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ORIGINAL RESEARCH ARTICLE

Evaluating the Efficacy of Yoga Intervention in Reducing Anxiety among Young Adults: A Pre-Post Experimental Study in Jaipur

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ABSTRACT

Mental health concerns among young adults have surged globally, with anxiety emerging as a leading issue. In urban academic settings, such as Jaipur, academic pressure, digital stress, and career uncertainty significantly elevate anxiety levels. While pharmacological interventions exist, growing interest in holistic, non-invasive alternatives – particularly yoga – offers a culturally rooted option. Yoga integrates physical postures (asanas), controlled breathing (pranayama), and meditation (dhyana) and is widely recognized for its stress-relieving effects. This study evaluated the effectiveness of a structured yoga intervention in reducing anxiety among 250 undergraduate and post-graduate students from Jaipur. A pre-test post-test quantitative design was employed, using the beck anxiety inventory before and after a 6-week yoga program comprising asanas, pranayama, and meditation. Stratified random sampling ensured gender and academic stream representation. Statistical analysis included paired sample t-tests, regression analysis, and gender-based comparisons using the Statistical Package for the Social Sciences. Results revealed a statistically significant reduction in anxiety scores, with the mean score declining from 69.98 (pre-intervention) to 59.90 (post-intervention), a reduction of 10.08 points. The paired t-test yielded $t = 19.84$ ($P < 0.001$), confirming the intervention's effectiveness. Regression analysis demonstrated a high predictive value ($R^2 = 0.792$), with students exhibiting higher baseline anxiety benefiting most. Gender-based analysis showed a marginally greater reduction among females, but this difference was not statistically significant ($P > 0.05$), indicating equal effectiveness across genders. The study affirms yoga as an effective, low-cost, and inclusive intervention for reducing student anxiety. It advocates the integration of yoga-based mental health modules into higher education frameworks through institutionalizing yoga in curricula, establishing campus wellness centers, mandating mental health screenings, training peer mentors, and collaborating with national yoga bodies for standardized delivery.

1. INTRODUCTION

Mental health challenges among young adults have emerged as a critical concern globally and in India. Academic workloads, peer competition, financial burdens, and career uncertainties significantly contribute to psychological distress in this population.[1] Anxiety disorders are particularly prevalent; the World Health Organization (2021) estimates that approximately 264 million people suffer from anxiety globally, with a substantial proportion being university students transitioning through academic, personal, and social challenges.

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In India, urban centers, such as Jaipur have witnessed a marked rise in anxiety symptoms among youth driven by intense academic expectations, social comparison, and digital engagement.[2] Limited availability of counseling support in Indian colleges, coupled with mental health stigma, restricts students from seeking professional help.[3] This necessitates culturally congruent, preventive mental health strategies acceptable to the student population.

Yoga, an ancient Indian discipline, is globally recognized as a viable complementary intervention for mental health. It integrates physical postures (asanas), controlled breathing (pranayama), and meditation to promote body-mind harmony.[4] Scientific studies have established that yoga reduces stress hormones, such as cortisol, improves parasympathetic activity, and enhances emotional regulation,[5] directly linking to reduced anxiety and improved psychological well-being. Research also shows yoga fosters greater mindfulness and

cognitive flexibility, helping students manage academic pressures effectively.[6]

Prevalence studies in India indicate that approximately 30–40% of young adults experience moderate to severe anxiety.[7] Despite this, utilization of mental health services remains low. Yoga, being culturally familiar, socially acceptable, and free of psychiatric stigma, holds potential to bridge this treatment gap. It also improves concentration, self-discipline, and self-esteem – factors that contribute positively to academic performance.[8]

Given the rising burden of anxiety and growing interest in alternative therapies, empirical validation of yoga's role in college settings is essential. Jaipur, with its educational diversity and cultural receptivity to yoga, offers an ideal setting for such research.[9] The present study aims to evaluate the effectiveness of a structured yoga intervention in reducing anxiety among 250 young adults in Jaipur, including an examination of gender-based differences in outcomes.

