

WHO FEARS MATH MORE? GENDER INSIGHTS INTO MATHEMATICS ANXIETY

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ARTICLE INFO	ABSTRAK
Article History:	Penelitian ini bertujuan untuk menguji perbedaan kecemasan matematika berdasarkan gender pada siswa sekolah menengah pertama di SMP Sangkara Medan tahun ajaran 2024/2025. Penelitian ini menggunakan pendekatan kuantitatif dengan desain komparatif, melibatkan 35 siswa kelas 7 dan 8. Data dikumpulkan menggunakan angket kecemasan matematika yang telah divalidasi dan dianalisis menggunakan uji t independen. Hasil penelitian menunjukkan bahwa tidak terdapat perbedaan yang signifikan dalam kecemasan matematika antara siswa laki-laki dan perempuan. Temuan ini mengindikasikan bahwa kecemasan matematika pada siswa SMP merupakan fenomena yang bersifat universal dan tidak ditentukan oleh gender, sehingga perlu ditangani melalui pendekatan pembelajaran yang inklusif.
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Kata kunci: kecemasan matematika, perbedaan gender, siswa SMP, uji t

ABSTRACT

This study aims to examine gender differences in mathematics anxiety among junior high school students at SMP Sangkara Medan in the 2024/2025 academic year. A quantitative comparative design was employed involving 35 students from grades 7 and 8. Data were collected using a validated mathematics anxiety questionnaire and analyzed using an independent samples t-test. The results revealed no statistically significant difference in mathematics anxiety between male and female students. These findings suggest that mathematics anxiety is a universal and context-dependent phenomenon, rather than an issue inherently associated with gender, highlighting the importance of inclusive instructional approaches.

Keywords: mathematics anxiety, gender differences, junior high school, t-test

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Introduction

Mathematics is widely acknowledged as a core component of cognitive development and is positioned as a fundamental subject across school curricula. Despite this significance, many learners demonstrate emotional discomfort or negative reactions when faced with mathematical tasks, a condition commonly described as mathematics anxiety. Mathematics anxiety is commonly described as a persistent sense of tension, worry, or fear that disrupts mathematical reasoning and performance (Carey et al., 2015). Previous research shows that mathematics anxiety not only influences cognitive mechanisms such as working memory, but

also affects motivation, attitudes toward learning, and long term academic decision making (Foley et al., 2017; Gunderson et al., 2018).

Numerous studies have examined whether mathematics anxiety varies by gender across different educational settings. Findings from global research indicate that female students often report higher levels of anxiety related to mathematics, and this trend has been linked to societal expectations, gender stereotypes, and lower mathematical self-confidence (Barroso et al., 2021; Jameson et al., 2024; Zhang et al., 2019). Recent literature also explores how mathematics anxiety interacts with affective and cognitive variables. For example, Kaskens et al. (2020) demonstrated that mathematics anxiety negatively correlates with students' development, whereas self-efficacy and mathematical self-concept serve as positive predictors. Moreover, teacher expertise appears to mitigate these effects, reinforcing the notion that mathematics anxiety operates within a broader learning environment rather than solely as an internal emotional response. Similarly, Hill et al. (2016) observed variations based on age and developmental stage, noting that although female learners generally show higher levels of anxiety, its effect differs across schooling levels.

However, emerging evidence suggests that disparities between genders are not universal. Studies within the Indonesian context, such as those conducted by Miatun and Ulfah (2023), Juniardi et al. (2024), and Akmalia and Ulfah (2021) found no statistically significant difference in mathematics anxiety between male and female students. Consistent patterns have been reported in contexts where instructional approaches and expectations are similar across gender groups (Usman & Widyastuti, 2024). Scholars further propose that factors like classroom climate, assessment type, parental involvement, and mathematics self-efficacy may play a stronger role in determining anxiety levels than gender alone (Pizzie & Kraemer, 2017; Ramirez et al., 2018). Although research by Lailiyah et al. (2021) addressed anxiety during online learning, gender specific outcomes were not examined in depth, leaving unanswered questions in the junior high school context.

