



Evaluate the physiological effects of yoga practice on adolescent health: A pre-test and post-test study

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Abstract

The study aimed to evaluate the impact of regular yoga practice on physiological parameters specifically thyroid function, blood pressure, and blood sugar levels among adolescents, using a pre-test and post-test design. A total of 90 adolescent athletes participated in a structured yoga intervention, practicing regularly under expert guidance. The research also sought to assess the effectiveness of yoga in promoting overall physiological health and preventing lifestyle-related health risks in this age group. To test the stated objectives, hypotheses were framed to determine whether significant differences existed between pre- and post-intervention physiological parameters. Data analysis using paired samples t-tests revealed significant positive shifts in the classifications of TSH levels, systolic blood pressure, and fasting blood sugar levels after the yoga intervention. Participants previously categorized as requiring 'Significant Attention' for these parameters transitioned towards 'Moderate' or 'Low Attention Required' categories. These findings conclude that yoga practice is effective in promoting healthier metabolic, cardiovascular, and endocrine profiles among adolescents, establishing it as a beneficial preventive approach against emerging lifestyle-related health risks in this population.

Keywords: Yoga Interventions, thyroid function, physiological effects

Introduction

Adolescence represents a formative stage in human development, characterized by dynamic physiological, psychological, and hormonal transitions. Adolescence is particularly vulnerable to environmental factors and lifestyle choices because of these changes, which can affect an individual's general health. Adolescents are more susceptible to disorders like thyroid imbalances, blood pressure irregularities, obesity, and blood sugar fluctuations as a result of increased academic stress, exposure to digital screens, irregular eating habits, and decreased physical activity. These conditions may develop into long-term health problems in adulthood if they are not treated.

Yoga is an age-old Indian discipline that combines meditation practices, controlled breathing (pranayama), and physical postures (asanas) to support overall health and wellbeing. Recent studies demonstrate how yoga can improve metabolic health, endocrine function, psychological resilience, and physical fitness. Although yoga's effectiveness in treating conditions like diabetes, hypertension, and stress-related disorders has been extensively studied in adult populations, little is known about how it affects adolescents, especially in terms of physiological effects.

By methodically examining the effects of yoga on thyroid function, systolic and diastolic blood pressure, and fasting and postprandial blood sugar levels in adolescents, the current study aims to close this research gap. To evaluate the physiological changes brought on by consistent yoga practice, the study uses a structured intervention program with a pre-test and post-test design.

The study also recognizes the relationship between psychological and physiological health, noting that adolescents' academic performance, emotional control, and

mental focus can all be enhanced by better physical health. The study intends to establish yoga as a preventive health strategy specifically designed for adolescents, in addition to being a fitness activity, by concentrating on quantifiable physiological markers. The results could offer evidence-based backing for incorporating yoga into athletic training regimens, school curricula, and adolescent health initiatives, fostering long-lasting health benefits from a young age.

Literature Review

Chauhan *et al.* (2024) ^[1] evaluated how yoga affected medical students' stress, anxiety, and depression. According to the study, regular yoga practice improved mood, strengthened stress-reduction abilities, and dramatically decreased negative psychological symptoms. According to the study, incorporating yoga into medical education may help aspiring medical professionals better manage stress and possibly lower burnout, which is especially pertinent for high-stress academic populations.

The study by Motzkus & Jarry (2024) ^[2] investigates how gender norms impact yoga practice, particularly among men. The authors discovered that because yoga is perceived as a feminized activity, traditional masculine norms frequently discourage male participation in the practice. This realization is crucial because it draws attention to the social and cultural obstacles that prevent yoga from becoming more widely practiced, especially among male teenagers and adults. The results indicate that in order to promote yoga's physiological and mental health benefits among diverse populations, more inclusive and gender-sensitive strategies are required.

The therapeutic potential of yoga for people with schizophrenia was examined by Yin *et al.* (2024) ^[3]. The results showed that yoga interventions significantly

improved overall quality of life and clinical symptoms like emotional instability and social disengagement. By improving social functioning and lessening the severity of symptoms when paired with traditional treatments, the study highlights the benefits of yoga as a complementary therapy in mental health, especially for complex psychiatric conditions.

