

Effectiveness of Fit India Fitness Protocol on Cardiovascular Endurance Among Law Students

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ABSTRACT

The Fit India Movement, initiated by the Indian government, aims to enhance health and well-being through yoga and physical fitness activities. This study investigated the effect of the Fit India Fitness Protocol (FIFP) on the cardiovascular endurance of law students. It randomly selected 80 male students aged 18 to 24 from KLE Law College in Bangalore, Karnataka, and assigned them to four groups, each including 20 members. Group I engaged in physical fitness exercises, Group II performed yoga, Group III participated in both physical fitness and yoga, while Group IV served as the control group. The intervention lasted 12 weeks, during which individuals in the treatment groups trained five days a week, while the control group adhered to their routines. We used the 2 km walk/run test as the criterion variable to evaluate the differences in cardiovascular endurance among the groups. A one-way analysis of covariance (ANCOVA) that took into account the initial cardiovascular endurance showed that all three treatment groups had much better cardiovascular endurance than the control group. The Bonferroni post-hoc test indicated that the physical fitness exercise group (Group I) attained the greatest improvements in cardiovascular endurance. The data indicate that the Fit India physical fitness exercise protocol significantly improves the cardiovascular endurance along with the health and well-being of the law college students.

Keywords: Training Protocol, Fit India, Cardiovascular Endurance, Physical Fitness

INTRODUCTION

Physical fitness is a cornerstone of overall health and well-being. Recognizing the growing concerns about sedentary lifestyles and their impact on public health, the Indian government launched the Fit India Movement in 2019. This initiative aims to create awareness and encourage individuals to adopt regular physical activity and yoga as part of their daily routines. Structured fitness programs, such as the Fit India Fitness Protocol (FIFP), have been developed to provide comprehensive guidelines for improving physical and mental health (Fit India 2019).

Fitness is the ability of the heart, lungs, blood vessels, and muscles to function efficiently, enabling individuals to perform daily tasks with energy and reduced risk of health issues caused by inactivity. It fosters optimal physical performance, appearance, and well-being, allowing individuals to handle stress and endure challenges that unfit individuals cannot. As a cornerstone of health, fitness supports reaching one's full potential. Unfortunately, many in our society lack sufficient physical activity to maintain good health and fitness.

Cardiovascular endurance (CE) is the ability of the heart, lungs, and circulatory system to deliver oxygen-rich blood to the working muscles during prolonged physical activity and for the muscles to efficiently use this oxygen to produce energy (American College of Sports Medicine, 2018). It is a fundamental component of health-related physical fitness and an essential measure of overall aerobic capacity. Activities such as running, swimming, and cycling are examples that test and enhance CE, as they require sustained oxygen consumption over time. For college students, cardiorespiratory endurance holds particular importance as it significantly impacts their physical, mental, and emotional well-being. Academic life is demanding, often accompanied by stress, sedentary behaviour, and irregular schedules, making CRE a critical area of focus to ensure a balanced and healthy lifestyle.

Long-term health advantages are fostered by developing cardiorespiratory endurance during college days. Higher CE levels are associated with reduced risks of chronic illnesses such as cardiovascular diseases, hypertension, diabetes, and obesity (Warburton et al., 2006). Engaging in CVE-enhancing activities helps in maintaining a healthy weight, improving metabolism, and strengthening the immune system. For college students, these benefits lay the foundation for a healthier future by promoting habits that can be sustained well beyond their academic years.

The article systematically presents the study, starting with Objectives and Hypotheses, outlining its purpose and assumptions. Section II covers Methodology, including research design, participants, interventions, and data collection. Section III provides Data Analysis and Interpretation using statistical tools, followed by a Discussion comparing findings with prior studies. Section IV summery, concludes with key outcomes, recommendations, and future research suggestions. References are provided for all cited sources.

OBJECTIVES

The following objectives were established for this investigation:

- To analyze the impact of a physical fitness intervention program aligned with the Fit India Fitness Protocol on the cardiovascular endurance of law college students.
- To assess the influence of a yoga-based intervention program developed under the Fit India Fitness Protocol on the cardiovascular endurance of law college students.
- To investigate the effects of a combined physical fitness and yoga intervention program, following the Fit India Fitness Protocol, on the cardiovascular endurance of law college students.