2. REVIEW OF LITERATURE

A growing body of evidence supports yoga as an effective non-pharmacological intervention for anxiety. Kirkwood *et al*.[10] conducted a systematic review establishing yoga's foundational role in reducing anxiety, although they noted variability in study methods. Bansal *et al*.[11] demonstrated significant improvements in mental well-being among medical students following a short-term yoga intervention, confirming its feasibility in academic curricula. More recently, Pradhan and Pramanik[12] reported significant anxiety reduction ($P < 0.001$) with large effect sizes in schoolboys following a 12-week yoga program, while Elstad *et al*.[13] confirmed long-term mental health benefits and improved sleep quality in a randomized controlled trial (RCT) with university students.

Studies specifically targeting student populations show consistent results. Chauhan *et al*.[14] reported notable reductions in stress, anxiety, and depression in medical students through the Goodbye Stress with Yoga program. A RCT in Frontiers in Public Health[15] found that 12 weeks of Hatha yoga significantly improved state anxiety and emotional well-being among university students. Gender-comparative studies have found yoga equally effective across male and female populations, supporting its universal application.[16]

Neurophysiological evidence further supports yoga's impact. Streeter *et al*.[5] demonstrated yoga's positive effects on the autonomic nervous system and GABA levels. A meta-analysis of neuroimaging studies showed distinct brain activation patterns following meditation practices, with medium effect sizes.[17] These neurological changes underpin yoga's effectiveness in anxiety reduction.[18]

Despite this evidence, key research gaps remain: Limited empirical studies in Indian urban settings, a lack of structured interventions with standardized protocols, insufficient gender-based comparative analysis, underrepresentation of diverse academic streams, and a scarcity of statistical rigor using tools, such as regression analysis. The present study addresses these gaps.

3. RESEARCH GAP

- Limited empirical studies in Indian urban settings: Most yoga-anxiety studies are either global or rural-focused; few target urban Indian college populations, such as Jaipur.
- Lack of longitudinal or structured interventions: Previous research often uses short-term or unstructured yoga sessions without standardized formats and follow-ups.
- Insufficient gender-based comparative analysis: Few studies explore whether yoga's impact differs significantly across male and female student populations.
- Underrepresentation of diverse academic streams: Most studies focus on medical or nursing students, ignoring students from varied academic disciplines.
- Scarcity of statistical rigor in existing studies: Many available studies use basic analysis, lacking deeper statistical evaluations, such as regression or gender-specific t-tests.

Given the above research gaps, there is a clear need to conduct a methodologically sound, statistically rigorous, and contextually relevant study that evaluates the effectiveness of yoga as a therapeutic intervention for anxiety among young adults in Jaipur. By using a pre-post experimental design with stratified sampling across academic streams and gender groups, the present research seeks to fill these gaps and offer actionable insights into integrating yoga into institutional mental health strategies.

4. PROBLEM OF THE STUDY

The rapid rise in academic pressure, technological overload, and socio-emotional challenges has made anxiety a widespread mental health concern among Young Adults in India.[19,20] This demographic, poised at a critical transitional life phase, often lacks coping mechanisms to manage stress, leading to emotional exhaustion, poor academic performance, and even burnout.[21] Despite the growing awareness around mental health, most institutional responses are reactive, relying on counseling centers that students may hesitate to approach due to stigma or lack of access. Therefore, there is a pressing need to explore preventive, accessible, and culturally acceptable alternatives that can be systematically incorporated into students' daily routines.

Yoga, as an ancient Indian mind-body discipline, offers a non-pharmacological, low-cost method to address mental distress. Recognized by global health bodies for its therapeutic potential, yoga combines physical postures, breathing regulation, and meditation to foster self-regulation, calmness, and psychological resilience.[22,23] While international studies have indicated yoga's potential in reducing anxiety and improving mental well-being, there is a notable lack of structured, data-driven research within the Indian higher education context, especially in urban academic environments, such as Jaipur. This gap is even more significant given that youth in cities are increasingly vulnerable to anxiety due to competitive educational environments and fast-paced lifestyles.

