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INTERVENTION OF PHYSICAL EXERCISE ON DIABETES AMONG MIDDLE AGED WOMEN

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Abstract

Diabetes represents a spectrum of metabolic disorder, which has become a major health challenge worldwide. An objective of this study is to evaluate the moderate intensity physical training on blood sugar among middle aged women. Thirty type 2 female diabetic patients (n = 30) from one medical college hospital were randomly selected as subjects. The age of the subjects ranged from 40 to 50 years. The subjects divided into two equal groups of fifteen subjects each (n = 15). In which, group I underwent physical training (PTG) for six days per week for twelve weeks and group II acted as control (CG) who did not undergo any special training programme apart from their regular activities. Blood sugar was selected as a test variable and assessed before and after the training period. The collected data were statistically analysed by using Analysis of Covariance (ANCOVA). From the results of the study, it was found that there was a significant reduction ($p \leq 0.05$) in blood sugar of training groups when compared to control group.

Keywords: Moderate intensity, physical exercise, blood sugar, type 2 diabetic mellitus

Introduction

The unprecedented economic development and rapid urbanization in Asian countries particularly India has led to shift in health problems from communicable to non-communicable diseases (Mohan *et al,* 2001). The ancient Indian physicians had a sound knowledge of Diabetes. They described the clinical features and complications of diabetes vividly. Physical training has been shown to benefit individuals with a wide range of health conditions including diabetes (Bijlani *et al,* 2005).Diabetes is a metabolic disorder. One important regimen for people with diabetes and for those at risk for developing diabetes is engagement in appropriate physical activity. The beneficial effects of physical activity typically include reductions in glucose level and body weight (USDHHS, 2004). As a particular form of physical activity, yoga programs using various physical postures have been shown to benefit individuals with a wide range of health conditions including diabetes (Bijlani *et al*, 2005). Frequent and regular physical exercise boosts the immune system, and helps prevent diseases of affluence such as heart disease, cardiovascular disease (Ronald et al., 2004). Adaptation of the human body to physical exercise can improve the health of internal system and the efficiency of external movements. Such an adaptation to one kind of stress may also prepare the person physically and emotionally to resist other stresses life.

Glucose is transported from the intestines or liver to body cells via the bloodstream, and is made available for cell absorption via the hormone insulin, produced by the body primarily in the pancreas. The prime source of energy human cells is glucose which is a kind

of sugar which passes through the blood system. When eat carbohydrates, glucose goes through body. Insulin is the hormone which is generated in the pancreas and discharged into the blood system when levels of glucose rise (DeFrongo *et al*, 1987 and Craig *et al*, 1989). The levels of glucose are kept normal by glucagon and insulin. Its measurement is important to the diagnosis of diabetes mellitus. Normal levels for this test are 70 to 100 mg/dl. Levels of blood sugar consistently higher than 150 mg/dl are a sign of high blood sugar also known as hyperglycemia. When the blood sugar level persistently falls to 70 are lower this is a sign of low blood sugar also know as hypoglycemia. Continual hyperglycemia causes diabetes mellitus, which is the most frequent disease connected to the regulation of blood sugar. Diabetes is a disease which can cause kidney, nerve and eye damage. Physical exercise helps to normalize blood sugar level and maintain health (WHO, 2008).

Materials and methods

For this study only type 2 female diabetes patients from Chennai diabetic center, Chennai, Tamil Nadu, were randomly selected as subject. Their age were ranged between 40 and 50 years. The selected thirty subjects were divided into two groups of fifteen each. Out of which, group I (n = 15) underwent physical exercises and group II (n = 15) remained as control. The training programme was carried out for six days per week during morning session only (6 am to 8 am) for twelve weeks. Blood sugar was selected as criterion variable for this study and it was measured by enzymatic glucose oxidase preoxidase (GOD-POD) method using Boehringer Mannheim kit. Both experimental groups initially performed thorough warming up exercises. After that group I performed the following physical exercises like calisthenics, stretching, sit-ups, push-ups and medicine ball exercises with moderate intensity. Mean and standard deviation were calculated for blood sugar for each group. And the data were analyzed by using analysis of covariance (ANCOVA). Statistical significance was set to priority at 0.05 levels.

