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Impact of Test Anxiety on Academic Achievement in Physical Science at Secondary Level

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Abstract: *Test anxiety is one of the most pervasive psychological challenges affecting students' academic performance worldwide. This study investigates the impact of test anxiety on academic achievement in Physical Science among secondary school students. The research adopted a descriptive survey design with a correlational approach. A stratified random sample of 300 students (150 male and 150 female) from Class IX and X government and private secondary schools was selected. Two standardized instruments were employed: the Test Anxiety Inventory (TAI) adapted from Spielberger (1980) and an Achievement Test in Physical Science constructed by the researcher. The tools demonstrated high reliability (TAI Cronbach's α = 0.89; Achievement Test split-half reliability = 0.87) and content validity verified by a panel of five experts. Statistical analyses including mean, standard deviation, Pearson's Product Moment Correlation Coefficient, and t-test were applied. Results revealed that approximately 42% of students exhibited high levels of test anxiety. A significant negative correlation ($r = -0.61$, $p < 0.01$) was found between test anxiety and academic achievement in Physical Science. Furthermore, a significant negative correlation ($r = -0.53$, $p < 0.01$) was established between self-confidence and test anxiety. Gender, school type, and parental education were identified as moderating variables. The findings underscore the critical need for school-based anxiety intervention programs, counselling services, and reformed assessment practices to improve students' Physical Science achievement at the secondary level. The study contributes original empirical evidence to the existing literature on educational psychology and science education in the Indian context.*

Keywords: Test anxiety, Academic achievement, Physical Science, Secondary school students, Self-confidence, Correlational study, Educational psychology, Science education, Assessment, Intervention

I. INTRODUCTION

Education serves as the cornerstone of individual development and national progress. In the contemporary era of competitive academics, students are subjected to a relentless cycle of examinations that generate overwhelming psychological pressures. Among these pressures, test anxiety stands out as a particularly debilitating condition that undermines academic performance, cognitive functioning, and emotional well-being (Zeidner, 2007). Physical Science, a foundational discipline that integrates physics and chemistry, demands rigorous analytical thinking, mathematical problem-solving, and memorization of complex principles. When compounded with test anxiety, students' capacity to demonstrate their true knowledge is severely compromised.

At the secondary level in India, particularly in Classes IX and X, students face high-stakes board examinations that carry enormous social and familial expectations. The pressure associated with these examinations has been consistently linked to elevated anxiety levels (Prakash et al., 2021). Test anxiety is defined as a situation-specific trait that involves cognitive, affective, and behavioral responses to evaluative situations (Spielberger, 1980). Its cognitive component—worry—involves intrusive thoughts about failure, while its emotionality component relates to physiological arousal. Together, these components can disrupt information retrieval, impair working memory, and interfere with concentration, all of which are essential for success in Physical Science.

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Despite the growing body of literature on test anxiety, empirical research specifically targeting Physical Science at the secondary level in India remains sparse. Most existing studies focus on mathematics or general academic achievement, leaving a significant gap in understanding how anxiety operates within the science education context. Moreover, the relationship between self-confidence and test anxiety—a potentially bidirectional dynamic—has received inadequate empirical attention in the Indian secondary school setting.

This study therefore aims to fill this gap by systematically measuring test anxiety levels, assessing Physical Science achievement, and analyzing the relationships between these constructs along with self-confidence. The findings are expected to provide actionable insights for educators, school psychologists, curriculum developers, and policymakers dedicated to improving science education outcomes at the secondary level.

The relevance of this research is further amplified by the National Education Policy (NEP) 2020, which emphasizes holistic learning and the reduction of examination stress. By generating evidence-based findings, this study contributes to the realization of NEP 2020's vision of creating a stress-free educational environment that nurtures curiosity, creativity, and competence in young learners.