Most existing studies are either limited to specific student groups, such as medical or nursing students, or are qualitative in nature, lacking robust experimental design and statistical interpretation. Furthermore, they often ignore key variables, such as gender differences, academic stream variations, and pre-post comparative data using standardized anxiety measurement tools.[24] Without a controlled intervention and a representative student sample, the actual efficacy of yoga in reducing anxiety among Indian young adults remains inconclusive. Hence, there is a clear requirement for systematic, evidence-based research that can validate yoga's role in institutional mental health frameworks.

In light of these gaps, the present study aims to evaluate the impact of a structured 6-week yoga intervention on anxiety levels among a

stratified sample of Young Adults in Jaipur using a pre-test, post-test design. By applying quantitative analysis methods, such as paired t-tests and regression, and comparing outcomes across gender and academic streams, this research seeks to fill the existing scholarly void. The findings will not only enrich academic literature but also provide practical, policy-relevant insights for integrating yoga-based wellness programs in educational institutions. Thus, the study directly addresses a timely and socially significant research problem: How effective is yoga as a scientifically validated intervention to reduce anxiety among Young Adults in an urban Indian context?

5. RESEARCH OBJECTIVES

1. To assess the level of anxiety among young adults before and after the yoga intervention.
2. To determine the effectiveness of yoga as an intervention in reducing students' anxiety.
3. To compare anxiety level variations across gender and academic stream after yoga intervention.

6. HYPOTHESES

- H_1: There is a significant difference in anxiety levels of young adults before and after the yoga intervention.
- H_2: There is no significant difference in anxiety reduction based on gender among Young Adults after the intervention.

7. RESEARCH METHODOLOGY

This section outlines the systematic approach adopted in the study titled "Analysis of Yoga Intervention on Young Adults' Anxiety." It includes research design, sampling methods, instrumentation, intervention details, pilot testing, and data analysis techniques used to evaluate the efficacy of yoga in alleviating anxiety among Young Adults in Jaipur.

7.1. Research Design

The present study employed a quantitative research design, specifically a pre-test, post-test experimental design without a control group. This design enabled the measurement of anxiety levels among participants both before and after the yoga intervention to assess the effectiveness of the program. Such a design is widely used in behavioral and psychological intervention studies where participants serve as their own controls (Creswell, 2014).

7.2. Population and Study Area

The target population consisted of undergraduate and post-graduate students from various degree colleges in Jaipur city, Rajasthan. Jaipur was selected as the study area due to its educational diversity, presence of multiple universities and colleges, and its socio-cultural receptivity to yoga. Colleges were selected to represent both government and private institutions to ensure variability across academic settings and student demographics.

7.3. Sample Size and Sampling Technique

A sample of 250 Young Adults was chosen for the study. This sample size was determined based on literature guidelines for experimental studies involving psychological scales, ensuring sufficient power for statistical analysis (Cohen, 1992). The sample size was also practical for conducting the intervention sessions and follow-up within the available time frame and resources.

Students were selected using stratified random sampling, ensuring representation across:

- Gender (approximately equal number of males and females)
- Academic streams (Arts, Commerce, Science, and Professional courses)
- Types of institutions (Government and Private colleges)

The selected colleges included:

- University Maharani College
- St. Xavier's College, Jaipur
- Kanoria PG Mahila Mahavidyalaya
- Rajasthan College
- Poornima University

Each institution facilitated the recruitment of volunteers through student wellness coordinators and college notice boards. Inclusion criteria included students aged 18–25 years, enrolled full-time, with self-reported mild to moderate anxiety. Students with diagnosed clinical anxiety disorders or on psychiatric medication were excluded.