Sociocultural dimensions also contribute to gendered patterns of mathematics anxiety. Real and Carvalho (2025) reported that stereotype pressure may erode confidence among female students, resulting in elevated mathematics anxiety, especially among those pursuing STEM fields. Similarly, Pérez-Fuentes et al. (2020) demonstrated that mathematics anxiety may reduce performance by lowering learners' confidence in their mathematical ability. These findings indicate that mathematics anxiety is multidimensional, shaped by cultural, psychological, and instructional influences rather than gender alone.

Despite extensive scholarship, findings remain inconsistent. While some studies report substantial gender differences, others suggest negligible or no disparities. Furthermore, most international studies rely on broader comparative samples, whereas localized research particularly in Southeast Asia and Indonesia remains limited. Existing Indonesian studies frequently focus on older students or pandemic-based learning conditions, leaving fewer studies on junior high school students, a formative stage during which mathematical attitudes stabilize (Gunderson et al., 2018). Although methodological advancements have been made, such as Ganley and McGraw (2016) validating the MASYC-R scale, only a small number of studies rigorously compare gender using validated instruments and assumption-based inferential analyses.

Although gender differences in mathematics anxiety have been widely investigated, empirical findings remain inconsistent, particularly in the Indonesian junior high school context. Previous studies have reported mixed results and often lack focused analysis at this educational level. Accordingly, this study examines whether a significant gender difference in mathematics anxiety exists among junior high school students at SMP Sangkara Medan using a validated instrument and appropriate statistical analysis, with the aim of clarifying existing inconsistencies in prior research.

Methods

Using a quantitative comparative framework, this study focused on identifying differences in mathematics anxiety between male and female students. This design was appropriate for assessing variation in anxiety levels across gender groups.

The participants consisted of 35 students enrolled at SMP Sangkara Medan during the 2024/2025 academic year. The sample was drawn using a non-probability convenience sampling technique based on accessibility and willingness to participate. The participants included both grade 7 and grade 8 students, consisting of 15 males and 20 females. Specifically, 18 participants were from grade 7 and 17 from grade 8.

Table 1. Distribution of Participants

Grade	Male	Female	Total
7	10	8	18
8	5	12	17
Total	15	20	35

The research instrument used was a mathematics anxiety questionnaire adapted from existing validated instruments to ensure suitability for junior high school students. The original questionnaire consisted of 20 items; however, following a validity test using item-total correlation, only 13 items met the required threshold and were retained for further analysis. Responses were recorded using a four-level Likert-type scale, ranging from 1 (Never) to 4 (Always). Reliability analysis produced a Cronbach's Alpha value of 0.707, suggesting that the instrument had adequate internal consistency.

Data collection was carried out during regular school hours with the approval of school administrators and teachers. The questionnaires were administered in classroom settings and completed under supervision to ensure independent responses and reduce potential external influences. Students received an explanation regarding the aims of the study before taking part.

Ethical clearance was secured from the school authorities before the data collection process. Student participation was voluntary, and all responses were collected anonymously. Students were assured that all responses would be kept anonymous and utilized exclusively for research activities. Participants were also given the right to discontinue their involvement at any stage without any adverse consequences.

All data were processed using SPSS version 26. The analysis process was carried out in several stages to ensure that the dataset met the required statistical assumptions before performing the hypothesis testing. First, descriptive statistics were used to summarize mathematics anxiety scores across gender groups, including key measures such as central

tendency and dispersion. This step provided an initial understanding of general trends and variations within the dataset.

Next, assumption testing was performed. Data distribution was assessed using the Shapiro–Wilk test, which is suitable for small sample sizes. The test results indicated p-values of 0.706 for male students and 0.693 for female students. As the obtained values were above the 0.05 significance level, the assumption of normality was met.