Results

Table I. Analysis of covariance for Blood sugar of experimental groups and control group

Test		**PEG**	**CG**	**SOV**	**SS**	**df**	**MS**	***F***
Pre test	Mean	126.26	121.48	B	213.33	2	213.33	1.83
	S.D	11.44	10.05	W	3244.53	28	115.88	
Post test	Mean	116.38	123.73	B	4612.8	2	4612.8	8.37*
	S.D.	6.19	4.50	W	1546.0	28	55.21	
Adjusted Post test	Mean	115.93	124.02	B	3981.11	2	3981.11	12.82*
				W	1428.44	27	49.29	

*Significant F = (df 1, 28) (0.05) = 4.20; ($p \leq 0.05$) F = (df 1, 27) (0.05) = 4.21; ($p \leq 0.05$)

The table I showed that the pre test mean values on blood sugar for physical training group and control group were 126.26 and 121.48 respectively. The obtained *F* ratio of 1.83 for pretest which was lower than the required table value 4.20 with df 2 and 28 at 0.05 level of confidence. The post test mean values for physical training group and control group were 116.38 and 123.73 respectively. The obtained *'F'* ratio of 8.37 for posttest which was higher

than the required table value 4.20 with df 2 and 28 at 0.05 level of confidence. The adjusted post test mean values on blood sugar for physical training group and control group were 115.93 and 124.02 respectively. The obtained *F* ratio of 12.82 for adjusted posttest which was higher than the required table value 4.21 with df 2 and 27 for significance at 0.05 level of confidence on diabetic mellitus. Hence, the results of the study showed that there was a significance difference exists between physical training group and control group on diabetic mellitus. The pre, post and adjusted post test mean values of experimental group and control group on blood sugar was graphically represented in the figure 1.

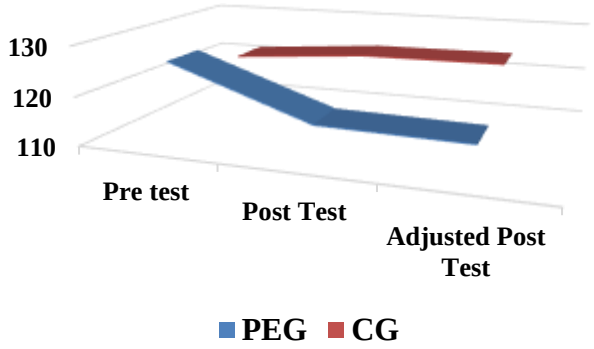


Figure 1: The pre, post and adjusted post test mean values of experimental group and control group on blood sugar

Discussion

From the results of the study showed that there was a significant improvement in blood sugar due to physical training in middle aged women. Exercise has been shown to increase insulin sensitivity, decrease glucose intolerance (Neil et al., 2006). It is biologically plausible that physical activity might reduce the risk of type 2 diabetes, because physical activity increases glucose disposal through a number of pathways. Physical activity has independent effects on glucose disposal by increasing both insulin-mediated and non–insulin-mediated glucose disposal (Goodyear *et al*, 1992). A single bout of physical activity increases insulin-mediated glucose uptake for more than 24 hours (Annuzzi *et al*, 1991). The increased insulin sensitivity occurs because of increased number and activity of glucose transporters, both in muscle and in adipose tissue (Devlin, 1992). Glycogen syntheses activity is also increased, resulting in increased glycogen synthesis and increased non oxidative disposal of glucose. In addition to this direct effect on glucose disposal, physical activity results in decreased adipose tissue mass and preserved or increased lean body mass, (Blair, 1993) which also led to increased insulin sensitivity. Equivalent energy expenditures from moderate activity may confer comparable benefits. In the Insulin Resistance Atherosclerosis Study, both non vigorous activities are significantly associated with insulin sensitivity among men aged 40 to 69 years (Mayer *et al*, 1998). Daily walking combined with dietary therapy not only reduced body weight but also improved insulin sensitivity among diabetic patients (Yamanouchi et al, 1995). Therefore, the present study was designed to determine the physical

training on blood glucose level of type 2 female diabetic patients.

Conclusion: This study has confirmed the useful role of physical training in the control of blood sugar level. Fasting and postprandial blood glucose levels came down significantly. Good glycemic status can be maintained for long periods of time. In summary, the results of this study suggest that physical training could potentially be a risk reduction option for middle aged women at high risk for type 2 diabetes. The result of the study indicated that there was significant reduction on blood glucose levels of female type -2 diabetic patients due to twelve weeks of physical exercise intervention.

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INDIAN KNOWLEDGE SYSTEMS AND YOGA: TOWARDS HOLISTIC WELL-BEING IN THE TWENTY-FIRST CENTURY