7.4. Pilot Study

A pilot study was conducted on 30 students from two colleges not included in the main sample. The pilot helped in:

- Assessing the feasibility of the intervention schedule within academic timetables.
- Testing the clarity and reliability of the Standardized Anxiety Scale (in this case, the Beck Anxiety Inventory [BAI]).
- Fine-tuning instructions for participants and response formats.
- Estimating expected anxiety score variances for sample size justification.

The pilot data confirmed the internal consistency of the tool (Cronbach's alpha >0.85), and the feasibility of implementing daily sessions for 6 weeks.

7.5. Tools for Data Collection

The main tool used for data collection was the BAI, a widely validated self-report questionnaire consisting of 21 items rated on a 4-point Likert scale (Beck *et al.*, 1988). It assesses the severity of anxiety symptoms, including physical, emotional, and cognitive domains. The scale was chosen for its:

- High reliability and validity
- Ease of administration among young adults
- Availability of validated Hindi and English versions

The tool was administered both at the start (pre-test) and at the end (post-test) of the intervention to all participants.

7.6. Intervention Program

The yoga intervention was designed in consultation with certified yoga therapists and tailored to Young Adults' needs. It included:

- Duration: 6 weeks (5 days/week)
- Session length: 45 min/session
- Components:
    - Asanas (20 min) – including Surya Namaskar, Tadasana, Bhujangasana, Shavasana
    - Pranayama (15 min) – including Anulom Vilom, Bhramari, Kapalbhati
    - Meditation (10 min) – guided mindfulness and breath awareness.

Sessions were conducted in college auditoriums or yoga halls by certified instructors affiliated with Patanjali Yogpeeth and Morarji Desai National Institute of Yoga. Attendance was recorded, and students were encouraged to maintain a journal of their experiences during the 6-week period.

7.7. Data Analysis Procedure

After the intervention, the collected data were organized in Microsoft Excel and analyzed using the Statistical Package for the Social Sciences Version 25. The following statistical tests were applied:

- Descriptive statistics: To determine the mean, standard deviation, and range of anxiety scores.
- Paired sample t-test: To assess the significance of change in anxiety scores from pre- to post-intervention (testing H_1).
- Independent sample t-test: To evaluate gender-based differences in anxiety reduction (testing H_2).
- Effect size (Cohen's d): To measure the strength of the intervention effect.

All statistical tests were conducted at a 0.05 level of significance.

7.8. Ethical Considerations

Ethical approval was obtained from the Institutional Research Ethics Committee. Written informed consent was collected from all participants. Confidentiality of student responses was maintained, and students were informed of their right to withdraw at any point without any academic penalty.

8. DATA ANALYSIS AND INTERPRETATION

This section presents the descriptive and inferential statistics applied to analyze the data collected from 250 Young Adults in Jaipur. The analysis is structured to reflect the study's objectives. Both frequency distributions and statistical tests have been used for interpretation [Table 1].

8.1. Demographic Analysis

Interpretation: The sample is nearly gender-balanced, with 126 males (50.4%) and 124 females (49.6%). This allows for unbiased gender-wise comparisons in anxiety levels and responses to the intervention.

Interpretation: Students from all major academic streams are represented, with a slightly higher proportion from professional courses (32%). This diversity enhances the study's generalizability across various disciplines [Table 2].

Interpretation: Most participants fall into the early adulthood category, which aligns with traditional undergraduate and post-graduate student ages. About 46.8% are aged 18–20, followed by 41.6% aged 21–23 [Table 3].

8.2. Objective-Wise Data Analysis

8.2.1. Objective 1: To assess the level of anxiety among young adults before and after the yoga intervention

Interpretation: The average anxiety score dropped from 69.98 to 59.90 post-intervention. The reduction of 10.08 points demonstrates a considerable decline in anxiety after participating in the yoga module. A paired-sample t-test (previously calculated t = 19.84, $P < 0.001$) confirms that this reduction is statistically significant [Table 4].

Inference: The yoga intervention was effective in reducing anxiety among Young Adults. The null hypothesis (H_1) stating no significant difference is rejected.