Homogeneity of variance across groups was evaluated using Levene's test. The resulting p-value (0.220) exceeded the 0.05 criterion, indicating that the variance assumption was fulfilled. With these assumptions satisfied, parametric statistical analysis could be conducted.

A summary of the normality and homogeneity test results is provided in Table 2.

Table 2. Summary of Normality and Homogeneity Tests

Test	Group	Statistic Value	p-value	Interpretation
Shapiro–Wilk Normality Test	Male	—	0.706	Normally distributed ($p > 0.05$)
Shapiro–Wilk Normality Test	Female	—	0.693	Normally distributed ($p > 0.05$)
Levene's Test for Homogeneity	Male vs Female	—	0.220	Homogeneous variance ($p > 0.05$)

Based on the information presented in Table 2, the dataset satisfied the assumptions necessary for parametric testing.

Finally, an independent samples t-test was then applied to examine potential differences in mathematics anxiety between male and female students. The analysis produced a p-value of 0.289, exceeding the 0.05 significance criterion. This result indicates that mathematics anxiety did not differ significantly across the two gender groups. Accordingly, anxiety levels were comparable for male and female students.

Following assumption testing, group differences in mathematics anxiety were evaluated using an independent samples t-test. A summary of the analytical results is provided in Table 3.

Table 3. Results of the Independent Samples t-Test

Group Comparison	Mean Score	SD	t-statistic	p value	Result
Male vs Female Math Anxiety	29.47 (Male) vs 31.45 (Female)	—	—	0.289	Not significant ($p > 0.05$)

Based on Table 3, the independent samples t-test produced a p value of 0.289, exceeding the 0.05 significance criterion. This outcome indicates that mathematics anxiety levels did not differ significantly between male and female students in the present sample. These results imply that both male and female students reported comparable experiences of mathematics anxiety within the studied context.

To clearly illustrate the sequence of procedures undertaken in this study, a structured research and analysis workflow was developed. The process began with the identification of participants, consisting of 35 students from grades 7 and 8. After participant selection, the

mathematics anxiety questionnaire containing 13 valid items measured using a four-level Likert-type response format to collect students' answers.

Following data collection, statistical validation procedures were performed to examine the appropriateness and reliability of the measurement instrument. Item validity analysis determined which statements were suitable for analysis, while internal consistency was assessed using Cronbach's Alpha, resulting in a reliability coefficient of **0.707**, indicating that the instrument was acceptable for use in this study.

Once the instrument was verified, assumption testing was performed to determine whether the dataset met the criteria for parametric analysis. Normality was assessed using the Shapiro–Wilk test, while variance homogeneity was examined with Levene's test. With both assumptions satisfied, the independent samples t test was chosen as the main analytical procedure to examine differences in mathematics anxiety scores across gender groups.

An overview of the research procedure, from participant selection to statistical decision-making, is illustrated in the flowchart shown in Figure 1.

