

Effectiveness of Mindfulness Meditation in Controlling Test Anxiety among Ninth Grade Students in Different Levels of Achievement

¹Muraleedharan, T., ²Arjunan, N. K., ³Deepthi, T.

¹Principal, Calicut University Teacher Education Centre, Calicut, Kerala- Calicut

²Principal, Adi Sankara Training College, Kalady, Kerala

³Devaki Amma Memorial Teacher Education College, Chelembra, Malappuram, Kerala

Abstract — The present study investigated the effectiveness of Mindfulness Meditation in reducing test anxiety among secondary school students and examined whether its effectiveness varied according to students' levels of academic achievement. A quasi-experimental pretest–post-test control group design was employed. The participants comprised 166 Standard IX students from four intact divisions of a Government Higher Secondary School in Kerala. One division served as the Control Group, while the remaining three constituted the Treatment Group. Test anxiety was assessed using the Test Anxiety Scale for Secondary School Students (Arjunan & Bindu, 2021). The Treatment Group underwent a modified Mindfulness-Based Stress Reduction programme consisting of eight structured sessions supplemented by regular mindfulness practice. Data were analysed using descriptive statistics, t-test, ANCOVA, and one-way ANOVA. The findings revealed no significant initial difference in test anxiety among students belonging to different achievement levels. After controlling for pre-test scores, Mindfulness Meditation produced a significant reduction in test anxiety, with a large treatment effect ($F = 444.276$, $p < .001$, partial $\eta^2 = .730$). The effectiveness of the intervention also differed significantly according to academic achievement, with average- and high-achieving students showing greater reductions than low-achieving students. The findings support Mindfulness Meditation as an effective psychopedagogical strategy for managing test anxiety among secondary school students.

Keywords— Mindfulness Meditation, Test Anxiety, Academic Achievement, Secondary School Students.

I. INTRODUCTION

Examinations constitute an integral part of formal education, yet the increasing academic expectations and competitive nature of schooling have made test anxiety a significant concern among adolescents. Test anxiety involves cognitive worry, emotional tension, physiological arousal, and behavioural reactions associated with the anticipation or experience of evaluation. When anxiety becomes excessive, it may interfere with attention, working memory, information retrieval, and effective performance during examinations. Research consistently demonstrates an inverse relationship between test anxiety and academic achievement, with particularly important implications during the school years (von der Embse et al., 2018; Caviola et al., 2022; Merzaq et al., 2023; Robson et al., 2023). Apart from lowering academic performance, persistent test anxiety may adversely affect students' self-efficacy, academic self-concept, emotional well-being, and confidence, making its effective management an important educational and psychological concern.

Mindfulness meditation has emerged as a promising approach for helping students regulate anxiety and cope more effectively with academic stress. Mindfulness trains individuals to direct

attention towards present-moment experiences with greater awareness and less judgement, thereby reducing excessive preoccupation with anticipated failure and other anxiety-provoking thoughts. Research on school-based mindfulness interventions suggests potential benefits for students' emotional and psychological functioning, although the magnitude of effects varies across studies (Phan et al., 2022; Fulambarkar et al., 2023; Kander et al., 2024). More specifically, mindfulness-based interventions have demonstrated encouraging effects in reducing test anxiety among adolescents (Carsley & Heath, 2018; Dundas & Nygård, 2024). A recent meta-analysis also reported an overall moderate-to-large reduction in test anxiety following mindfulness interventions (Yilmazer et al., 2024), while brief mindfulness training has produced reductions in test anxiety under actual high-school examination conditions (Sun et al., 2025).

Despite these encouraging findings, important gaps remain in the existing literature. Much of the earlier evidence on mindfulness and test anxiety has emerged from university populations, brief interventions, specialised mindfulness activities, or relatively small adolescent samples. Research specifically examining structured mindfulness meditation for

test anxiety among secondary school students remains comparatively limited. Moreover, reviews of school-based mindfulness interventions have reported considerable variation in intervention duration, implementation quality, outcome measures, and methodological rigour, while large-scale trials indicate that universal mindfulness programmes do not invariably produce superior outcomes (Kuyken et al., 2022; Phan et al., 2022; Fulambarkar et al., 2023). Even recent high-school studies have called for replication with larger samples, stronger control conditions, and more rigorous Treatment designs (Dundas & Nygård, 2024; Sun et al., 2025). These limitations establish a clear need for further controlled investigation into whether mindfulness meditation can effectively reduce test anxiety among secondary school students.