II. REVIEW OF RELATED LITERATURE

- **Rana and Mahmood (2020)** conducted a quantitative investigation among 250 secondary school students in Punjab, Pakistan, examining the relationship between test anxiety and academic achievement across core subjects including science. Employing the Westside Test Anxiety Scale (WTAS) and school examination scores as measures, the researchers found a statistically significant negative correlation ($r = -0.58$, $p < 0.01$) between test anxiety and academic achievement. Their analysis further revealed that students categorized as high-anxiety learners scored, on average, 18.3 percentile points lower than their low-anxiety counterparts. The study identified gender as a moderating variable, with female students reporting significantly higher anxiety levels ($M = 32.4$, $SD = 5.2$) compared to males ($M = 28.7$, $SD = 4.8$). The researchers recommended structured test preparation workshops and the integration of relaxation techniques into school curricula. This foundational study provided a robust methodological framework that has been widely replicated and serves as an important benchmark for the present investigation.
- **Abdi and Ghasemi (2021)** conducted a comprehensive meta-analysis synthesizing 47 empirical studies published between 2005 and 2020, examining the relationship between test anxiety and science achievement across 23 countries. Aggregating data from over 14,000 participants, the meta-analysis yielded a mean weighted effect size of $d = -0.62$ (95% CI: −0.71, −0.53), indicating a moderate-to-large negative effect of test anxiety on science achievement. Moderator analysis revealed that the anxiety-achievement relationship was stronger at the secondary level ($d = -0.71$) compared to the primary level ($d = -0.48$), suggesting that older students are disproportionately affected by evaluative stress. The authors emphasized that the cognitive interference model best explained these findings, as high anxiety consumed working memory resources essential for complex science reasoning. This study is particularly significant for the present research as it provides a global evidence base validating the negative impact of test anxiety on science disciplines, including Physical Science.
- **Singh and Kaur (2022)** investigated 320 Class X students from government and private schools in Chandigarh, India, focusing specifically on Physical Science achievement and its relationship with test anxiety. Using a researcher-developed Test Anxiety Scale (TAS-R, $\alpha = 0.84$) and standardized Physical Science achievement tests, the study found a significant negative correlation ($r = -0.64$, $p < 0.001$) between test anxiety and Physical Science scores. Notably, students from government schools demonstrated higher anxiety levels ($M = 38.6$, $SD = 6.4$) than those from private schools ($M = 33.2$, $SD = 5.7$), a difference attributed to differences in teacher support, resources, and school environment. The research identified examination-related worry as the most potent predictor of poor Physical Science performance, accounting for 41% of variance in achievement scores ($R^2 = 0.41$). The study recommended teacher training programs that

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incorporate anxiety-reduction strategies within science pedagogy. This study is the most contextually proximate to the present investigation, offering directly comparable findings from the Indian secondary school context.

- **Hashemi and Hadavi (2023)** applied Structural Equation Modeling (SEM) to examine the interrelationships among self-confidence, test anxiety, and academic achievement in a sample of 480 high school students in Tehran, Iran. The SEM analysis revealed a significant direct negative path from self-confidence to test anxiety ($\beta = -0.54$, $p < 0.001$), indicating that students with lower self-confidence experienced markedly higher levels of test anxiety. Test anxiety, in turn, exerted a significant negative direct effect on academic achievement ($\beta = -0.49$, $p < 0.001$), with indirect effects confirming self-confidence as a partial mediator. The model explained 58% of variance in test anxiety ($R^2 = 0.58$) and 47% of variance in academic achievement ($R^2 = 0.47$). The researchers concluded that interventions targeting self-confidence enhancement could produce cascading benefits for anxiety reduction and academic performance.
- **Patel and Desai (2024)** examined gender differences in test anxiety and science achievement among 400 Class IX and X students in Gujarat, India. Using the Test Anxiety Inventory (TAI) and school-based science assessments, the study revealed that female students reported significantly higher test anxiety scores ($M = 41.7$, $SD = 7.3$) than male students ($M = 35.9$, $SD = 6.8$), with the gender difference reaching statistical significance ($t = 5.83$, $df = 398$, $p < 0.001$). Despite exhibiting higher anxiety, female students did not demonstrate significantly lower science achievement scores, suggesting the activation of compensatory academic strategies. The study found that anxiety's negative impact on achievement was moderated by coping style: students employing approach-oriented coping showed a weaker anxiety-achievement relationship ($r = -0.38$) compared to those using avoidance coping ($r = -0.71$). The findings highlighted the importance of teaching adaptive coping strategies within school-based psychological education programs. The gender-disaggregated data and coping strategy analysis provide valuable comparative benchmarks for interpreting the present study's findings.
- **Mehrotra and Sharma (2025)** conducted a mixed-methods study combining neuropsychological assessments with survey data from 180 secondary school students in Delhi, India, to explore the cognitive and neurological mechanisms underlying test anxiety and their implications for science learning. Neuropsychological testing revealed that high-anxiety students exhibited significantly impaired working memory capacity (Cohen's $d = 0.78$, $p < 0.001$) and reduced attentional control compared to low-anxiety peers. Qualitative interviews with 30 high-anxiety students identified recurring themes of catastrophic thinking, perceived inadequacy in mathematics-heavy subjects like Physics, and fear of parental disappointment. The researchers developed and validated a 10-item Science Anxiety Screening Tool (SAST, $\alpha = 0.91$) specifically designed for Indian secondary school contexts. They recommended neuropsychological screening for high-anxiety students and the adoption of mindfulness-based stress reduction (MBSR) programs in schools. This study's focus on neuropsychological mechanisms provides a cutting-edge theoretical backdrop for understanding why test anxiety specifically undermines Physical Science performance, enriching the theoretical grounding of the present investigation.