HYPOTHESES

Based on the objectives, the following hypotheses were proposed:

- The 12-week Fit India physical fitness intervention program was hypothesized to significantly enhance the cardiovascular endurance of law college students.
- It was hypothesized that a 12-week Fit India yoga intervention program would lead to a significant improvement in the cardiovascular endurance of law college students.
- The hypothesis suggested that the combination of physical fitness exercises and yoga training, conducted under the Fit India Fitness Protocol, would result in a greater enhancement of cardiovascular endurance compared to the individual effects of either the physical fitness exercise group or the yoga training group among law college students.

METHODOLOGY

This investigation evaluates the impact of the Fit India Fitness Protocol on the cardiovascular endurance of law college students.

- **Study Design:** The study adopted a randomized treatment design involving 80 male students aged 18-24 from KLE Law College, Bengaluru. Participants were divided into four groups of 20 each: Physical Fitness (focused on endurance, flexibility, strength, and resistance), Yoga (focused on asanas, pranayama, and meditation), Combined (integrating both protocols), and Control (no intervention). Cardiovascular endurance was assessed pre- and post-intervention.
- **Inclusion Criteria:** Male students aged 18-24, enrolled at KLE Law College, Bengaluru, willing to participate in the 12-week study, and without any pre-existing medical conditions or physical limitations.
- **Exclusion Criteria:** Students with medical conditions, injuries, or disabilities affecting physical activity, those unwilling to participate or commit to the study protocol, and individuals practicing similar fitness or yoga programs.
- **Data Collection and Intervention:** Data were collected through pre- and post-tests measuring cardiovascular endurance using a 12-minute run test before and after the 12-week intervention. Participants were divided into four groups: Physical Fitness (Group I), Yoga (Group II), Combined Training (Group III), and Control (Group IV). Groups I-III underwent five weekly training sessions.
- **Statistical Technique:** Descriptive statistics and one-way analysis of covariance (ANCOVA), with pre-test readings as covariates, were employed to determine significant differences between groups. Bar diagrams, profile plots, and Bonferroni post-hoc tests were utilized for pairwise comparisons and in-depth analysis.

ANALYSIS OF DATA AND INTERPRETATION

This section provides an overview of the results from the analysis of cardiovascular endurance scores among the control and treatment groups.

Table 01: Descriptive Statistics of Cardio Vascular Endurance Split by Groups and Pre-Post

Groups	Tests	Min	Max	Mean	S D Error of mean	S D
Control	Pre	9.14	14.54	11.333	0.382	1.712
	Post	9.09	14.49	11.242	0.369	1.653
Physical Fitness	Pre	10.12	16.08	12.430	0.336	1.506
	Post	8.47	11.56	9.815	0.166	0.744
Yoga	Pre	10.50	15.18	12.965	0.273	1.223
	Post	9.34	13.18	10.940	0.251	1.126
Combined	Pre	10.23	16.11	12.729	0.312	1.399
	Post	9.12	12.46	10.245	0.197	0.882

Interpretation: The table 01 presents the descriptive statistics for Cardiovascular Endurance (CVE) based on pre- and post-test data from the treatment and control groups. The findings are summarized as follows:

- **Control Group:** The pre-test mean CVE score was 11.333 (SD = 1.712), which slightly declined to 11.242 (SD = 1.653) in the post-test. This indicates a minimal decrease in cardiovascular endurance

and a slight reduction in score variability.

- **Physical Fitness Group:** The pre-test mean CVE score was 12.430 (SD = 1.506), which improved significantly to 9.815 (SD = 0.744) in the post-test. This reflects a notable reduction in time, signifying improved cardiovascular endurance, with more consistent performance among participants.
- **Yoga Group:** The pre-test mean CVE score was 12.965 (SD = 1.223), improving to 10.940 (SD = 1.126) in the post-test. This demonstrates that yoga positively impacted cardiovascular endurance, with relatively uniform improvements across the group.
- **Combined Group:** The pre-test mean CVE score was 12.729 (SD = 1.399), which improved to 10.245 (SD = 0.882) in the post-test. This indicates steady and moderate gains in cardiovascular endurance from the combined intervention.