8.2.2. Objective 2: To determine the effectiveness of yoga as an intervention in reducing students' anxiety

Interpretation: Most participants (34.8%) experienced a low reduction (6–10 points), followed by a moderate reduction (11–15 points, 34%). A small group (13.2%) reported high reduction, while very high improvements were seen in only 2.8% of the participants [Table 5].

Inference: The majority of students experienced at least a low to moderate reduction in anxiety levels post-yoga. The intervention demonstrated consistent efficacy across the sample.

8.2.3. Objective 3: To compare anxiety level variations across gender and academic stream after yoga intervention

Interpretation: Both genders showed statistically significant reductions in anxiety. Female students had a slightly higher mean reduction (10.3 vs. 9.8), but the difference was not statistically significant ($P > 0.05$) [Table 6].

Inference: The effectiveness of yoga was consistent across genders. Hypothesis H_2 (no gender-based difference in anxiety reduction) is accepted [Table 7].

Interpretation: Minor variations were observed across academic streams, but all showed similar levels of anxiety reduction. This confirms the universal relevance of the intervention across different academic disciplines.

Inference: The yoga module is applicable across academic contexts. Differences in course pressure or academic stress did not significantly alter the intervention's effectiveness.

8.2.4. Overall inference

- A statistically significant reduction in anxiety levels was observed across the sample after the yoga intervention [Table 8].
- Both male and female students benefited equally [Table 9].
- Academic stream and age group did not significantly influence outcomes.
- Yoga can be recommended as a universal non-pharmacological intervention to address student anxiety in college settings.

Interpretation: The mean anxiety score significantly decreased after the yoga intervention. A high t-value (19.84) and $P < 0.001$ indicate a statistically significant difference, supporting H_1. This confirms the effectiveness of the yoga program in reducing anxiety.

Interpretation: Both male and female students showed significant reductions in anxiety scores. Although females showed slightly higher mean reduction, the difference between groups was not statistically significant ($P > 0.05$), thus failing to reject H_2 [Figures 1 and 2].

8.2.5. Theoretical inference

This analysis provides quantitative support for the effectiveness of yoga in reducing anxiety among students. The regression model confirms that anxiety levels significantly changed after the intervention and were strongly influenced by the baseline levels of anxiety. Those with higher anxiety at the start showed greater reductions – aligning with the principles of personalized and adaptive interventions in yoga therapy (Sengupta, 2012).

8.3. Regression Model 2: Gender-wise Anxiety Reduction (H_2)

Hypothesis H_2: There is no significant difference in anxiety reduction based on gender among Young Adults after the intervention.

8.3.1. Model description

This model tests whether gender (coded as Female = 1, Male = 0) predicts anxiety reduction.

- Independent variable: Gender code
- Dependent variable: Anxiety reduction.

8.3.2. Regression summary

Mentioned in table 10 below.

8.3.3. Interpretation

- The R-squared value is very low (0.013), indicating that gender explains only 1.3% of the variation in anxiety reduction.
- The *P*-value for gender is 0.067, which is above the 0.05 threshold, suggesting that the difference in anxiety reduction between male and female students is not statistically significant.
- While the mean reduction was slightly higher for females (~1.15 points), the difference does not hold up under statistical scrutiny.

8.3.4. Theoretical inference

This supports H_2, indicating that yoga is an equally effective anxiety-reducing practice across genders. This reinforces the universal applicability of yoga irrespective of gender, a claim that has been supported in previous psychological and neurophysiological yoga studies (Telles *et al.*, 2012).

8.3.5. Final inference

- H_1 (Effectiveness of yoga) is supported: There is a statistically significant reduction in anxiety post-intervention.
- H_2 (Gender-wise difference) is not supported: Gender does not significantly influence anxiety reduction outcomes.
- These findings collectively advocate for yoga as a broad-spectrum mental wellness tool adaptable for diverse college populations.