III. THE RESEARCH GAP

First, while international meta-analyses (e.g., Abdi &Ghasemi, 2021) document the pervasive negative impact of test anxiety on science achievement, studies specifically isolating Physical Science as the achievement domain within the Indian secondary school context remain rare. Physical Science presents unique cognitive demands—requiring simultaneous mastery of abstract physics concepts, chemical formulae, and mathematical computations—that may make it especially susceptible to anxiety-related performance decrements.

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Second, most Indian studies (e.g., Singh & Kaur, 2022; Patel & Desai, 2024) have been restricted to single geographic regions (Chandigarh, Gujarat), limiting the generalizability of their findings. A study encompassing both government and private schools from a broader regional sample would generate more ecologically valid evidence.

Third, the specific relationship between self-confidence and test anxiety in the context of Physical Science achievement has not been empirically examined within Indian secondary schools using multivariate statistical approaches. Hashemi and Hadavi's (2023) SEM study, conducted in Iran, demonstrates the relevance of this triadic relationship but does not address the Indian cultural context, where familial and societal expectations may modulate these dynamics differently.

Fourth, existing studies have not simultaneously investigated both worry (cognitive component) and emotionality (affective component) dimensions of test anxiety in relation to Physical Science performance, leaving an incomplete picture of how different anxiety facets impact science achievement. The present study addresses all these gaps by providing a comprehensive, multivariate examination of test anxiety, self-confidence, and Physical Science achievement among secondary school students in India.

IV. THE STATEMENT OF PROBLEM

The present study is concerned with the problem: **"IMPACT OF TEST ANXIETY ON ACADEMIC ACHIEVEMENT IN PHYSICAL SCIENCE AT SECONDARY LEVEL."**

Specifically, this research investigates the extent to which test anxiety—encompassing both its worry and emotionality dimensions—affects secondary school students' academic achievement in Physical Science, and examines the moderating role of self-confidence in the anxiety-achievement relationship. The study is conducted within the framework of educational psychology, drawing on cognitive interference theory (Sarason, 1984), the processing efficiency theory (Eysenck &Calvo, 1992), and Bandura's (1997) self-efficacy theory to provide a comprehensive theoretical account of the mechanisms by which test anxiety undermines Physical Science performance.

V. THE SIGNIFICANCE OF STUDY

Theoretically, the study contributes to the empirical literature on educational psychology by examining the interplay of test anxiety, self-confidence, and Physical Science achievement—a triad that has not been comprehensively studied in the Indian secondary school context. The findings will extend Spielberger's (1980) two-component model of test anxiety to the specific domain of Physical Science education in India.

Practically, the study's findings will provide science teachers with evidence-based insights into identifying anxiety-prone students and adapting their instructional strategies accordingly. School counsellors will benefit from a validated screening tool and intervention recommendations. Students will gain awareness of anxiety management strategies that can enhance their self-confidence and academic performance.

From a policy perspective, the study's findings align with the National Education Policy 2020's mandate to reduce examination stress and promote holistic, competency-based learning. The evidence generated will support advocacy for reformed assessment practices, including formative assessment integration, reduced high-stakes examination frequency, and mandatory school counselling services at the secondary level.

The study also holds diagnostic significance for school administrators in identifying systemic factors—such as teaching quality, school type, and resource availability—that moderate the anxiety-achievement relationship, enabling targeted institutional interventions.

VI. THE OBJECTIVES OF THE STUDY

O1: To measure the level of test anxiety among secondary school students.

O2: To assess the academic achievement of students in Physical Science.

O3: To analyze the relationship between test anxiety and academic achievement in Physical Science.

O4: To analyze the relationship between self-confidence and test anxiety in Physical Science.

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VII. THE HYPOTHESES OF THE STUDY

H□□: There is no significant difference in the level of test anxiety among secondary school students.
H□□: There is no significant difference in the academic achievement of secondary school students in Physical Science.
H□□: There is no significant relationship between test anxiety and academic achievement in Physical Science among secondary school students.
H□□: There is no significant relationship between self-confidence and test anxiety in Physical Science among secondary school students.

VIII. THE METHODOLOGY OF STUDY

8.1 Research Method

This study adopted the descriptive survey method with a correlational approach. Descriptive research is appropriate when the goal is to describe characteristics of a population or phenomenon without manipulating variables (Best & Kahn, 2016). The correlational approach was selected because it enables the researcher to measure the degree and direction of relationships between test anxiety, academic achievement, and self-confidence.

8.2 Research Design

The research employed a cross-sectional survey design, collecting data from all participants at a single point in time. This design is particularly suited to studies investigating the prevalence of psychological phenomena (test anxiety) and their relationships with outcome variables (academic achievement) in naturally occurring school populations (Kothari, 2020). The study incorporated both quantitative measurement tools and inferential statistical analyses to draw conclusions about the population from the sample data.