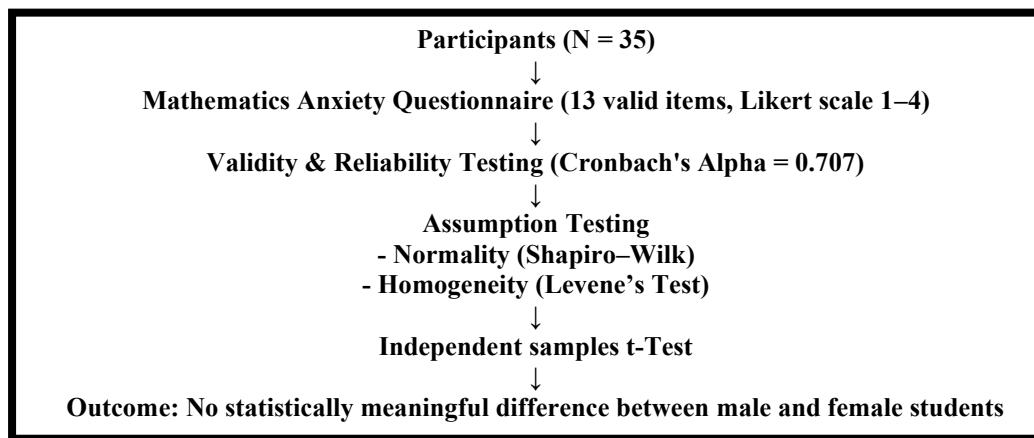


Figure 1. Flowchart of the research procedure and data analysis steps.

Descriptive statistics were used to outline the pattern of mathematics anxiety scores across gender groups. As reported in Table 4, female participants slightly outnumbered male students in the sample. Male students showed a lower mean anxiety score than female students, indicating marginally higher reported anxiety among females on average. Minimum and maximum scores revealed a comparable range for both male and female students, suggesting similar variability in anxiety levels across gender groups. Furthermore, the standard deviation values were close in magnitude for both groups, implying that the dispersion of mathematics anxiety scores appeared relatively consistent between male and female students. Overall, the descriptive results suggest that while female students tended to report marginally higher anxiety, the difference between genders was not substantial.

Table 4. Descriptive Statistics of Mathematics Anxiety Scores by Gender Group

Sample Size	Min	Max	Total Score	Average	Standard Deviation
MALE	15	23	37	442	29,47
FEMALE	20	20	46	629	31,45
Valid N (listwise)	15				6,194

To provide a clearer visual understanding of the distribution pattern of mathematics anxiety between male and female students, a bar chart was constructed based on the mean scores obtained from the questionnaire responses. While numerical values offer statistical precision, graphical representation allows for an intuitive comparison and highlights potential differences that may not immediately appear through descriptive statistics alone. The visualization serves to illustrate the general tendencies in students' emotional responses toward mathematics and supports the interpretation of gender patterns in anxiety levels observed in the dataset. Figure 2 displays a bar chart illustrating differences in mean mathematics anxiety scores between male and female students.

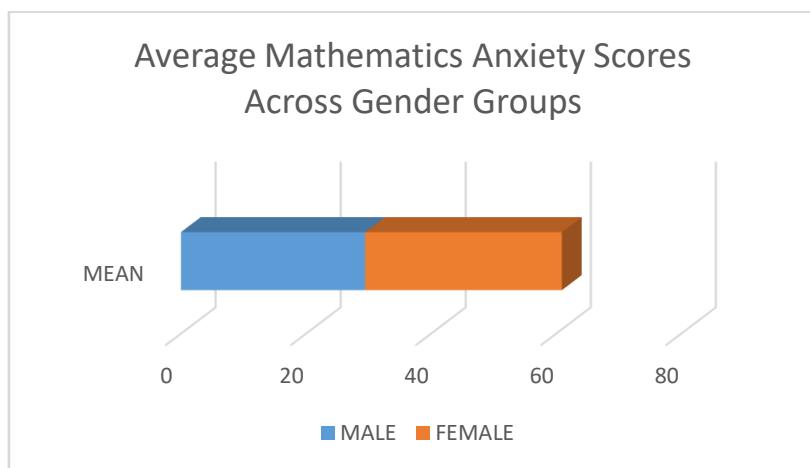


Figure 2. Bar Chart of Mean Mathematics Anxiety Levels Across Male and Female Students

As illustrated in Figure 2, female students demonstrated a higher average level of mathematics anxiety ($M = 31.45$) compared to male students ($M = 29.47$). This pattern suggests that female students, on average, reported slightly greater emotional discomfort, stress, or concern when engaging with mathematics-related tasks. Although the difference between the two groups appears modest and should be interpreted cautiously, the visual representation reflects a consistent tendency where female learners expressed somewhat heightened anxiety compared to their male counterparts.

