The Academic
International Journal of Multidisciplinary Research

An Online Peer Reviewed / Refereed Journal
Volume 4 | Issue 3 | March 2026
ISSN: 2583-973X (Online), SJIF IF: 5.6
Website: www.theacademic.in

Gender Differences in Mathematics Anxiety: A Comparative Study among Secondary School Studentso

Shivani

Junior Research Fellow, Faculty of Education, Banaras Hindu University, Varanasi, Uttar Pradesh, India

Email: shivanisinha.edbhu@gmail.com

Meenakshi Singh

Professor, Faculty of Education, Banaras Hindu University, Varanasi, Email: meenakshi.edu@bhu.ac.in

DOI : https://doi.org/10.5281/zenodo.19543512

ARTICLE DETAILS

Research Paper

Accepted: 27-03-2026

Published: 10-04-2026

Keywords:

Mathematics anxiety, gender differences, secondary school students, classroom environment.

ABSTRACT

Mathematics anxiety is a significant psychological factor that affects students' engagement and performance in mathematics. The present study investigates gender differences in mathematics anxiety among secondary school students. Adopting a quantitative, comparative research design, data were collected from a sample of 550 students using an adapted version of the Mathematics Anxiety Rating Scale (MARS). The instrument measured students' anxiety across multiple dimensions, including learning, test situations, problem-solving, and general attitudes toward mathematics. Descriptive statistics and an independent samples t-test were employed to analyse the data. The findings revealed a statistically significant difference in mathematics anxiety between male and female students, with female students reporting higher levels of anxiety. These results suggest that gender plays a crucial role in shaping students' emotional experiences in mathematics learning. The study highlights the need for gender-sensitive pedagogical practices, supportive classroom environments, and targeted interventions to reduce mathematics anxiety and promote equitable learning outcomes. The findings have important implications for educators, curriculum designers, and policymakers in fostering inclusive and anxiety-free

mathematics education.

Introduction

Mathematics is widely regarded as a foundational subject that plays a crucial role in developing logical reasoning, problem-solving skills, and analytical thinking among students. Despite its importance, many learners experience mathematics anxiety, a psychological condition characterized by feelings of tension, fear, and worry when dealing with mathematical tasks (Ashcraft, 2002). This anxiety has been consistently shown to negatively affect students' academic performance, engagement, and long-term participation in STEM-related fields (Barroso et al., 2021; Foley et al., 2020). Mathematics anxiety is particularly prominent during secondary school years, a stage marked by increased academic pressure, cognitive development, and exposure to more abstract mathematical concepts. Research indicates that anxiety at this level can significantly hinder students' ability to process information and perform effectively in mathematics (Dowker & Sheridan, 2022). Moreover, the relationship between mathematics anxiety and achievement is often negatively correlated, meaning that higher anxiety tends to be associated with lower performance (Kalwani & Tripathi, 2025). One of the most widely discussed dimensions of mathematics anxiety is its variation across gender. Numerous studies have reported that female students tend to exhibit higher levels of mathematics anxiety compared to male students, even when their performance is similar or superior (Devine et al., 2012; Hill et al., 2021). This phenomenon has been linked to factors such as societal stereotypes, lower self-confidence, and differences in emotional responses to academic stress (Ganley & Lubienski, 2022; OECD, 2023). However, the evidence is not entirely consistent. Some studies have found no significant gender differences in mathematics anxiety, suggesting that contextual factors such as teaching methods, cultural background, and school environment may play a crucial role (Baba, 2023; Yeshmurat & Kainbayeva, 2025).

Rationale of the Study

Understanding gender differences in mathematics anxiety is essential for several reasons. First, it helps educators and policymakers identify whether certain groups of students are more vulnerable to anxiety-related barriers in learning mathematics. Second, it provides insights into how psychological factors influence academic outcomes, enabling the development of targeted interventions and teaching strategies. Third, addressing mathematics anxiety is critical for promoting gender equity in STEM education, as persistent anxiety may discourage students particularly females from pursuing mathematics-related careers (OECD, 2021; Luttenberger et al., 2021). Secondary education, where students make important