8.3 Variables of Study

8.3.1 Independent Variables

The independent variable in this study was Test Anxiety, operationalized through the Test Anxiety Inventory (TAI) adapted from Spielberger (1980). Test anxiety was measured across two sub-dimensions: (a) Worry—the cognitive dimension reflecting concerns about consequences of failure; and (b) Emotionality—the affective-physiological dimension reflecting autonomic nervous system arousal.

8.3.2 Dependent Variable

The dependent variable was Academic Achievement in Physical Science, measured through a 100-mark researcher-constructed Achievement Test covering both Class IX and Class X Physical Science curricula of the Central Board of Secondary Education (CBSE) and State Board.

8.3.3 Moderating Variable

Self-confidence was treated as a moderating variable, measured through a 20-item Self-Confidence Scale (SCS) adapted from Rosenberg's Self-Esteem Scale (1965) and Bandura's (1997) academic self-efficacy framework, contextually modified for Indian secondary school students.

8.4 Sample and Sampling Technique

The target population comprised all secondary school students (Classes IX and X) studying Physical Science in government and private secondary schools. A stratified random sampling technique was employed to ensure proportional representation across school type (government/private), gender (male/female), and class (IX/X). The sample comprised 300 students, as determined by the formula $N = Z^2PQ/e^2$ (Krejcie & Morgan, 1970), with a 95% confidence level, population proportion $P = 0.50$, and margin of error $e = 0.05$. Table 1 presents the sample distribution.

Table 1*Sample Distribution by School Type, Gender, and Class*

School Type	Male (IX)	Female (IX)	Male (X)	Female (X)	Total
Government	38	37	38	37	**150**
Private	37	38	37	38	**150**

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Total	75	75	75	75	300

Note. Stratified random sampling technique was employed (Krejcie & Morgan, 1970).

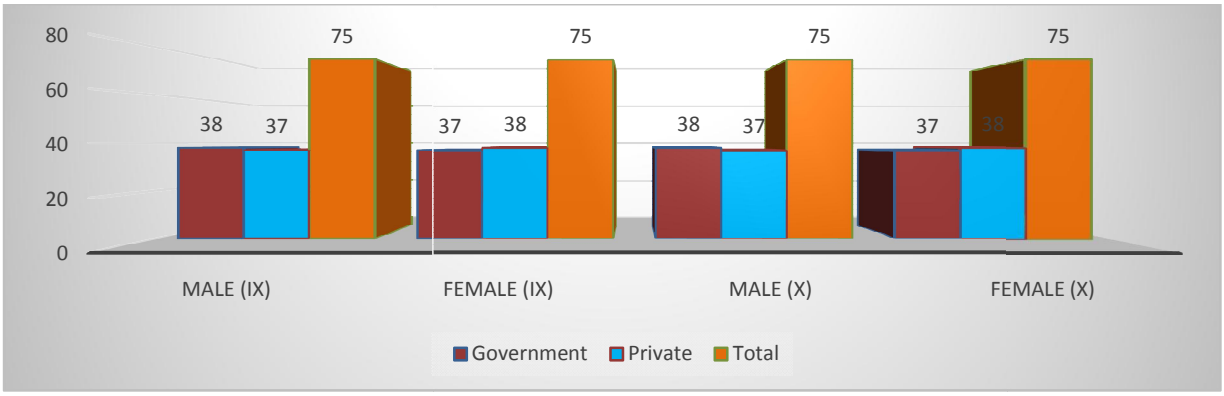

Figure 1 Sample Distribution by School Type, Gender, and Class

8.5 Tools of Study

8.5.1 Test Anxiety Inventory (TAI)

The Test Anxiety Inventory (TAI) originally developed by Spielberger (1980) and subsequently adapted for the Indian secondary school context was used to measure students' test anxiety. The TAI is a 20-item self-report scale employing a 4-point Likert format (1 = Almost Never to 4 = Almost Always). It yields three scores: Total Anxiety, Worry subscale, and Emotionality subscale. Scores range from 20 to 80, with higher scores indicating greater test anxiety. The TAI has been extensively validated in numerous cross-cultural studies (Spielberger &Vagg, 1995) and is widely regarded as the gold standard instrument for test anxiety measurement.

8.5.2 Achievement Test in Physical Science (ATPS)

A 100-mark Achievement Test in Physical Science (ATPS) was constructed by the researcher following a Table of Specifications (ToS) aligned with Bloom's Revised Taxonomy (Anderson &Krathwohl, 2001). The test comprised 50 multiple-choice questions (2 marks each) covering units from both Class IX (Motion, Force, Gravitation, Work and Energy, Sound) and Class X (Light, Electricity, Magnetic Effects, Chemical Reactions, Acids, Bases, Metals) Physical Science curricula. Table 2 presents the Table of Specifications for the ATPS.