The observed difference aligns with previous research suggesting that gender may influence affective responses toward mathematics, with female students often reporting higher levels of anxiety than males. However, despite this visible trend, the inferential statistical analysis conducted later (independent-samples t test) indicated that the observed difference was not statistically significant. This indicates that although female students appear to experience slightly higher anxiety in descriptive terms, the variation may not be substantial enough to generalize beyond this sample. Therefore, the visual trend provides meaningful context but must be interpreted together with the statistical findings to ensure accurate conclusions.

While descriptive statistics and bar charts provide useful insights into mean score comparisons, they may not fully capture the underlying distributional properties of the data. To further explore how mathematics anxiety scores vary between gender groups, a boxplot was constructed to visualize the spread, central tendency, and potential outliers within the dataset.

Unlike the bar chart, which focuses solely on average values, the boxplot allows for a more nuanced interpretation by illustrating the median, interquartile range (IQR), and distribution symmetry for both male and female students.

This visual approach is particularly important when assessing whether observed group differences are meaningful or merely reflective of natural variations within the population. The boxplot facilitates direct comparison of core distributional characteristics and provides additional context regarding score variability, consistency, and potential deviations. By examining the spread and alignment of quartiles, educators and researchers can better understand whether gender influences not only average performance but also the broader emotional response patterns associated with mathematics anxiety. The boxplot representing the distribution of mathematics anxiety scores across gender groups is illustrated in Figure 3.

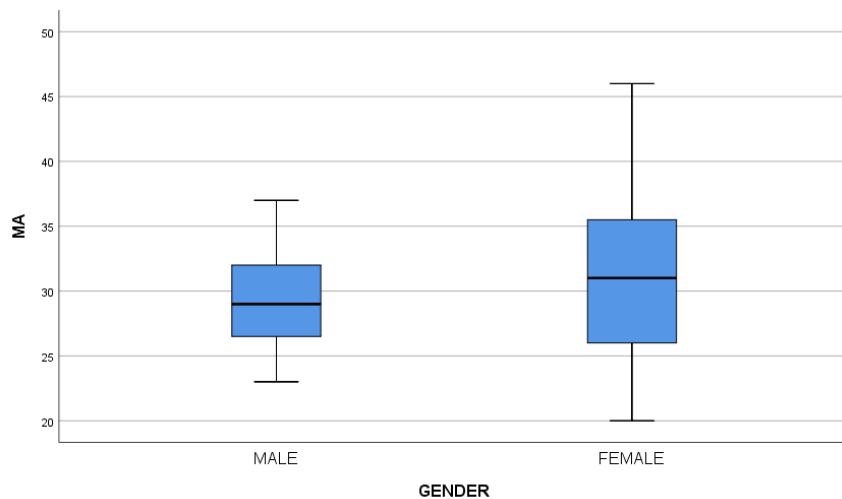


Figure 3. Boxplot of Mathematics Anxiety Score Distributions Across Gender Groups

As depicted in Figure 3, the boxplot illustrates that the distributions of mathematics anxiety scores for male and female students appear largely similar. The median score of female students appears slightly higher than that of male students, indicating a marginally increased central value; however, the difference is visual rather than substantial. The comparable range of scores, marked by similar minimum and maximum boundaries, suggests that both male and female students experience mathematics anxiety across a similar span of emotional intensity levels.

The interquartile ranges (IQRs) of both gender groups display substantial overlap, which indicates that the middle 50 percent of scores are closely clustered within a similar interval. This overlapping suggests that variability in mathematics anxiety is consistent across genders rather than gender-dependent. Furthermore, the relative symmetry of the whiskers on both sides of the boxplot suggests balanced distribution patterns with no strong skewness observed in either direction.