In order to lower stress and anxiety and improve mental health in medical students, Fazia *et al.* (2023) ^[4] investigated an online mindfulness-based intervention that is similar to yoga. Even with virtual sessions, the study discovered notable improvements in mental clarity and emotional regulation as well as significant decreases in stress. These findings show how flexible and successful mindfulness and yoga-inspired programs can be in distance learning settings, particularly in the wake of a pandemic.

Kavitha *et al.* (2023) ^[5] measured the serum cortisol levels of medical students in order to investigate the biochemical effects of yoga and meditation. Those who practiced yoga and meditation showed a noticeable decrease in cortisol, a major stress hormone. According to this physiological data, mind-body techniques can help young adults—including students who are under academic pressure—develop a balanced and healthier stress response system by regulating stress at the hormonal level.

Anshu Singh *et al.* (2023) ^[6] investigated how yoga affected asthmatic patients' pulmonary function. According to the study's findings, yoga considerably improves lung capacity, respiratory effectiveness, and general pulmonary health. These enhancements in breathing abilities demonstrate yoga's potential as an adjunctive respiratory therapy intervention, not only for asthma but also for other lung-functioning disorders, such as respiratory complications following a viral infection.

The beneficial effects of yoga on respiratory health were confirmed by Bhagel & Saha's (2021) ^[7] thorough systematic review and meta-analysis on the subject of yoga's effects on pulmonary functions and respiratory muscle strength. The findings indicate that consistent yoga practice strengthens respiratory muscles and improves ventilation efficiency, which is beneficial not only for individuals with respiratory ailments but also for enhancing athletic performance and overall fitness.

In a systematic review and meta-analysis, Ghazvineh *et al.* (2022) ^[8] assessed how yoga affected lipid profiles, such as triglycerides and cholesterol. According to the study's findings, yoga interventions support cardiovascular health by improving lipid metabolism, which lowers LDL (bad cholesterol) and raises HDL (good cholesterol). For those who are at risk of cardiovascular diseases, this makes a compelling case for including yoga in lifestyle interventions.

Kamatchi & Elangovan (2022) ^[9] looked into how yoga affected middle-aged women with hypothyroidism's self-confidence and low-density lipoprotein (LDL) levels. Along with increases in psychological well-being and self-confidence, the study found a decrease in LDL levels. These two advantages show how yoga has a broad effect on mental and physical health, especially for women who are dealing with long-term endocrine disorders.

This systematic review by Rizvi *et al.* (2023) ^[10] highlighted the value of evidence-based complementary therapies like yoga in clinical settings, with a primary focus on palliative care programs. The study emphasized the possible

advantages of incorporating yoga into regular treatment for patients with long-term metabolic disorders and cancer, among other chronic diseases. The inclusion of yoga in holistic health care models could improve quality of life, pain management, and emotional well-being.

Research Methodology

The present study employed a pre-test and post-test experimental design to evaluate the physiological effects of yoga interventions on adolescent athletes. The sample consisted of 90 adolescent athletes selected through purposive sampling from three districts of Rajasthan: Jaipur, Jodhpur, and Udaipur. The participants were balanced in terms of age (18-19 years) and gender (45 males and 45 females), ensuring a representative athletic sample.

Population/Universe

The population for this study consisted of adolescent athletes from the districts of Jaipur, Jodhpur, and Udaipur in Rajasthan. These athletes were actively engaged in various sports disciplines, including track events, field events, and combined events.

Sampling Technique

The study adopted a purposive sampling technique, selecting participants who were adolescent athletes actively involved in sports training and willing to participate in yoga interventions.

Sample Size

The sample size was 90 adolescent athletes, equally distributed across

1. **Districts:** 30 athletes each from Jaipur, Jodhpur, and Udaipur

Objectives

1. To evaluate the impact of regular yoga practice on physiological parameters specifically thyroid function, blood pressure, and blood sugar levels among adolescents using a pre-test and post-test approach.
2. To assess the effectiveness of yoga interventions in promoting overall physiological health and preventing lifestyle-related health risks in adolescent populations.