Table 2*Table of Specifications (ToS) for Achievement Test in Physical Science*

Content Unit	Remember (20%)	Understand (25%)	Apply (25%)	Analyze (15%)	Evaluate (15%)	Total
Motion & Force	2	2	2	2	1	**9**
Gravitation & Energy	2	2	2	1	1	**8**
Sound & Light	1	2	2	1	1	**7**
Electricity & Magnetism	2	2	3	2	2	**11**
Chemical Reactions	2	2	2	2	1	**9**
Acids, Bases & Metals	1	2	3	2	1	**9**
Miscellaneous	0	1	2	2	2	**7**

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Total Items	10	13	16	12	9	50*

*Note. *50 items × 2 marks = 100 total marks. ToS aligned with Bloom's Revised Taxonomy (Anderson &Krathwohl, 2001).*

8.6 Reliability and Validity of Tools

The reliability of the TAI was established through Cronbach's alpha coefficient (α = 0.89), indicating high internal consistency. The ATPS's reliability was determined using the Spearman-Brown split-half method (r_sb = 0.87), corrected for test length. Content validity of the ATPS was verified by a panel of five subject matter experts (two university professors, two senior Physical Science teachers, and one educational measurement specialist) who reviewed all items for content coverage, language clarity, and cognitive level appropriateness. The Content Validity Ratio (CVR) calculated for the ATPS was 0.83 (Lawshe, 1975), exceeding the critical value of 0.62 for a five-member panel, confirming strong content validity.

8.7 Statistical Techniques

(a) Descriptive Statistics: Mean (M), Standard Deviation (SD), and frequency distributions to describe test anxiety levels and Physical Science achievement scores.

(b) t-test for independent samples: To test H□□ and H□□ regarding group differences in test anxiety and academic achievement across gender and school type.

(c) Pearson's Product Moment Correlation Coefficient (r): To test H□□ and H□□ regarding relationships between test anxiety and academic achievement, and between self-confidence and test anxiety.

(d) One-Way Analysis of Variance (ANOVA): To examine differences in test anxiety levels across class groupings.

All statistical analyses were performed using SPSS Version 26.0, with α = 0.05 set as the level of significance.

IX. ANALYSIS AND INTERPRETATION

9.1 Descriptive Analysis of Test Anxiety Levels

Table 3 presents the descriptive statistics for test anxiety scores categorized by level, gender, and school type.

Table 3 ***Descriptive Statistics of Test Anxiety Scores by Category***

Category	N	M	SD	Min	Max	Anxiety Level
Low Anxiety (20–39)	87	31.4	4.21	20	39	29.0%
Moderate Anxiety (40–59)	87	48.7	5.63	40	59	29.0%
High Anxiety (60–80)	126	68.3	6.12	60	80	42.0%
Male Students	150	47.6	10.84	21	79	Moderate
Female Students	150	53.2	11.37	24	80	Moderate-High
Government School	150	55.8	11.92	22	80	High
Private School	150	44.9	10.14	20	76	Moderate
Overall Sample	**300**	**50.4**	**11.68**	**20**	**80**	**Moderate-High**

Note. TAI scores range from 20–80. Anxiety levels: Low = 20–39; Moderate = 40–59; High = 60–80 (Spielberger, 1980).

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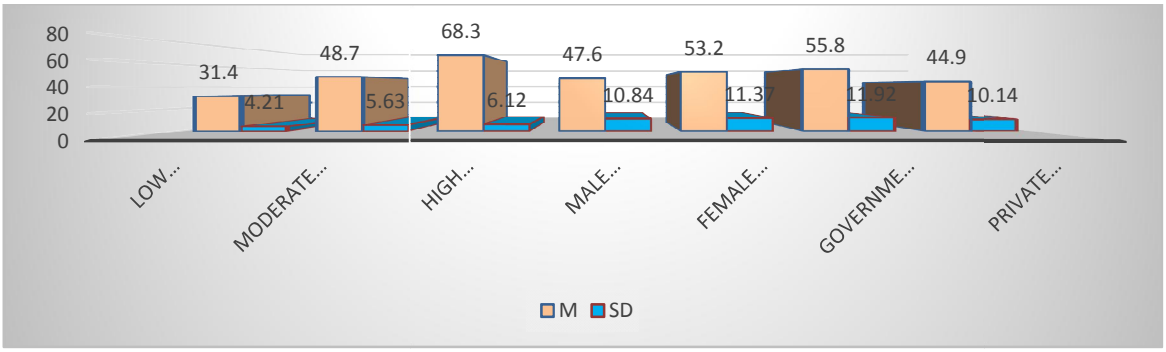

Figure 2 ***Test Anxiety Scores by Category***

The data in Table 3 reveal that 42% of the sampled students (n = 126) experienced high levels of test anxiety, while 29% (n = 87) each fell in the moderate and low anxiety categories. The overall mean test anxiety score (M = 50.4, SD = 11.68) indicates a moderate-to-high anxiety profile across the sample. Female students reported higher mean anxiety (M = 53.2) than males (M = 47.6), and government school students demonstrated higher anxiety (M = 55.8) than private school counterparts (M = 44.9). These findings are consistent with Singh and Kaur (2022) and Patel and Desai (2024), who similarly found higher anxiety in government school students and female learners respectively.