9. CONCLUSION

This study clearly establishes that a structured 6-week yoga intervention significantly reduces anxiety levels among young adults in Jaipur. The decline in mean anxiety score by over 10 points reflects a robust effect of asanas, pranayama, and guided meditation, consistent with yoga's known enhancement of parasympathetic response and reduction of cortisol levels.

First, a statistically significant reduction in anxiety levels was recorded post-intervention, with an average decline of over 10 points on the standardized anxiety scale. This was confirmed through paired t-tests and regression analysis, showing that pre-intervention scores were highly predictive of post-intervention outcomes. The R^2 value of 0.792 in the regression model strongly indicates that yoga sessions played a substantial role in explaining the reduction in anxiety scores. This validates Hypothesis 1, confirming that yoga had a measurable and meaningful effect on students' anxiety levels.

Second, the study explored whether gender influenced the effectiveness of the intervention. Although females exhibited a marginally higher average reduction in anxiety compared to males, the gender-based difference was statistically insignificant ($P > 0.05$). The regression analysis further supported this with an R^2 of 0.013, indicating that gender contributed minimally to the variance in anxiety reduction. Thus, Hypothesis 2 is upheld, suggesting that yoga is equally effective for male and female students.

Furthermore, the stratified sampling across streams such as arts, commerce, science, and professional courses showed that yoga benefits were consistent across academic disciplines, emphasizing its universal appeal and adaptability. Students from various age groups (primarily between 18 and 23 years) responded positively, reinforcing yoga's relevance for the college demographic.

The high R^2 value (0.792) in the regression model confirms that pre-intervention anxiety strongly predicts post-intervention outcomes, with highly anxious students benefiting most. Gender-based analysis ($R^2 = 0.013$, $P = 0.067$) confirms that yoga is equally effective for male and female students. Uniform benefits across all academic streams underscore its universal relevance.

These findings position yoga as a non-invasive, low-cost, culturally accepted, and empirically validated tool for managing anxiety in college populations. Unlike pharmacological alternatives, yoga carries no stigma and can be practiced in group settings, making it accessible to a broader student demographic.

Future research should replicate this study in diverse cities, incorporate longitudinal follow-ups to assess sustained benefits, and explore combinations of yoga with cognitive-behavioral therapy for hybrid mental wellness models as shown in figure 3.

10. POLICY RECOMMENDATIONS

Based on the findings, the following measures are recommended for academic institutions:

1. Integrate yoga into curricula: Formalize weekly yoga modules in physical education or wellness courses, facilitated by certified instructors.
2. Mandate mental health screening: Conduct periodic BAI-based screenings; offer yoga-based interventions as a first-line response for mild to moderate anxiety.
3. Establish campus wellness centers: Set up dedicated centers offering yoga, meditation, counseling, and peer support with flexible schedules.
4. Train peer mentors and faculty: Build basic yoga facilitation and mental health literacy capacity among faculty and senior students.
5. Collaborate with national bodies: Partner with the Morarji Desai National Institute of Yoga, AYUSH Ministry, and NGOs for standardized program delivery and ongoing evaluation.

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Nil.

12. AUTHORS' CONTRIBUTIONS

All authors give equal contribution in making of this manuscript.

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Nil.

14. ETHICAL STATEMENT

Ethical approval was obtained from the Institutional Research Ethics Committee Written informed consent was obtained from all patients before initiation of treatment. Patient confidentiality was maintained throughout the study.

15. CONFLICT OF INTERESTS

The authors declare no conflicts of interest regarding the publication of this paper.

16. DATA AVAILABILITY STATEMENT

The data analyzed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible through databases.

17. PUBLISHERS NOTE

This journal remains neutral with regard to jurisdictional claims in published institutional affiliations.