Hypotheses

Based on the above objectives following hypotheses was being framed

H₀₁: There is no significant difference between pre-test and post-test physiological parameters (thyroid function, blood pressure, and blood sugar levels) among adolescents following yoga interventions.

H_{a1}: There is a significant difference between pre-test and post-test physiological parameters (thyroid function, blood pressure, and blood sugar levels) among adolescents following yoga interventions.

Results and Discussion

1. Respondents Profile

There were 90 adolescents' athletes who took part in the study. 50% of the individuals were 18 years old and 50% were 19 years old. Regarding gender, the sample comprised 45 males (50%) and 45 females (50%), ensuring balanced representation.

Participants were drawn equally from three districts of Rajasthan: Jaipur, Jodhpur, and Udaipur, each contributing 33.3% of the total respondents. Most of them (58.9%) were in college, 32.2% had finished high school, and 8.9% had finished secondary school.

When broken down by sport, 47.8% were in field events, 23.3% were in combined events, and 5.6% were in other sports. Based on the sports training experience of the participants, 60% had 1 to 3 years of experience, 30% had less than 1 year, and 10% had more than 4 years of experience.

A large majority (83.3%) said they did yoga as part of their training, while only 16.7% said they didn't do yoga at all. This profile shows a diverse but balanced group of teen athletes of different ages, genders, levels of education, types

of sports, and levels of training.

2. Physiological Parameters and Yoga Interventions

The hypothesis H₀1 is further sub divided into three hypotheses H₀1.1, H₀1.2 and H₀1.3.

2.1 Physiological Parameter TSH (Thyroid Function) and Yoga Interventions

H₀1.1: There is no significant difference between pre-test and post-test physiological parameter TSH (Thyroid Function) among adolescents following yoga interventions.

H_a1.1: There is significant difference between pre-test and post-test physiological parameter TSH (Thyroid Function) among adolescents following yoga interventions.

Table 1: Paired Samples Statistics (H1.1)

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TSH (Thyroid Function): Post	2.34	90	.781	.082
	TSH (Thyroid Function): Pre	1.7111	90	.79668	.08398

Table 2: Paired Samples Correlations (H1.1)

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	TSH (Thyroid Function): Post & TSH (Thyroid Function): Pre	90	-.940	.000

Table 3: Paired Samples T- Test (H1.1)

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	TSH (Thyroid Function): Post - TSH (Thyroid Function): Pre	.63333	1.55390	.16380	.30788	.95879	3.867	89	.000

The results of the paired samples test for TSH (thyroid stimulating hormone) levels in adolescents following yoga intervention show a statistically significant positive shift in the classifications of TSH levels. Following the intervention, participants whose TSH levels were initially classified as "Needs Significant Attention" on the three-point scale demonstrated a discernible shift towards the "Moderate Attention" or "Low Attention Required" categories. Adolescents who had more thyroid imbalance prior to the yoga program benefited the most, moving

toward healthier TSH levels, as evidenced by the strong negative correlation between their pre- and post-test TSH scores. This implies that consistent yoga practice helped control thyroid function, lessening the severity of dysfunction where it was first most noticeable. Finally, it can be concluded that as the p-value is found to be lower than the standard alpha value of 0.05 the null hypothesis H₀1.1 is being rejected confirming that the alternate hypothesis H_a1.1 is being accepted which states that there is significant difference between pre-test and post-

test physiological parameter TSH (Thyroid Function) among adolescents following yoga interventions.

physiological parameter Systolic Blood Pressure among adolescents following yoga interventions.

2.2 Physiological Parameter Systolic Blood Pressure and Yoga Interventions

H₀1.2: There is no significant difference between pre-test and post-test

H_a1.2: There is significant difference between pre-test and post-test physiological parameter Systolic Blood Pressure among adolescents following yoga interventions.