Additionally, the absence of extreme outliers reinforces the stability of the data and indicates that no individual participants reported exceptionally high or low anxiety scores beyond the expected range. Taken together, these visual characteristics support the overall conclusion that the overall distribution of mathematics anxiety across male and female students are largely comparable. Although minor differences exist in median values, they do not appear

substantial enough to suggest a meaningful gender disparity in anxiety levels. This interpretation aligns with the inferential statistical findings, in which the independent samples t-test revealed no statistically significant difference between the two groups.

Results and Discussion

A. Results

Descriptive analysis showed that male students obtained a mean mathematics anxiety score of 29.47 ($SD = 4.033$), while female students had a slightly higher mean score of 31.45 ($SD = 6.194$). Prior to hypothesis testing, the data met the assumptions required for parametric analysis. An independent samples t-test was subsequently conducted to examine gender differences in mathematics anxiety. The results indicated that the difference between male and female students was not statistically significant ($p = 0.289$). Therefore, the null hypothesis was retained, suggesting that mathematics anxiety did not differ significantly by gender in this sample.

B. Discussion

The present study contributes to the growing body of evidence suggesting that mathematics anxiety among junior high school students is not inherently determined by gender differences. Rather than emphasizing numerical contrasts between male and female students, the findings underscore that mathematics anxiety manifests as a shared emotional experience within the learning context. This supports the view that gender alone is insufficient to explain variations in students' anxiety toward mathematics.

Consistent with recent Indonesian studies (Juniardi et al., 2024; Usman & Widystuti, 2024), the results reinforce the argument that contextual factors such as instructional practices, classroom climate, assessment approaches, and emotional support play a more influential role in shaping mathematics anxiety than gender categorization. This perspective challenges simplified gender-based interpretations that have often dominated discussions on affective outcomes in mathematics education.

While several international studies continue to report higher mathematics anxiety among female students (Jameson et al., 2024; Van Mier et al., 2019; Zhang et al., 2019), these differences are frequently linked to sociocultural influences, including stereotype threat and gendered performance expectations (Pizzie & Kraemer, 2017). Variations in educational culture and pedagogical norms may account for the absence of such gender-based patterns in the present study, where expectations and learning opportunities for male and female students are relatively comparable.

Furthermore, prior research highlights mathematics self-efficacy as a critical factor underlying students' anxiety responses, irrespective of gender (Carey et al., 2015; Ramirez et al., 2018). Students' perceptions of their own mathematical competence, combined with situational learning conditions, have been shown to exert a strong influence on anxiety levels (Imro'ah et al., 2019). Instructional strategies that foster supportive classroom environments, encourage positive emotional regulation, and promote formative feedback can therefore play a central role in mitigating mathematics anxiety (Miatun & Ulfah, 2023).

Taken together, this study strengthens the theoretical perspective that mathematics anxiety should be understood as a universal and context-dependent phenomenon, rather than a problem inherently associated with gender. Accordingly, efforts to reduce mathematics anxiety

should prioritize inclusive pedagogical approaches that address students' emotional and cognitive needs across genders, rather than focusing on gender-specific interventions alone.

Conclusion

This study examined gender differences in mathematics anxiety among grade 7 and 8 students at SMP Sangkara Medan. The findings reveal that there is no statistically significant difference in mathematics anxiety between male and female students. This indicates that mathematics anxiety within the investigated context is not determined by gender, but rather experienced in a relatively similar manner by both groups. These results reinforce the perspective that mathematics anxiety should be understood as a universal and context-dependent phenomenon, rather than a gender-specific issue.

Based on these findings, efforts to reduce mathematics anxiety should prioritize inclusive instructional approaches that address students' emotional and psychological needs regardless of gender. Teachers and schools are encouraged to create supportive classroom environments, strengthen students' mathematical self-efficacy, and apply anxiety-reducing strategies such as collaborative learning and constructive feedback. Given the limited sample size and scope of this study, future research is recommended to involve larger and more diverse populations and to explore additional contributing factors that may influence mathematics anxiety.

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