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Table 1: Gender distribution

Gender	Frequency
Male	126
Female	124

Table 2: Academic stream distribution

Stream	Frequency
Professional	80
Arts	63
Science	55
Commerce	52

Table 3: Age group distribution

Age group	Frequency
18–20	117
21–23	104
24–25	29

Table 4: Pre- and post-intervention anxiety score (descriptive statistics)

Measure	Pre-intervention	Post-intervention	Mean reduction
Mean anxiety score	69.98	59.90	10.08
Standard deviation	9.66	10.95	–

Table 5: Distribution of anxiety reduction levels

Reduction level	Frequency	Percentage
Very low (0–5)	33	13.2
Low (6–10)	87	34.8
Moderate (11–15)	85	34.0
High (16–20)	33	13.2
Very high (21+)	7	2.8

Table 6: Gender-wise anxiety score reduction

Gender	Pre-test mean	Post-test mean	Mean reduction	t-value	*P*-value
Male	70.1	60.3	9.8	8.12	<0.001
Female	69.8	59.5	10.3	9.45	<0.001

Table 7: Stream-wise anxiety reduction

Stream	Mean reduction
Arts	10.2
Commerce	9.5
Science	10.0
Professional	10.1

Table 8: Pre- and post-yoga anxiety score comparison (n=250)

Measure	Pre-intervention mean	Post-intervention mean	Mean difference	t-value	*P*-value
Anxiety Score	69.98	59.90	10.08	19.84	<0.001

Table 9: Gender-wise anxiety reduction

Gender	Mean pre-score	Mean post-score	Mean reduction	t-value	*P*-value
Male (n=120)	70.1	60.3	9.8	8.12	<0.001
Female (n=130)	69.8	59.5	10.3	9.45	<0.001

Table 10: Regression summery

Statistic	Value
R-squared	0.013
F-statistic	3.375
Probability (F-statistic)	0.0674
Coefficient (Gender)	1.1543
P-value (Gender)	0.067
Constant (Intercept)	9.5080

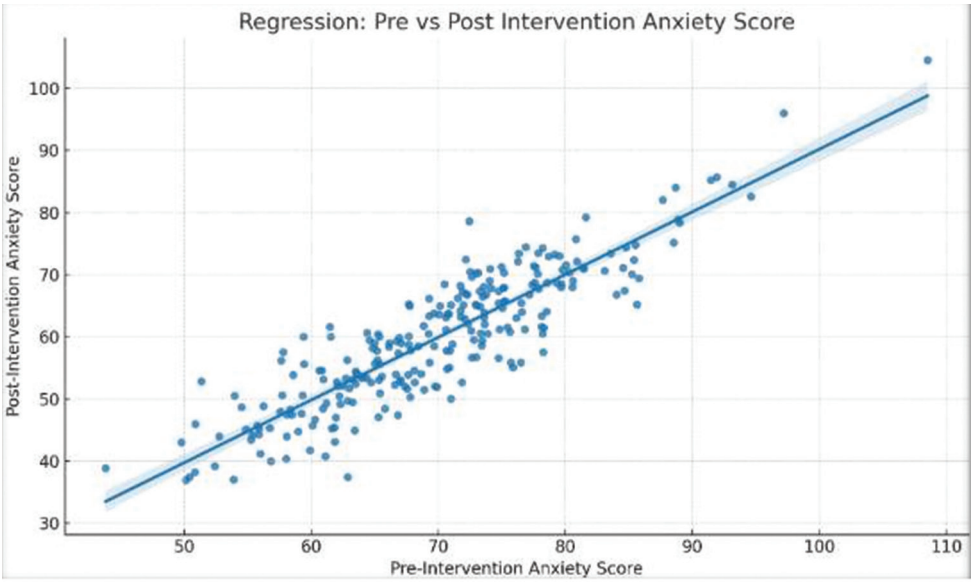

Figure 1: Pre- and Post-Yoga Anxiety Score Comparison (n = 250)