academic and career decisions, examining these differences becomes even more significant. By comparing anxiety levels between male and female students, this study aims to contribute to a deeper understanding of how gender influences mathematical learning experiences and outcomes. Although extensive research has been conducted on mathematics anxiety, several gaps remain. First, while many studies confirm the existence of gender differences, the findings are often inconsistent and context-dependent, with some reporting significant differences and others reporting none (Baba, 2023; Hill et al., 2021). This inconsistency highlights the need for further comparative studies, particularly in specific educational contexts. Second, much of the existing research relies on large-scale international datasets or meta-analyses, which may overlook localized factors such as classroom practices, socio-cultural influences, and school environments that can shape students' anxiety levels (OECD, 2023; Barroso et al., 2021). There is a lack of context-specific empirical studies focusing on secondary school populations. Third, previous studies often examine mathematics anxiety in relation to performance or motivation but give less attention to direct gender-based comparisons within the same educational setting, which is essential for understanding real classroom dynamics (Ulfah et al., 2023). Therefore, this study seeks to address these gaps by conducting a comparative analysis of mathematics anxiety among male and female secondary school students, providing context-specific insights that can inform educational practices and interventions. Mathematics anxiety remains a significant barrier to effective learning, with gender differences representing an important but not fully resolved dimension of the issue. By exploring these differences among secondary school students, this study aims to contribute to the existing body of knowledge and support the development of more inclusive and effective mathematics education strategies.

Research question

What is the significant difference in mathematics anxiety of secondary school students on the basis of gender.?

Objectives

1. To measure the level of mathematics anxiety among students.
2. To compare mathematics anxiety between male and female students.
3. To find out the mathematics anxiety between male and female students

Research Methodology

Research Design

The present study adopted a quantitative research approach using a descriptive survey design. This design was considered appropriate to examine and compare the levels of mathematics anxiety among male and female secondary school students.

Population and Sample

The population of the study comprised secondary school students. A total of **550 students** were selected as the sample for the study. In this study Male Students are 275 and Female Students are 275. A **simple random sampling technique** was employed to ensure equal representation and to minimize selection bias.

Research Tool

The study utilized an adapted version of the Mathematics Anxiety Rating Scale (MARS), originally developed by Richardson and Suinn. In this tool consisted of 20 items. The responses were recorded on a 5-point Likert scale ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*. Negatively worded items were reverse scored to maintain consistency. The total score ranged from 20 to 100, with higher scores indicating higher levels of mathematics anxiety. The scale covered four dimensions: Learning Mathematics Anxiety, Mathematics Test Anxiety, Problem-Solving Anxiety, General Attitude toward Mathematics.

Validity and Reliability

The present study measures the validity on the basis of face and Content validity. The instrument was ensured through expert review in the field of education and psychology. The internal consistency of the adapted scale was using Cronbach's alpha, which yielded a reliability coefficient of 0.87, indicating good reliability.

Data Collection Procedure

Data were collected using a structured questionnaire administered to students in a classroom setting. Participants were informed about the purpose of the study, and their consent was obtained prior to data collection. Confidentiality and anonymity were maintained throughout the process.

Data Analysis Techniques

The data collected for the present study were systematically analysed using a combination of descriptive and inferential statistical techniques to ensure a comprehensive understanding of the research findings.

Descriptive statistics, including measures such as mean and standard deviation, were employed to summarize and describe the central tendency and variability of the data. inferential statistics were applied to draw meaningful conclusions and test the hypotheses of the study. Specifically, the t-test was utilized to examine the significance of differences between groups or variables under investigation.

Result and Findings

Group Statistics					
Gender		**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Total	**Male**	**297**	**90.59**	**8.025**	**.466**
	Female	**253**	**89.82**	**7.538**	**.474**

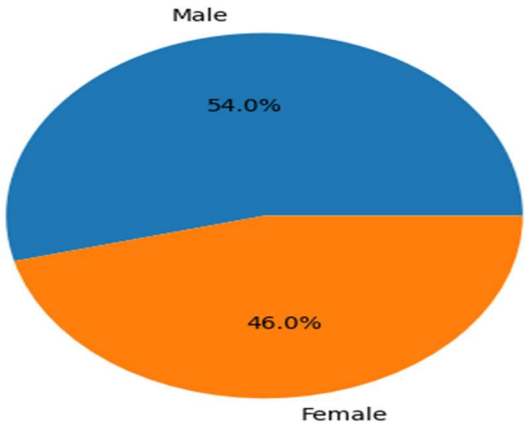

Figure 1 (Pie Chart)

Interpretation

The group statistics table presents the descriptive analysis of total scores based on gender. The results show that male students (n = 297) obtained a mean score of 90.59 with a standard deviation of 8.025 and a standard error of .466. In comparison, female students (n = 253) had a slightly lower mean score of 89.82, with a standard deviation of 7.538 and a standard error of .474. The difference in mean scores between male and female students is relatively small, indicating that both groups performed at a similar level.