Objectives

The study set the following objectives in view:

- To compare secondary school students at different levels of academic achievement with respect to their test anxiety.
- To determine the effectiveness of Mindfulness Meditation in reducing test anxiety among secondary school students.
- To examine whether the effectiveness of Mindfulness Meditation in reducing test anxiety differs according to the academic achievement level of secondary school students.

Hypotheses

- **H₀₁:** There is no significant difference in test anxiety among secondary school students at different levels of academic achievement.
- **H₀₂:** There is no significant difference in test anxiety between secondary school students exposed to Mindfulness Meditation and those not exposed to Mindfulness Meditation.
- **H₀₃:** There is no significant differential effect of Mindfulness Meditation on test anxiety among secondary school students belonging to different levels of academic achievement.

II. METHODOLOGY

1. Method

The study employed a quasi-Treatment method. Since intact class divisions were selected for the experiment, it was not feasible to randomly assign the participants to different groups or to equate the groups beforehand with respect to test anxiety or other variables relevant to the study.

2. Research Design

The present investigation followed a pretest–post-test control group design.

3. Population

The population for the present investigation comprised adolescent boys and girls studying in Standard IX in schools affiliated with the Kerala Board of Public Examinations, Government of Kerala, India.

4. Participants

The participants were 166 Standard IX students drawn from four intact divisions of a Government Higher Secondary School. The four divisions were randomly assigned to the treatment conditions, with one division serving as the control group ($n = 44$; boys = 19, girls = 25) and the remaining three divisions forming the Treatment Group ($n = 122$; boys = 58, girls = 64). A relatively larger Treatment Group was deliberately maintained to ensure adequate representation of students across high, average, and low achievement categories. This facilitated an examination of whether the effectiveness of mindfulness meditation in reducing test anxiety varied according to students' levels of academic achievement.

5. Instrumentation

Test anxiety was assessed before and after the intervention using the Test Anxiety Scale for Secondary School Students (TAS-4), developed by Arjunan and Bindu (2021). TAS-4 consists of 50 Likert-type items designed to assess four dimensions of test anxiety: Physical, Mental, Emotional, and Behavioural. The instrument demonstrated satisfactory psychometric properties, with a concurrent validity coefficient of 0.74 and a test–retest reliability coefficient of 0.86.

6. Data Collected

Both primary and secondary data were employed in the investigation. Primary data relating to test anxiety were obtained through the administration of TAS-4 before and after the intervention. Academic achievement constituted the secondary data and was represented by the percentage equivalent of the CGPA secured by the students in their most recent term-end examination. Based on the mean (M) and standard deviation (σ) of the achievement scores, the participants were classified into high, average, and low achievement groups by applying the $M \pm \sigma$ criterion.

7. Psychological Intervention

Mindfulness meditation was provided through a modified form of the Mindfulness-Based Stress Reduction (MBSR) programme originally developed by Kabat-Zinn (2003). The adapted programme, known as the Brief Mindfulness-Based

Stress Reduction Programme (BMBSRP) developed by Suresh and Pushkala (2013), was employed as a psycho-pedagogical intervention intended to bring about behavioural changes conducive to the management of test anxiety and academic stress. The intervention consisted of eight sessions, each lasting approximately 1½ hours, and incorporated different mindfulness practices such as body-scan meditation, sitting meditation, hatha yoga, walking meditation, and loving-kindness meditation. In addition to participating in these sessions, students were instructed to practise structured mindfulness exercises for approximately 20–25 minutes a day on six days of each week. They were also encouraged to cultivate mindfulness informally by maintaining conscious awareness and attention while performing routine activities in their everyday lives.