Table 4: Paired Samples Statistics (H1.2)

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Systolic BP: Post	2.28	90	.750	.079
	Systolic BP: Pre	1.6556	90	.73685	.07767

Table 5: Paired Samples Correlations (H1.2)

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Systolic BP: Post & Systolic BP: Pre	90	-.903	.000

Table 6: Paired Samples T- Test (H1.2)

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Systolic BP: Post - Systolic BP: Pre	.6222	1.45013	.15286	.31850	.92595	4.071	89	.000

After yoga interventions, adolescents' systolic blood pressure (BP) levels showed a statistically significant improvement, according to the paired samples test. After practicing yoga, many participants who had previously been classified as needing "Significant Attention" due to elevated systolic blood pressure moved to the "Moderate Attention" or "Low Attention Required" categories on the three-point classification scale. Adolescents with higher systolic blood pressure initially benefited more from the intervention, as evidenced by the significant negative correlation between pre- and post-test classifications; significant drops in blood pressure helped them move into healthier ranges. This demonstrates how regular yoga practice helped adolescents' systolic blood pressure levels be effectively reduced and managed.

Finally, it can be concluded that as the p-value is found to

be lower than the standard alpha value of 0.05 the null hypothesis H₀1.2 is being rejected confirming that the alternate hypothesis H_a1.2 is being accepted which states that there is significant difference between pre-test and post-test physiological parameter Systolic Blood Pressure among adolescents following yoga interventions.

Physiological Parameter Fasting Blood Sugar and Yoga Interventions

H₀1.3: There is no significant difference between pre-test and post-test physiological parameter Fasting Blood Sugar among adolescents following yoga interventions.

H_a1.3: There is significant difference between pre-test and post-test physiological parameter Fasting Blood Sugar among adolescents following yoga interventions.

Table 7: Paired Samples Statistics (H1.3)

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Fasting Blood Sugar: Post	2.29	90	.864	.091
	Fasting Blood Sugar: Pre	1.6333	90	.82721	.08720

Table 8: Paired Samples Correlations (H1.3)

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Fasting Blood Sugar: Post & Fasting Blood Sugar: Pre	90	-.872	.000

Table 9: Paired Samples T- Test (H1.3)

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Fasting Blood Sugar: Post - Fasting Blood Sugar: Pre	.65556	1.63639	.17249	.31282	.99829	3.801	89	.000

The paired samples test for Fasting Blood Sugar among adolescents after yoga interventions reveals a statistically significant improvement in fasting blood sugar levels post-intervention. When classified on the three-point scale, several participants initially categorized under ‘Needs Significant Attention’ for elevated fasting blood sugar transitioned to ‘Moderate Attention’ or ‘Low Attention Required’ categories following the intervention. The strong negative correlation between pre- and post-test classifications indicates that adolescents with higher initial fasting blood sugar levels experienced greater improvements. This suggests that regular yoga practice effectively helped regulate and lower fasting blood sugar levels, contributing to better metabolic health among the adolescent participants.

Finally, it can be concluded that as the p-value is found to be lower than the standard alpha value of 0.05 the null hypothesis H_0 1.3 is being rejected confirming that the alternate hypothesis H_a 1.3 is being accepted which states that there is significant difference between pre-test and post-test physiological parameter Fasting Blood Sugar among adolescents following yoga interventions.

Conclusion

The study concludes that yoga interventions have a significant positive effect on TSH (Thyroid Stimulating

Hormone), Systolic Blood Pressure, and Fasting Blood Sugar levels among adolescent athletes. The findings demonstrated a marked reduction in TSH levels, indicating improved thyroid function post-intervention. Similarly, a significant decrease in systolic blood pressure was observed, suggesting better cardiovascular regulation due to consistent yoga practice. Additionally, fasting blood sugar levels showed notable improvement, reflecting enhanced metabolic control and better glucose regulation among the participants. These outcomes collectively affirm that regular yoga practice can effectively contribute to the physiological well-being of adolescent athletes, supporting both their health maintenance and athletic performance.

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