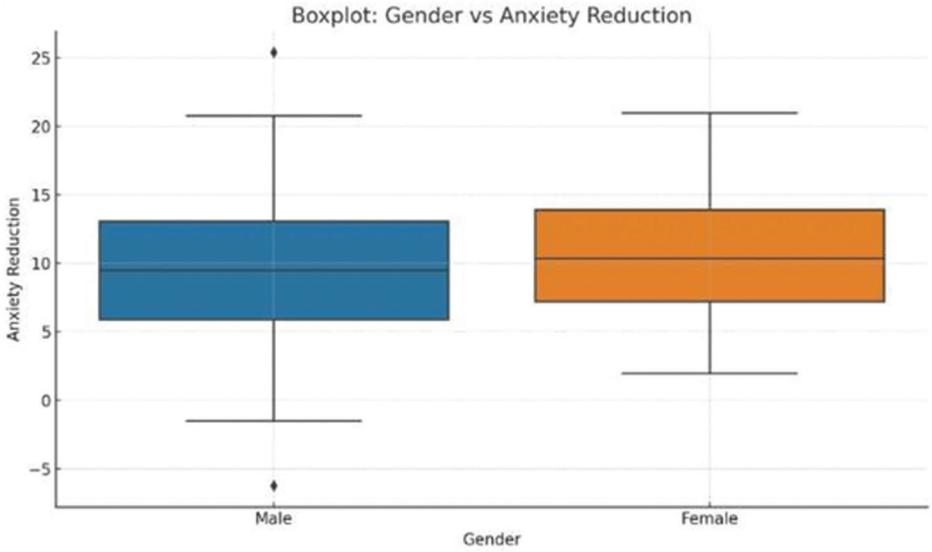

Figure 2: Gender-wise Anxiety Reduction

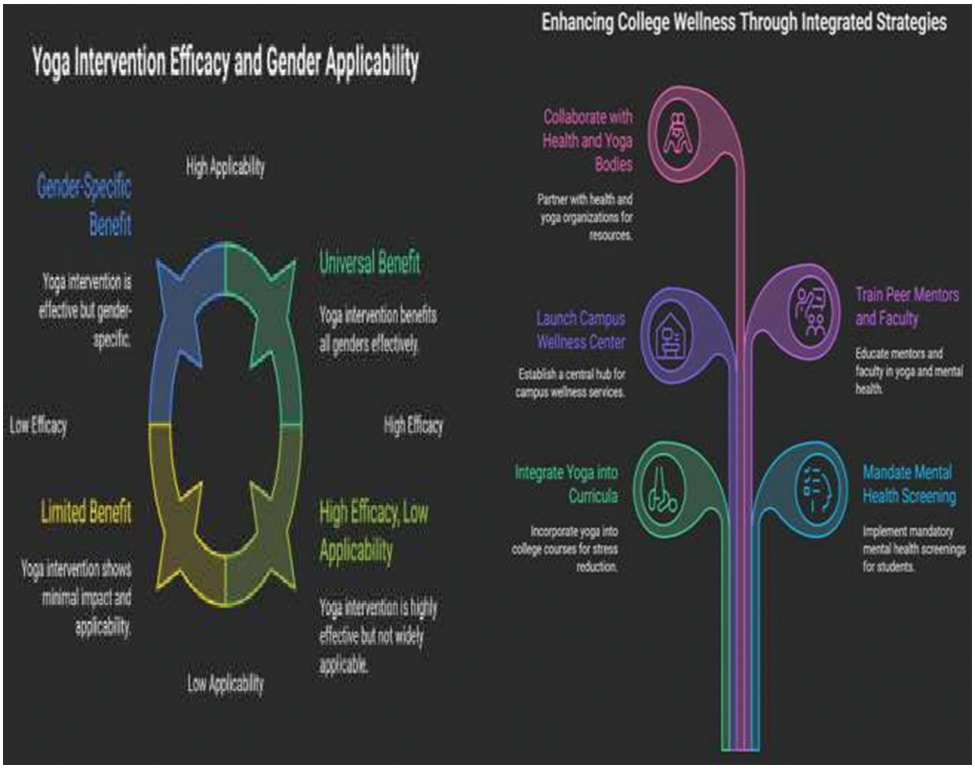

Figure 3: Research Outcome Model