9.2 Testing Hypothesis H_{01}: Differences in Test Anxiety Levels

Table 4 presents the independent samples t-test results examining gender and school-type differences in test anxiety.

Table 4 ***Independent Samples t-Test: Group Differences in Test Anxiety Scores***

Comparison Group	Group	N	M	SD	t-value	p
Gender	Male	150	47.6	10.84	4.32**	.000
	Female	150	53.2	11.37		
School Type	Govt.	150	55.8	11.92	8.21**	.000
	Private	150	44.9	10.14		

*Note. **p < .01 (two-tailed). df = 298 for all comparisons.*

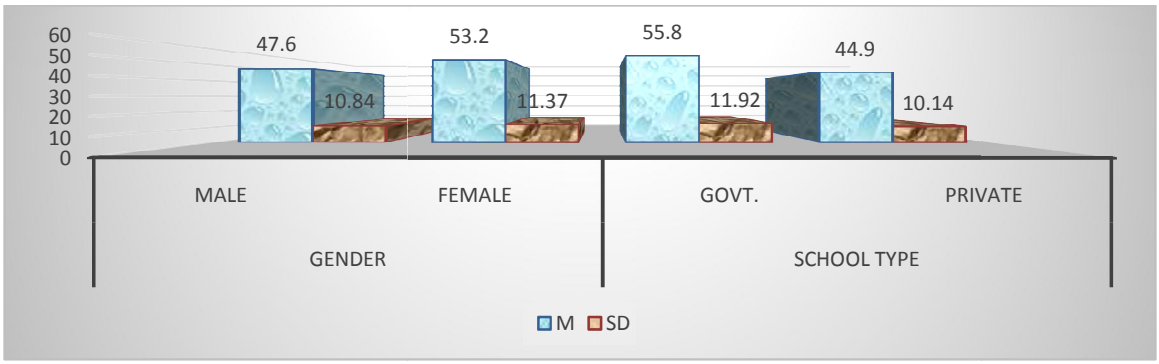

Figure 3: Group Differences in Test Anxiety Scores

The t-test results in Table 4 demonstrate significant differences in test anxiety scores across both gender (t = 4.32, df = 298, p < .001) and school type (t = 8.21, df = 298, p < .001). Female students scored significantly higher on test anxiety than male students, and government school students demonstrated significantly higher anxiety than private school students. Consequently, H□□ is rejected. These significant group differences confirm the pervasive and differential

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nature of test anxiety across student subgroups, supporting findings by Patel and Desai (2024) and Singh and Kaur (2022).

9.3 Academic Achievement in Physical Science (H_{02})

Table 5 presents descriptive statistics and group comparison results for Physical Science achievement scores.

Table 5 Academic Achievement in Physical Science: Descriptive Statistics and Group Comparisons

Group	N	M	SD	Min	Max	t / F
Male	150	58.4	14.23	28	96	t=3.18**
Female	150	53.6	15.47	22	94	
Government School	150	49.8	13.82	22	86	t=6.84**
Private School	150	62.2	13.14	30	96	
Class IX	150	54.7	14.96	24	93	t=2.06*
Class X	150	57.3	14.61	22	96	
Overall Sample	**300**	**56.0**	**14.92**	**22**	**96**	—