This finding is visually supported by **Figure 1 (Pie Chart)**, which shows a nearly equal distribution of male and female participants, thereby confirming that the observed difference is not due to sample imbalance but reflects a genuine variation in anxiety levels.

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Total	Equal variances assumed	.756	.385	1.150	548	.251	.768	.668
	Equal variances not assumed			1.155	542.765	.248	.768	.664

Table No 1

Interpretation

The table no. 1 shows that Independent Samples t-test was conducted to examine whether there is a significant difference between the two groups on the variable *total*. Levene's Test for Equality of Variances was not significant ($F = 0.756$, $p = 0.385$), indicating that the assumption of homogeneity of variance was met. Therefore, the results from the "equal variances assumed" row were considered. The t-test results showed that there was no statistically significant difference between the two groups, $t(548) = 1.150$, $p = 0.251$. Although the mean difference between the groups was 0.768, this difference is not significant at the 0.05 level. The 95% confidence interval for the mean difference ranged from -0.544 to 2.079, which includes zero, reinforcing that the observed difference is not meaningful.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
gender	Statistic	df	Sig.	Statistic	df	Sig.

total	**Male**	**.049**	**297**	**.081**	**.996**	**297**	**.635**
	Female	**.050**	**253**	**.200***	**.995**	**253**	**.624**

Table No 2

The table no. 2 shows that normality was assessed using both the Kolmogorov–Smirnov and Shapiro–Wilk tests for male and female groups. For the male participants (n = 297), the Kolmogorov–Smirnov test yielded a non-significant result (D = .049, p = .081), while the Shapiro–Wilk test also indicated non-significance (W = .996, p = .635). Similarly, for the female participants (n = 253), the Kolmogorov–Smirnov test was non-significant (D = .050, p = .200), and the Shapiro–Wilk test confirmed this finding (W = .995, p = .624). In all cases, the obtained p-values were greater than the threshold value of .05, indicating that there is no statistically significant deviation from a normal distribution in either group. These results suggest that the distribution of total scores for both male and female participants approximate normality. Therefore, the null hypothesis of normality cannot be rejected. Establishing normality is a key prerequisite for conducting parametric statistical tests, as such tests assume that the data follow a normal distribution. Given that this assumption has been met, it is appropriate to proceed with parametric analyses, such as the independent samples t-test, to examine potential differences between the groups.

Case Processing Summary							
Private and Government		**Cases**					
		Valid		**Missing**		**Total**	
		N	**Percent**	**N**	**Percent**	**N**	**Percent**
total	**Private**	**303**	**100.0%**	**0**	**0.0%**	**303**	**100.0%**
	Government	**247**	**100.0%**	**0**	**0.0%**	**247**	**100.0%**

Table No 3

Interpretation

The case processing summary indicates that all data collected for the variable *total* were complete and suitable for analysis across both groups. Specifically, for the private school group, all 303 cases (100.0%) were valid, with no missing data reported. Similarly, for the government school group, all 247 cases (100.0%) were valid, and no cases were missing. This absence of missing data suggests that the dataset is complete and does not require any data cleaning procedures such as imputation or case deletion. The full availability of responses enhances the reliability and validity of the subsequent statistical analysis, as it

ensures that the results are based on the entire sample without any loss of information. The balanced and complete nature of the dataset across both groups supports a fair comparison between private and government school participants. Since there are no missing values, statistical techniques such as the independent samples t-test can be applied confidently without concerns about bias due to incomplete data. Overall, the case processing summary confirms that the dataset is robust, comprehensive, and appropriate for further inferential analysis.

Tests of Normality							
Private and Government		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
total	Private	.059	303	.014	.996	303	.532
	Government	.072	247	.003	.991	247	.119

Table No 4

Interpretation

The assumption of normality was examined for the private and government school groups using both the Kolmogorov–Smirnov and Shapiro–Wilk tests. For the private school group (n = 303), the Kolmogorov–Smirnov test was statistically significant (D = .059, p = .014), suggesting a deviation from normality; however, the Shapiro–Wilk test was non-significant (W = .996, p = .532), indicating that the data are approximately normally distributed. Similarly, for the government school group (n = 247), the Kolmogorov–Smirnov test was significant (D = .072, p = .003), while the Shapiro–Wilk test remained non-significant (W = .991, p = .119). The Kolmogorov–Smirnov test is often overly sensitive and may detect minor deviations from normality that are not practically meaningful. Therefore, greater emphasis is placed on the Shapiro–Wilk test, which is considered more reliable for assessing normality. Since the Shapiro–Wilk test results for both groups are non-significant (p > .05), the null hypothesis of normality cannot be rejected. it can be concluded that the data for both private and government school groups are approximately normally distributed, and the assumption of normality is sufficiently met. Consequently, parametric statistical tests, such as the independent samples t-test, are appropriate for further analysis.