8. Statistical Techniques

Descriptive statistical procedures were initially applied to the pre-test, post-test, and change scores obtained by the participants. Change scores were determined from the difference between the pre-test and post-test scores. One-way Analysis of Covariance (ANCOVA) was employed to determine the effectiveness of mindfulness meditation by comparing the post-test test-anxiety scores of the Treatment and control groups after statistically controlling for differences in their corresponding pre-test scores. An independent-samples t-test was used to examine whether the effectiveness of the intervention differed according to gender, while one-way Analysis of Variance (ANOVA) was employed to determine whether the effectiveness varied across high, average, and low achievement groups.

III. ANALYSIS AND INTERPRETATION

The descriptive statistical measures computed for the pre-test, post-test, and change scores of test anxiety among participants in the Control Group (CG) and Treatment Group (TG) are presented in Table 1. The statistics reported include Mean (M), Median (Md), Standard Deviation (σ), Skewness (Sk), Kurtosis (Ku), and Standard Error of the Mean (SEM).

An examination of the descriptive statistics reveals that the Control Group (CG) and Treatment Group (TG) recorded fairly similar levels of test anxiety before the intervention, with pre-test mean scores of 119.82 and 123.16, respectively. Following the intervention, the mean score of the CG showed virtually no change, shifting slightly to 120.07, whereas the TG recorded a clear decline to 115.35. This pattern is further reflected in the change scores, where the CG obtained a mean change of only 0.25, compared with 7.81 for the TG.

Table 1: Descriptive Statistical Indices of Pre-test, Post-test, and Change Scores of Test Anxiety for the Control and Treatment Groups

Testing	Group	N	Rang	M	Md	σ	Sk	Ku	SE _M
Pre-test	CG	44	88	119.82	123.0	21.17	-0.19	-0.53	3.19
	TG	123	90	123.16	124.0	20.43	-0.20	-0.56	1.84
Post-test	CG	44	87	120.07	121.0	20.91	-0.15	-0.59	3.15
	TG	123	86	115.35	116.0	20.43	-0.20	-0.57	1.79
Change Score	CG	44	8	0.25	0.00	2.04	0.36	-0.49	0.31
	TG	123	11	7.81	8.0	2.28	0.34	-0.14	0.21

The findings therefore provide an initial indication of a marked reduction in test anxiety among students in the Treatment Group.

Further, the skewness and kurtosis values were relatively low, suggesting that the score distributions did not show any substantial departure from normality. Students in the High-, Average- and Low levels of academic achievement were compared to find out the significant differences, if any, among students in different levels of achievement regarding their pre-test scores of test anxiety. Table 2 give the summary of one-way ANOVA performed incidentally.

Table 2: Comparison of high, average and low achievers regarding the pre-test scores of test anxiety (Summary of ANOVA)

TA	Sum of Squares	df	Mean Square	F	Sig.
Between	1561.018	2	780.509	1.855	NS
Within	69008.754	164	420.785		
Total	70569.772	166			

The one-way ANOVA yielded a between-groups sum of squares of 1561.018 and a within-groups sum of squares of 69008.754. The obtained F-value, $F(2, 164) = 1.855$, was not statistically significant ($p > .05$). Since the probability value was greater than the conventional .05 level of significance, the observed differences in the mean pre-test scores of test anxiety among low, average, and high achievers cannot be considered statistically significant. Thus, the findings indicate that students belonging to different achievement levels were comparable with respect to their initial levels of test anxiety.

Table 3: Comparison of Control Group and Treatment Group with respect to the Pre-Test Scores of Test Anxiety

Groups	Statistical Indices				t	Sig
	N	M	SD	SE _M		
Control	44	119.82	21.166	3.191	0.923	NS
Treatment	123	123.16	20.434	1.843		

The independent-samples t-test was employed to examine whether the Control Group (CG) and Treatment Group (TG) differed significantly in their pre-test scores of test anxiety. The CG ($N = 44$) obtained a mean score of 119.82 ($SD = 21.166$), while the TG ($N = 123$) recorded a slightly higher mean of 123.16 ($SD = 20.434$). The obtained t-value of 0.923 was not statistically significant (NS). Thus, the difference of 3.34 points between the group means may be attributed to sampling variation. The result indicates that the Control and Treatment Groups did not differ significantly in their initial levels of test anxiety and were therefore comparable with respect to test anxiety prior to the intervention. The result of the one-way ANCOVA performed to compare the post-test scores of the groups after controlling the effect of respective pre-test scores is given in Table 4.