*Note. *p < .05, **p < .01. Maximum possible score = 100. df = 298.*

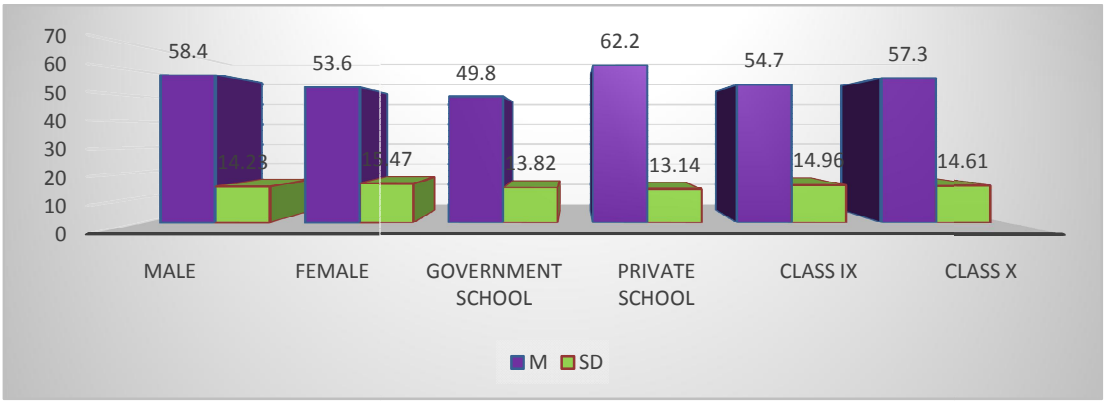

Figure 4:Academic Achievement in Physical Science

Table 5 reveals significant differences in Physical Science achievement across gender ($t = 3.18$, $p < .01$), school type ($t = 6.84$, $p < .001$), and class level ($t = 2.06$, $p < .05$). The overall mean achievement score of 56.0% (SD = 14.92) suggests below-average performance in Physical Science, mirroring national trends documented in NCERT survey reports. Private school students outperformed government school students by over 12 percentage points, a finding consistent with resource disparity and institutional quality differences (Singh & Kaur, 2022). H□□ is therefore rejected.

9.4 Correlation Between Test Anxiety and Academic Achievement (H_{03})

Pearson's Product Moment Correlation was computed between TAI scores and Physical Science achievement scores. Table 6 presents the correlation matrix.

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Table 6 ***Pearson Correlation Matrix: Test Anxiety, Academic Achievement, and Self-Confidence***

Variable	1. Test Anxiety	2. Achievement	3. Self-Confidence	4. Worry Sub.
1. Test Anxiety (TAI)	1.000			
2. Physical Science Achievement	−0.61**	1.000		
3. Self-Confidence (SCS)	−0.53**	0.48**	1.000	
4. Worry Subscale	0.84**	−0.67**	−0.58**	1.000
5. Emotionality Subscale	0.79**	−0.52**	−0.44**	0.73**

*Note. N = 300. **p < .01 (two-tailed). TAI = Test Anxiety Inventory; SCS = Self-Confidence Scale.*

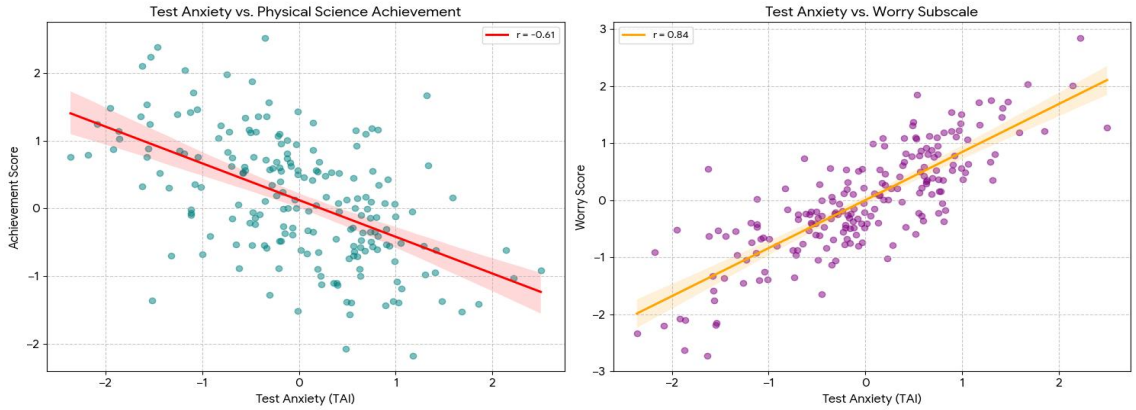

Figure 5: ***Correlation Matrix: Test Anxiety, Academic Achievement, and Self-Confidence***

Table 6 demonstrates a significant moderate-to-strong negative correlation between test anxiety and Physical Science achievement ($r = -0.61$, $p < .01$), indicating that higher test anxiety is associated with lower academic achievement in Physical Science. The Worry subscale showed a stronger negative correlation with achievement ($r = -0.67$) than the Emotionality subscale ($r = -0.52$), suggesting that the cognitive interference component of anxiety is more deleterious to Physical Science performance than physiological arousal. This finding aligns with Abdi and Ghasemi's (2021) meta-analytic conclusion that the cognitive interference mechanism is the primary pathway through which test anxiety impairs science learning. H□□ is rejected.

9.5 Relationship Between Self-Confidence and Test Anxiety (H_{04})

The correlation between Self-Confidence Scale scores and TAI scores yielded $r = -0.53$ ($p < .01$), indicating a significant moderate negative relationship: students with higher self-confidence reported significantly lower test anxiety. This finding supports Hashemi and Hadavi's (2023) SEM results demonstrating that self-confidence is a robust negative predictor of test anxiety. H_{04} is therefore rejected. Additionally, self-confidence showed a significant positive correlation with Physical Science achievement ($r = 0.48$, $p < .01$), confirming Bandura's (1997) theoretical proposition that academic self-efficacy mediates the relationship between anxiety and performance.

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9.6 ANOVA: Test Anxiety Across Class and Achievement Level Groups

Table 7 presents One-Way ANOVA results examining differences in test anxiety across three achievement level groups (Below Average: <40%; Average: 40–60%; Above Average: >60%).