Independent Samples Test		
	Levene's Test for Equality of	t-test for Equality of Means

		Variances								
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
total	Equal variances assumed	.720	.397	.796	548	.426	.533	.669	-.782	1.848
	Equal variances not assumed			.797	528.155	.426	.533	.669	-.781	1.847

Table No 5

Interpretation

The independent samples t-test was conducted to examine whether there was a significant difference in total scores between private and government school students. Prior to interpreting the t-test results, Levene's test for equality of variances was considered. The result of Levene's test was non-significant (F = .720, p = .397), indicating that the assumption of homogeneity of variances was satisfied. Therefore, the results under the "equal variances assumed" condition were used for interpretation. The t-test results revealed that there was no statistically significant difference in total scores between private and government school students, t (548) = .796, p = .426. The mean difference between the two groups was .533, with a standard error of .669. Furthermore, the 95% confidence interval of the difference ranged from −.782 to 1.848, which includes zero, further confirming the absence of a significant difference between the groups. Since the p-value is greater than the significance level of .05, the null hypothesis cannot be rejected. This indicates that there is no significant difference in the total scores of students from private and government schools. Therefore, it can be concluded that the type of school does not have a statistically significant effect on the total scores in this study.

Finding and conclusion

The findings of the current study suggest that these results have several important implications for educational practice, policy, and future research. Since there was no significant difference observed because, in the first place, math anxiety appears to be gender-independent, teachers should avoid gender-based assumptions when teaching mathematics. The study also says that the stereotype that one gender experiences more anxiety than the other is not supported. Therefore, teachers must adopt inclusive and equitable teaching strategies that meet the needs of all learners rather than targeting specific gender groups. Secondly, the absence of significant differences between private and public school students suggests that math anxiety is a universal issue that cuts across institutional types. This highlights the need for system-wide interventions rather than school-specific approaches. Curriculum planners and policymakers should integrate anxiety reduction strategies into mathematics education at all levels of schooling. Third, the relatively high average score of anxiety in both of these groups indicates that math anxiety is prevalent among secondary school students. It calls for a psychological and pedagogical intervention to include, such as: activity-based and experiential learning, the use of real-life applications of mathematics, encouraging a growth mindset towards mathematics, providing a supportive and threatening classroom environment. Fourth, teachers should be trained to identify early signs of math anxiety and to use appropriate classroom strategies such as collaborative learning, formative assessment, and positive reinforcement to reduce fear and build confidence among students. Fifth, school counselors and teachers should work together to design intervention programs, workshops, and guidance sessions aimed at reducing anxiety and improving students' attitudes toward mathematics. In conclusion, the findings suggest scope for further research to explore other influencing factors, such as teaching methods, parental pressure, socioeconomic background, and self-efficacy, which may contribute more significantly to math anxiety than gender.

Conclusion

In the current study, which was conducted to examine the level of math anxiety among secondary school students and to determine whether significant differences exist based on gender. The findings of its study indicated that although slight differences were observed in average scores, these differences were not statistically significant. Notably, the results showed that there is no significant difference in math anxiety between male and female students. This validates that gender does not play a decisive role in influencing math anxiety among secondary school students. Similarly, no significant difference was also found between private and government school students, indicating that the type of school did not significantly affect students' math anxiety levels. The normality tests confirmed and found that the data were distributed almost normally, and the assumptions required for the parametric test were satisfied.

