps students think logically, understand cause and effect relationships, and find more effective problem-solving strategies.

3. Gender Differences in Math Anxiety

The review results indicate that female students tend to have higher levels of math anxiety than male students. This finding has been consistently found in several studies. Xie et al. (2024), through a meta-analysis of 97.994 children in China, found that females exhibited higher levels of math anxiety than males. This difference was influenced by factors such as age, economic region, and the measurement instrument used.

Similar findings were also reported by Caviola et al. (2025), who showed that fifth-grade female students in Italy consistently had higher levels of test anxiety than male students. Gender differences in math anxiety are likely influenced by social stereotypes about math ability, different learning experiences, and higher academic pressure on female students. However, these studies do not always show significant differences in math ability between males and females.

4. Math Anxiety and Learning Environment

The learning environment is a crucial factor influencing the emergence of math anxiety in elementary school students. Gashaj et al. (2023) found that early numeracy skills, the home learning environment, and low math anxiety significantly influenced the development of elementary school students' math achievement. A supportive home learning environment can help students build confidence in mathematics, thereby minimizing math anxiety.

Furthermore, research by Lievore et al. (2024) showed that time pressure in solving math problems can increase students' state math anxiety. The study also found that high perceived competence can improve students' math performance, while high trait math anxiety actually decreases math performance. These findings suggest that a learning environment that places excessive pressure can increase students' math anxiety. Conversely, an emotionally supportive learning environment can help students feel more comfortable and confident in learning mathematics.

5. Math Anxiety, Learning Motivation, and Problem Solving

The review also showed that math anxiety is related to learning motivation and mathematical problem-solving ability. Supriadi et al. (2024) found that mathematical problem solving acts as a mediator between learning anxiety, mathematical reasoning, and learning motivation. Students with strong problem-solving skills tend to have higher learning motivation and greater self-confidence in facing math assignments. Interestingly, the study also found that increased learning anxiety in some students was actually accompanied by increased learning motivation. This suggests that a certain level of anxiety can motivate students to study harder, although excessive anxiety can still negatively impact math performance.

CONCLUSION

Research on math anxiety in elementary school students reveals that this issue significantly impacts the process and outcomes of mathematics learning. Most studies indicate that math anxiety is negatively related to mathematics achievement, particularly in numeracy, accuracy, calculation speed, and arithmetic problem solving.

The review also shows that math anxiety is influenced by various cognitive factors, such as working memory, mathematical reasoning skills, problem-solving strategies, and students' initial numeracy skills. Furthermore, affective and social factors, such as learning motivation, perceived self-efficacy, time pressure, the home learning environment, and gender, also influence the emergence of math anxiety in elementary school students.

Several studies have found that female students tend to have higher levels of math anxiety than male students. Furthermore, the relationship between math anxiety and mathematics achievement is reciprocal, so math anxiety can be both a cause and a consequence of students' low math ability.

Other findings indicate that mathematical problem-solving and reasoning skills play a crucial role in reducing the negative impact of math anxiety and increasing students' motivation to learn. Therefore, handling math anxiety in elementary school students needs to be done comprehensively by strengthening math skills, developing problem-solving strategies, increasing self-confidence, and creating a safe and emotionally supportive learning environment.

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