All treatment groups showed improvements in cardiovascular endurance, the Physical Fitness Group exhibited the greatest gains, followed by the Combined Group and the Yoga Group. The Control Group, which did not undergo any intervention, demonstrated minimal change. These results underscore the effectiveness of targeted exercise programs, particularly physical fitness training, in enhancing cardiovascular endurance among college students.

Table 02: Analysis of Covariance (ANCOVA) results of the Intervention program on Cardiovascular Endurance

Source	Sum of Squares	df	Mean Square	F-ratio	p-value
Pre Cardiovascular endurance	68.857	1	68.857	158.673	< 0.05*
Between Groups	49.320	3	16.440	37.884	<0.05*
Within Groups	32.547	75	0.434	-	-

*Indicates that the results are significant at < 0.05 level

Inference: Table 03 shows that, with a p-value less than 0.05 at the 5% significance level, there is a significant difference in post-intervention cardiovascular endurance scores among the groups (physical fitness, yoga, combined, and control) after adjusting for pre-intervention scores. The treatment groups experienced a considerable improvement in cardiovascular endurance, while the control group, which did not receive any intervention, showed no significant change.

Additionally, the analysis confirms a relationship between pre-test and post-test cardiovascular endurance scores. Given the significant effect of the training programs, a post-hoc test was conducted to determine the specific sources of these differences

Table no 03: Pre, Post and Adjusted Post test Mean scores of Cardiovascular Endurance

Group	Pre-test	Post-test	Adjusted post (for Pre-test)
Control	11.333	11.242	11.910
Physical Fitness	12.430	9.815	9.773
Yoga	12.965	10.940	10.551
Combined	12.729	10.245	10.009

Interpretation: Table 4.17 presents the mean cardiovascular endurance (CE) scores for the treatment and control groups across pre-test, post-test, and adjusted post-test evaluations:

- **Control Group:** The CE mean score was 11.133 in the pre-test, decreased to 10.677 in the post-test, and adjusted to 11.350 in the post-test.
- **Physical Fitness Group:** The mean score was 12.729 in the pre-test, improved significantly to 9.815 in the post-test, and adjusted to 9.750.
- **Yoga Group:** The pre-test CE mean score was 12.965, which improved to 10.940 in the post-test and adjusted to 10.551.
- **Combined Group:** The mean score was 12.729 in the pre-test, increased to 10.245 in the post-test, and adjusted to 10.009. These results highlight differences in cardiovascular endurance across the groups, with treatment groups showing notable improvements, particularly after interventions.

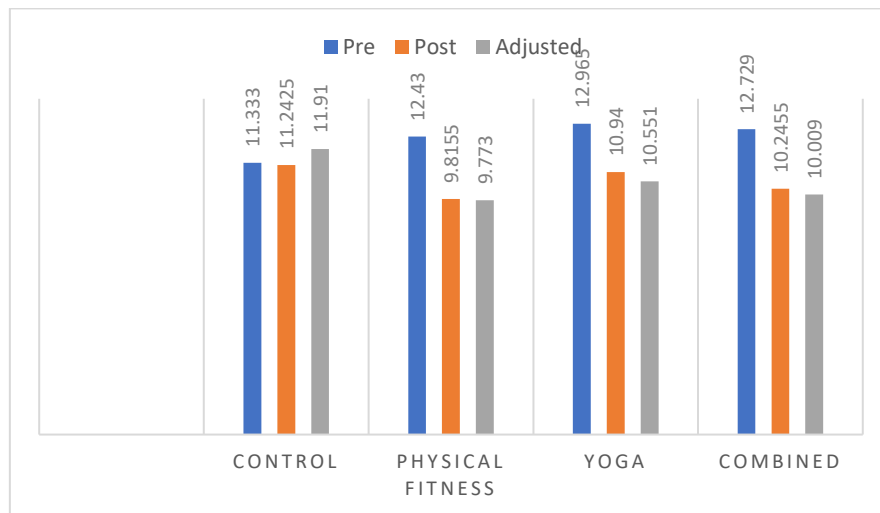


Figure- 01: Pre, Post and Adjusted Post test Mean scores of Cardiovascular Endurance

Interpretation: Figure 4.1 visually represents the data from Table 4.2. This multiple bar chart illustrates that, when comparing the corrected post-test mean cardiovascular endurance scores (adjusted for pre-test) with the pre-test mean scores across all treatments and control groups, the treatment groups show an increase in cardiovascular endurance.