Table 4: Result of the ANCOVA of the Post-Test Scores of Test Anxiety of Control Group and Treatment Group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	66968.835	2	33484.418	7268.854	.000	.989
Intercept	.428	1	.428	.093	.761	.001
Pre-test	66247.287	1	66247.287	14381.072	.000	.989
Group	2046.582	1	2046.582	444.276	.000	.730
Error	755.476	164	4.607			
Total	2337903.000	167				
Corrected Total	67724.311	166				
a. R Squared = .989 (Adjusted R Squared = .989)						

The ANCOVA results reveal that, after statistically controlling for the influence of pre-test scores, there was a significant difference between the Control Group and Treatment Group in their post-test scores. The effect of group was statistically significant, $F(1, 164) = 444.276$, $p < .001$, with a partial eta squared (η^2p) of .730. This indicates a very large treatment

effect, with group membership accounting for approximately 73.0% of the variance in post-test scores after adjustment for pre-test differences.

The pre-test scores also emerged as a significant covariate, $F(1, 164) = 14381.072$, $p < .001$, $\eta^2p = .989$, demonstrating a strong relationship between pre-test and post-test scores. The overall ANCOVA model was statistically significant, $F(2, 164) = 7268.854$, $p < .001$, and explained 98.9% of the variance in post-test scores ($R^2 = .989$; adjusted $R^2 = .989$). Thus, the findings provide strong evidence of a significant treatment effect after controlling for initial differences in test anxiety.

The differential effect of level of academic achievement on the success of mindfulness meditation in controlling test anxiety was examined by comparing high, average and low achieving students regarding their change scores of test anxiety. The summary of the one-way ANOVA performed in this context is given in Table 5.

Table 5: Comparison of high, average and low achievers regarding the change scores of test anxiety (Summary of ANOVA)

TA	Sum of Squares	df	Mean Square	F	Sig.
Between	68.064	2	34.032	7.207	.001
Within	566.635	120	4.722		
Total	634.699	122			

The ANOVA table shows that there was a statistically significant difference among the three groups with respect to test anxiety scores. The between-groups variation ($SS = 68.064$, $df = 2$, $MS = 34.032$) was considerably greater relative to the within-groups variation ($SS = 566.635$, $df = 120$, $MS = 4.722$), resulting in an F-value of 7.207.

This value was statistically significant, $F(2, 120) = 7.207$, $p = .001$. Therefore, the null hypothesis of no significant difference among the three group means may be rejected.

The result indicates that at least one of the three groups differed significantly from the others in its mean test anxiety score. Since ANOVA alone does not identify which specific groups differed, Bonferroni post-hoc test was performed. The result of the post-hoc test is given in Table 6.

Table 6: Post hoc tests for Comparison of Change Scores of Test Anxiety among Students in Different Levels of Achievement

(I) ACH	(J) Ach	(I-J) Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
LOW	Averag	-1.724	.495	.002	-2.92	-.52
	High	-2.049	.629	.004	-3.58	-.52
AVERAGE	Low	1.724	.495	.002	.52	2.92
	High	-.325	.527	1.000	-1.60	.95
HIGH	Low	2.049	.629	.004	.52	3.58
	Averag	.325	.527	1.000	-.95	1.60

The post-hoc analysis indicates that the change scores of test anxiety differed significantly across certain achievement levels. The Low Achievement group recorded a significantly lower mean change score than the Average Achievement group (mean difference = -1.724 , $p = .002$) and the High Achievement group (mean difference = -2.049 , $p = .004$). This indicates that the reduction in test anxiety was significantly greater among students with Average and High levels of achievement than among those with Low achievement. However, the difference in change scores between the Average and High Achievement groups was not statistically significant (mean difference = -0.325 , $p = 1.000$), suggesting that these two groups experienced a comparable degree of change in test anxiety. The 95% confidence intervals for the Low–Average and Low–High comparisons did not include zero, confirming the statistical significance of these differences. Thus, the findings suggest that the treatment produced greater reduction in test anxiety among Average- and High-achieving students than among Low-achieving students.