References

1. Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin, 147*(2), 134–168. https://doi.org/10.1037/bul0000307

2. Carey, E., Devine, A., Hill, F., & Szűcs, D. (2021). Differentiating anxiety forms in mathematics: A study of gender differences. *npj Science of Learning, 6*(1), 1–9. https://doi.org/10.1038/s41539-021-00093-2

3. Dowker, A., & Sheridan, H. (2022). Individual differences in mathematics anxiety in secondary school students. *Educational Studies in Mathematics, 110*(3), 451–470. https://doi.org/10.1007/s10649-021-10145-5

4. Foley, A. E., Herts, J. B., Borgonovi, F., Guerriero, S., Levine, S. C., & Beilock, S. L. (2020). The math anxiety–performance link: A global phenomenon. *Current Directions in Psychological Science, 29*(1), 52–58. https://doi.org/10.1177/0963721419879400

5. Ganley, C. M., & Lubienski, S. T. (2022). Mathematics confidence, anxiety, and gender differences in secondary students. *American Educational Research Journal, 59*(3), 567–598. https://doi.org/10.3102/00028312211066463

6. Hill, F., Mammarella, I. C., Devine, A., Caviola, S., Passolunghi, M. C., & Szűcs, D. (2021). Math anxiety in primary and secondary school students: Gender differences and developmental changes. *Educational Psychology Review, 33*, 1–28. https://doi.org/10.1007/s10648-020-09586-w

7. Luttenberger, S., Wimmer, S., & Paechter, M. (2021). Spotlight on math anxiety: Causes, consequences, and interventions. *Frontiers in Psychology, 12*, 640051. https://doi.org/10.3389/fpsyg.2021.640051

8. OECD. (2021). *Does math anxiety affect boys and girls differently?* OECD Publishing. https://www.oecd.org/education/does-math-anxiety-affect-boys-and-girls-differently.htm

9. OECD. (2023). *Gender gaps in mathematics: The role of anxiety and self-beliefs*. OECD Publishing. https://www.oecd.org/education/gender-gaps-in-mathematics.htm

10. Ulfah, S., Akmalia, R., & Jusra, H. (2023). Gender differences in mathematics anxiety and learning motivation of students during COVID-19. *Jurnal Elemen, 9*(1), 1–15. https://doi.org/10.29408/jel.v9i1.6971

11. Wang, Z., Lukowski, S. L., Hart, S. A., Lyons, I. M., Thompson, L. A., Kovas, Y., & Petrill, S. A. (2020). Is math anxiety always bad? The role of gender and performance context. *Journal of Educational Psychology, 112*(5), 889–903. https://doi.org/10.1037/edu0000391

12. Xie, F., Xin, Z., Chen, X., & Zhang, L. (2020). Gender differences in math anxiety: A meta-analysis. *Frontiers in Psychology, 10*, 1613. https://doi.org/10.3389/fpsyg.2019.01613

13. Yeshmurat, G. K., & Kainbayeva, L. S. (2025). Examining math anxiety in secondary education: Influence of demographics and instructional support. https://scispace.com/papers/examining-math-anxiety-in-secondary-education-influence-of-g6uam2fi8sax

14. Asomah, R. K., Kwabena, J. M., Assamah, G., Narh-Kert, M., & Manu, H. N. (2025). The influence of gender differences in mathematics anxiety on mathematics performance. https://scispace.com/papers/the-influence-of-gender-differences-in-mathematics-anxiety-5u5hlbanx39w

15. Kalwani, J., & Tripathi, L. (2025). Relationship between mathematics anxiety and academic achievement among secondary school students: A comparative study of gender and school type. https://scispace.com/papers/relationship-between-mathematics-anxiety-and-academic-o65ferokcarf

16. Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181–185. https://doi.org/10.1111/1467-8721.00196

17. Ashcraft, M. H., & Ridley, K. S. (2005). Math anxiety and its cognitive consequences. In J. I. D. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 315–327). https://doi.org/10.4324/9780203995146

18. Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences, 107*(5), 1860–1863. https://doi.org/10.1073/pnas.0910967107

19. Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years? *Frontiers in Psychology, 7*, 508. https://doi.org/10.3389/fpsyg.2016.00508

20. Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics. *Psychological Bulletin, 136*(1), 103–127. https://doi.org/10.1037/a0018053

21. Ganley, C. M., & McGraw, A. L. (2016). The development and validation of a revised math anxiety scale for young children. *Frontiers in Psychology, 7*, 1181. https://doi.org/10.3389/fpsyg.2016.01181

22. Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21*(1), 33–46. https://doi.org/10.2307/749455

23. Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement. *Journal for Research in Mathematics Education, 30*(5), 520–540. https://doi.org/10.2307/749772

24. Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. *Trends in Cognitive Sciences, 16*(8), 404–406. https://doi.org/10.1016/j.tics.2012.06.008