Table 04: Bonferroni Post Hoc test Analysis of Adjusted Post test Means of Treatment and Control groups on Cardiovascular Endurance

Groups				Mean Difference	p-value	(95% confidence Interval for Difference)	
Physical Fitness	Yoga	Combined	Control			Lower Bound	Upper Bound
9.773	-	-	11.910	2.137	< 0.05*	1.552	2.721
-	10.551	-	11.910	1.358	< 0.05*	0.750	1.967
-	-	10.009	11.910	1.900	< 0.05*	1.303	2.497
9.773	10.551	-	-	0.778	0.002*	-1.348	0.209

9.773	-	10.009	-	0.236	1.000	0.802	0.330
-	10.551	10.009	-	0.542	0.068*	0.023	1.108

*Indicates that the results are significant at < 0.05 level

Inference: The adjusted mean score of cardiovascular endurance between the control group and the physical fitness, yoga, and combined groups show statistically significant differences, as their respective p-values were below the 0.05 threshold ($< 0.05^*$, $< 0.05^*$, $< 0.05^*$, 0.002^*). However, no significant change in cardiovascular endurance was observed between the physical fitness and combined groups, with a p-value of 1.000. The physical fitness group adjusted post-test mean score for cardiovascular endurance was significantly higher than those of the control, yoga and combined groups.

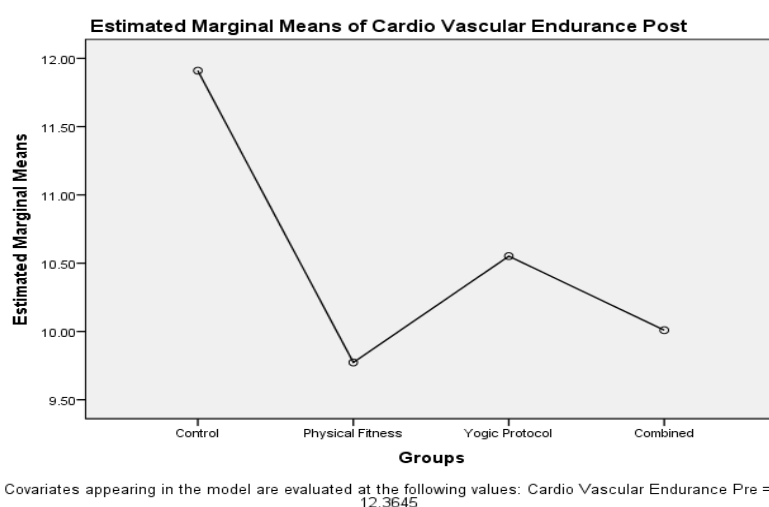


Figure - 02: Profile plot showing Adjusted post-test Mean scores of Cardiovascular Endurance Treatment and Control groups

Interpretation: The graphical representation showed that the physical fitness group achieved the highest effectiveness, followed by the combination group in second place, the yoga group in third, and the control group ranking last in terms of performance.

Table 05: Percentage of Relative Changes in Treatment groups with respect to Control

Control	Physical Fitness	Yoga	Combined Training
	-17.942%	-11.410%	-15.961%

Interpretation: Table 05 indicates the percentage of relative change in muscular strength among college students. The physical fitness group improved by -17.942%, the yoga group by -11.410%, and the combined group by -15.961%. Notably, the gain in cardio vascular endurance in the Physical fitness group is larger than the other two treatment groups.