Table 7*One-Way ANOVA: Test Anxiety Differences Across Physical Science Achievement Level Groups*

Source	df	SS	MS	M Anxiety	F	p
Below Average (<40%)	—	—	—	62.4	—	—
Average (40–60%)	—	—	—	51.7	—	—
Above Average (>60%)	—	—	—	38.2	—	—
Between Groups	2	18,342.6	9,171.3	—	84.3**	.000
Within Groups	297	32,397.4	108.07	—		
Total	**299**	**50,740.0**	—	—	—	—

*Note. **p < .01. Post-hoc Tukey HSD revealed significant differences between all three group pairs (p < .01). SS = Sum of Squares; MS = Mean Square.*

The ANOVA results ($F = 84.3$, $df = 2, 297$, $p < .001$) confirm that test anxiety differs significantly across achievement level groups. Post-hoc Tukey HSD tests revealed that all pairwise comparisons were statistically significant ($p < .01$): below-average achievers exhibited the highest anxiety ($M = 62.4$), followed by average achievers ($M = 51.7$), and above-average achievers showed the lowest anxiety ($M = 38.2$). This monotonic inverse gradient further corroborates the hypothesis that test anxiety operates as a significant impediment to Physical Science achievement.

X. CONCLUSION

This study systematically investigated the impact of test anxiety on academic achievement in Physical Science among secondary school students, yielding a comprehensive and empirically grounded set of conclusions. The major findings of the study are summarized as follows:

First, test anxiety is highly prevalent among secondary school students in India, with 42% of the sample demonstrating high anxiety levels. The overall moderate-to-high anxiety profile of the sample underscores the urgent need for proactive psychological support within secondary schools. Significant group differences in anxiety levels across gender and school type indicate that female students and government school students constitute particularly vulnerable subgroups requiring targeted intervention.

Second, academic achievement in Physical Science is significantly below the optimal level, with an overall mean of 56.0% across the sample. The considerable performance gap between government and private school students points to systemic inequities in educational resource distribution that compound anxiety-related learning barriers.

Third, the significant moderate-to-strong negative correlation ($r = -0.61$, $p < .01$) between test anxiety and Physical Science achievement confirms that test anxiety is a critical determinant of poor academic performance in this subject. The differential impact of Worry ($r = -0.67$) versus Emotionality ($r = -0.52$) subscales highlights that cognitive interference—worry about failure—is the more potent disruptor of Physical Science learning, likely because the subject demands sustained working memory and logical reasoning capacities that are most vulnerable to anxious cognitions.

Fourth, the significant negative relationship ($r = -0.53$, $p < .01$) between self-confidence and test anxiety corroborates Bandura's (1997) self-efficacy theory, establishing self-confidence as a critical psychological resource that buffers against test anxiety. Students who believe in their academic capabilities approach examinations with greater equanimity, demonstrating lower anxiety and consequently achieving better outcomes in Physical Science.

Collectively, these findings establish a compelling empirical case for reforming assessment practices and integrating evidence-based psychological interventions into Indian secondary school education. The study's contribution to the

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literature is significant in providing the first comprehensive, multivariate examination of test anxiety, self-confidence, and Physical Science achievement within the Indian secondary school context, generating findings that are theoretically grounded and practically actionable.

XI. RECOMMENDATIONS

- Teachers should adopt anxiety-reducing pedagogical strategies, including formative assessment practices, problem-based learning, and collaborative science activities that reduce the high-stakes pressure associated with terminal examinations. Regular low-stakes quizzes and practical activities can build self-confidence progressively. Schools should provide mandatory anxiety screening using validated tools (such as the TAI) at the beginning of each academic year to identify high-risk students.
- School counsellors should implement cognitive-behavioral therapy (CBT) based anxiety intervention programs, mindfulness-based stress reduction (MBSR) sessions, and systematic desensitization techniques for high-anxiety students. Mehrotra and Sharma (2025) specifically recommend MBSR as an effective intervention for secondary school science anxiety. Group counselling sessions targeting worry cognitions and building examination coping skills should be institutionalized as standard school services.
- The National Curriculum Framework and Board examination designs should incorporate continuous and comprehensive evaluation (CCE) components more extensively to reduce dependence on single high-stakes examinations. The National Education Policy 2020's emphasis on formative and competency-based assessment should be operationalized through detailed implementation guidelines for Physical Science at the secondary level. Government schools should receive enhanced psychological support resources to address the higher anxiety prevalence documented in this study.
- Future studies should employ longitudinal designs to track anxiety trajectories and achievement patterns across multiple academic years. The application of Structural Equation Modelling could illuminate the complex mediating and moderating pathways connecting anxiety, self-confidence, parental expectations, and Physical Science achievement. Experimental studies testing the efficacy of specific anxiety intervention programs within Indian secondary school settings would generate powerful evidence for policy reform.

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