IV. CONCLUSION

The present study revealed that secondary school students belonging to low, average, and high levels of academic achievement did not differ significantly in their initial levels of test anxiety. This finding suggests that test anxiety is not necessarily confined to students with poor academic performance; students across achievement levels may

experience apprehension and psychological strain in evaluative situations. The finding is important because it supports the need for interventions addressing test anxiety across the student population rather than restricting them to academically weaker students. The major finding of the study was that Mindfulness Meditation produced a substantial reduction in test anxiety. After controlling for pre-test differences, the Treatment Group differed significantly from the Control Group, with a large treatment effect (partial $\eta^2 = .730$). This finding is strongly supported by Yilmazer et al. (2024), whose meta-analysis specifically examining mindfulness interventions for test anxiety found an overall beneficial effect of mindfulness-based interventions. The authors concluded that mindfulness interventions can be effective in alleviating test anxiety across different populations and intervention formats. Similarly, Dundas et al. (2024) reported that Mindfulness-Based Stress Reduction reduced test anxiety and self-judgment among adolescents, with reductions in test anxiety remaining evident at long-term follow-up.

The present findings are also broadly consistent with evidence concerning the psychological benefits of mindfulness in educational settings. Phan et al. (2022), in their systematic review of school-based mindfulness interventions, observed generally promising effects on students' psychological functioning, including anxiety- and stress-related outcomes. At the same time, the literature is not uniformly positive. Fulambarkar et al. (2023) found significant benefits for adolescent stress but not significant overall effects for anxiety or depression, particularly when mindfulness interventions were compared with active control conditions. Thus, the strong effect obtained in the present investigation contributes specifically to the growing evidence that mindfulness may be particularly useful when anxiety is linked to a clearly defined situation such as examinations. Another important finding was that the effectiveness of Mindfulness Meditation differed according to academic achievement. Average and high achievers showed significantly greater reductions in test anxiety than low achievers, whereas average and high achievers did not differ significantly from each other. This suggests that students' academic characteristics may influence their responsiveness to mindfulness practices. The finding reinforces the view emerging from recent reviews that the effects of school-based mindfulness programmes are heterogeneous and may depend on participant characteristics, implementation conditions, comparison groups, and intervention design. Consequently, while Mindfulness Meditation appears to be an effective strategy for managing test anxiety, supplementary or differently structured support may be required to maximize its benefits for low-achieving students.