DISCUSSION ON FINDINGS

The findings highlight the impact of Physical Fitness, Yoga, and Combined protocols on cardiovascular

endurance among college students. Results from the pre- and post-tests indicate that all three treatment groups experienced notable improvements in cardiovascular endurance, with significant differences observed when compared to the Control group, which did not receive any intervention.

Fit India Physical Fitness Protocol: The 12-week Fit India physical fitness intervention shown the most significant improvement in the cardiovascular endurance of college students. This protocol's efficacy in enhancing cardiovascular endurance is largely due to its emphasis on low to high-intensity, repetitive activities that directly stress the cardiovascular system. The physical fitness group improved cardiovascular endurance by -17.942 percentage among the college students. This exercises typically elevate heart rate and challenge the body's oxygen transport systems, which stimulates the cardiovascular system to adapt through increased capillary density, improved stroke volume, and more efficient oxygen uptake. These adaptations are pivotal for endurance as they enable more sustained effort during aerobic activities. Zaki et al. (2023) conducted study on the effects of regular physical activity on adolescents, finding that moderate-to-high-intensity exercise significantly improves lipid profiles, insulin sensitivity, and cardiovascular health. Khattak et al. (2020) performed analogous tests investigating the impact of circuit training on cardiorespiratory endurance in college students. The study demonstrated that the 12-week circuit training regimen significantly enhances cardiorespiratory endurance.

Fit India Yoga Protocol: The Fit India 12-week yoga program demonstrated a moderately significant improvement in college students' cardiovascular endurance yoga group by -11.410 percentage. It might be the outcome of gains in respiratory efficiency, core strength, and flexibility. By increasing oxygen intake and execution, postures that stretch the main muscle groups and control breathing can enhance lung function and circulation, both of which increase endurance. Additionally, yoga's ability to promote mental calm may lessen the pressure that stress places on the heart, eventually enabling more effective cardiovascular responses. The similar studies aligned with Mognet and Mesfin (2022) found that yoga significantly improved cardiovascular endurance in U-17 male football participants. Similarly, Mahaja et al. (2019) reported that yoga enhances cardiorespiratory efficiency, general health, and physical fitness in healthy individuals.

Fit India Physical fitness and Yoga Protocols: The 12 weeks combined protocol (physical fitness and Yoga protocol) treatment shown the significant improvement in the cardiovascular endurance of college students by -15.961 percentage. The combined approach benefits from low to high-intensity cardiovascular work and the flexibility and balance elements of yoga. This combined protocol effect likely promotes more balanced development of cardiovascular endurance, as the physical fitness component trains the heart and lungs, while yoga improves joint mobility and core stability. Consequently, the combination protocol intervention provides a well-rounded benefit that is effective, though slightly less intense in its impact on cardiovascular endurance compared to the pure physical fitness protocol. Bhaskar et al. (2019) found that aerobic training and yoga improved cardio-respiratory endurance in obese male college students, with aerobic training yielding greater gains. Rameshkumar et al. (2018) reported that combining yogic practices with resistance training significantly enhanced cardio-respiratory endurance and body composition in obese boys. Satyavati and Hoovanna (2017) showed that regular yoga and physical workouts improved cardiovascular endurance in secondary school students.

SUMMARY AND CONCLUSION:

SUMMARY

The study underscores the significant effects of targeted Fit India physical fitness interventions on cardiovascular endurance. The Physical Fitness protocol proved to be the most effective for rapid improvements, directly enhancing cardiovascular and muscular adaptations essential for endurance

performance. The Yoga protocol demonstrated its effectiveness in improving cardiovascular efficiency through moderate intensity and gradual progression, offering a sustainable approach for those seeking balanced improvements. The Combined protocol provided a holistic advantage, blending low to high-intensity exercise with restorative practices to enhance cardiovascular endurance.

CONCLUSION

The study findings emphasize the importance of Fit India physical fitness exercise and yoga protocol interventions based on individual goals. The Fit India fitness protocol helps us to stay away from diseases. Physical activities develop a healthy body and help in maintaining a sound mind. For those aiming for peak cardiovascular performance, low- to high-intensity fitness routines are recommended. This study highlights that tailored approaches are key to optimizing cardiovascular endurance and improving the overall health of the college students.

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