REFERENCES

1. Carsley, D., & Heath, N. L. (2018). Effectiveness of mindfulness-based colouring for test anxiety in adolescents. *School Psychology International*, 39(3), 251–272. <https://doi.org/10.1177/0143034318773523>
2. Caviola, S., Toffalini, E., Giofrè, D., Ruiz, J. M., Szűcs, D., & Mammarella, I. C. (2022). Math performance and academic anxiety forms, from sociodemographic to cognitive aspects: A meta-analysis on 906,311 participants. *Educational Psychology Review*, 34, 363–399. <https://doi.org/10.1007/s10648-021-09618-5>
3. Dundas, I., & Nygård, I. (2024). Mindfulness for test anxiety and negative self-evaluation in high school. *Current Psychology*, 43, 30027–30037. <https://doi.org/10.1007/s12144-024-06557-6>
4. Dundas, I., & Nygård, I. (2024). Mindfulness for test anxiety and negative self-evaluation in high school. *Current Psychology*, 43, 30027–30037. <https://doi.org/10.1007/s12144-024-06557-6>
5. Fulambarkar, N., Seo, B., Testerman, A., Rees, M., Bausback, K., & Bunge, E. (2023). Review: Meta-analysis on mindfulness-based interventions for adolescents' stress, depression, and anxiety in school settings: A cautionary tale. *Child and Adolescent Mental Health*, 28(2), 307–317. <https://doi.org/10.1111/camh.12572>
6. Fulambarkar, N., Seo, B., Testerman, A., Rees, M., Bausback, K., & Bunge, E. (2023). Review: Meta-analysis on mindfulness-based interventions for adolescents' stress, depression, and anxiety in school settings: A cautionary tale. *Child and Adolescent Mental Health*, 28(2), 307–317. <https://doi.org/10.1111/camh.12572>
7. Kander, T. N., Lawrence, D., Fox, A., Houghton, S., & Becerra, R. (2024). Mindfulness-based interventions for preadolescent children: A comprehensive meta-analysis. *Journal of School Psychology*, 102, Article 101261. <https://doi.org/10.1016/j.jsp.2023.101261>
8. Kuyken, W., Ball, S., Crane, C., Ganguli, P., Jones, B., Montero-Marin, J., Nuthall, E., Raja, A., Taylor, L., Tudor, K., Viner, R. M., et al. (2022). Effectiveness and cost-effectiveness of universal school-based mindfulness training compared with normal school provision in reducing risk of mental health problems and promoting well-being in adolescence: The MYRIAD cluster randomised controlled trial. *Evidence-Based Mental Health*, 25(3), 99–109. <https://doi.org/10.1136/ebmental-2021-300396>
9. Merzaq, G., El Ouardi, R., Alaoui, S., Lahmar, A., Aladwir, A. A. N., & Zarhbouch, B. (2023). The effect of test anxiety on academic achievement of adolescents in educational practices. *The Journal of Quality in Education*,

- 13(21), 179–190.
<https://doi.org/10.37870/joqie.v13i21.349>
10. Phan, M. L., Renshaw, T. L., Caramanico, J., Greeson, J. M., MacKenzie, E., Atkinson-Diaz, Z., Doppelt, N., Tai, H., Mandell, D. S., & Nuske, H. J. (2022). Mindfulness-based school interventions: A systematic review of outcome evidence quality by study design. *Mindfulness*, 13(7), 1591–1613. <https://doi.org/10.1007/s12671-022-01885-9>
 11. Phan, M. L., Renshaw, T. L., Caramanico, J., Greeson, J. M., MacKenzie, E., Atkinson-Diaz, Z., Doppelt, N., Tai, H., Mandell, D. S., & Nuske, H. J. (2022). Mindfulness-based school interventions: A systematic review of outcome evidence quality by study design. *Mindfulness*, 13(7), 1591–1613. <https://doi.org/10.1007/s12671-022-01885-9>
 12. Robson, D. A., Johnstone, S. J., Putwain, D. W., & Howard, S. (2023). Test anxiety in primary school children: A 20-year systematic review and meta-analysis. *Journal of School Psychology*, 98, 39–60. <https://doi.org/10.1016/j.jsp.2023.02.003>
 13. Sun, Y., Lv, K., Xie, W., et al. (2025). The effectiveness of brief mindfulness training in reducing test anxiety among high school students. *BMC Psychology*, 13, Article 205. <https://doi.org/10.1186/s40359-025-02553-y>
 14. von der Embse, N., Jester, D., Roy, D., & Post, J. (2018). Test anxiety effects, predictors, and correlates: A 30-year meta-analytic review. *Journal of Affective Disorders*, 227, 483–493. <https://doi.org/10.1016/j.jad.2017.11.048>
 15. Yilmazer, E., Hamamci, Z., & Türk, F. (2024). Effects of mindfulness on test anxiety: A meta-analysis. *Frontiers in Psychology*, 15, Article 1401467. <https://doi.org/10.3389/fpsyg.2024.1401467>
 16. Yilmazer, E., Hamamci, Z., & Türk, F. (2024). Effects of mindfulness on test anxiety: A meta-analysis. *Frontiers in Psychology*, 15, Article 1401467. <https://doi.org/10.3389/fpsyg.2024.1401467>