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Abstract

Indian Knowledge Systems (IKS) represent one of the world's oldest and most comprehensive traditions of knowledge, encompassing philosophy, medicine, education, ethics, psychology, and spirituality. Among its most significant contributions is Yoga, a holistic discipline that seeks harmony between the body, mind, and spirit. Although widely recognised today for its physical benefits, Yoga is fundamentally a way of life grounded in ethical values, self-discipline, and inner transformation. In an age characterised by stress, mental health challenges, sedentary lifestyles, and social fragmentation, Yoga offers an integrated framework for promoting physical, psychological, emotional, and spiritual well-being. This paper examines Yoga as an essential component of Indian Knowledge Systems by exploring its philosophical foundations, its relevance to modern psychology and healthcare, its role in education, its relationship with Ayurveda, and its contribution to sustainable living. Drawing upon classical Indian texts such as the Yoga Sutras of Patanjali, the Bhagavad Gita, and the Upanishads, along with contemporary empirical research, the paper argues that Yoga provides a timeless yet scientifically relevant approach to holistic human development. The study adopts a qualitative, interpretive methodology that combines textual analysis of classical sources with a review of the contemporary scientific literature on Yoga and well-being. It concludes that integrating Yogic principles into education, healthcare, and public policy can contribute significantly to individual flourishing and societal well-being, while also cautioning against the erosion of Yoga's philosophical depth under the pressures of global commercialisation.

***Keywords**: Indian Knowledge Systems, Yoga, Holistic Well-being, Mental Health, Education, Psychology, Ayurveda, Ashtanga Yoga, Sustainability*

1. Introduction

Indian Knowledge Systems (IKS) comprise a rich body of indigenous knowledge that has evolved over thousands of years through philosophical inquiry, observation, and lived experience. Unlike many modern disciplines that separate knowledge into specialised fields, IKS adopts a holistic perspective in which philosophy, science, medicine, ethics, spirituality, and education are deeply interconnected. The ultimate objective of this tradition is not merely the acquisition of information but the cultivation of wisdom that leads to personal fulfilment and social harmony.

Among the many branches of IKS, Yoga occupies a unique position because it combines philosophical insight with practical methods for improving physical health, mental clarity, emotional stability, and spiritual awareness. While contemporary society often

associates Yoga with physical postures and fitness, classical Indian thought presents it as a comprehensive discipline aimed at mastering the mind and realising one's highest potential. The increasing global recognition of Yoga, including the observance of the International Day of Yoga, reflects its universal relevance in addressing the challenges of modern life.

The twenty-first century presents a paradox of unprecedented material progress accompanied by growing psychological distress. Rates of anxiety, depression, burnout, and lifestyle-related illness continue to rise even in societies with access to advanced medical technology. Sedentary occupations, digital overstimulation, weakened community ties, and the erosion of contemplative practices have together created conditions in which physical comfort coexists with inner disquiet. It is within this context that Yoga, as one of the most fully developed products of Indian Knowledge Systems, assumes renewed significance. Rather than being a relic of the past, Yoga offers a living framework capable of addressing thoroughly modern problems through ancient, tested methods.

This paper proceeds from the premise that Yoga cannot be adequately understood in isolation from the broader intellectual and spiritual ecosystem of Indian Knowledge Systems from which it emerged. Accordingly, the discussion begins with an overview of IKS before narrowing its focus to the philosophy, practice, and contemporary application of Yoga across the domains of physical health, mental health, education, and sustainable living.

1.1 Objectives of the Study

- To examine the philosophical foundations of Yoga within the broader framework of Indian Knowledge Systems.
- To analyse the contribution of Yoga to physical health and preventive healthcare.
- To evaluate the relevance of Yogic principles to modern psychology and mental health interventions.
- To assess the role of Yoga and Ayurveda as complementary systems of holistic health.
- To explore the integration of Yoga into education and human development, particularly in light of the National Education Policy 2020.
- To consider the relationship between Yogic philosophy and contemporary concerns regarding sustainability and ecological ethics.
- To critically examine the challenges posed by the commercialisation and decontextualisation of Yoga in global settings.

1.2 Methodology

This paper adopts a qualitative and interpretive research methodology grounded in textual and thematic analysis. Primary classical sources, including the Yoga Sutras of Patanjali, the Bhagavad Gita, and the Upanishads, are examined alongside secondary scholarly literature on Yoga, Ayurveda, psychology, and education. The study also draws upon peer-reviewed empirical research published in journals of psychiatry, psychology, and integrative medicine to situate classical Yogic concepts within the framework of contemporary evidence-based practice. This dual approach—combining philosophical exegesis with an appraisal of scientific literature—allows the paper to present Yoga simultaneously as a philosophical tradition and as a subject of ongoing empirical investigation. The paper is descriptive and analytical in nature rather than experimental, and

does not present new primary data; its contribution lies in synthesis and interpretation.

2. Indian Knowledge Systems: An Overview

Indian Knowledge Systems encompass diverse disciplines, including the Vedas, Upanishads, Vedanta, Samkhya, Ayurveda, Yoga, Nyaya, and classical arts and sciences. Despite their diversity, these traditions share a common understanding that human life is multidimensional and that true well-being arises from harmony between the body, mind, intellect, and spirit.

The Taittiriya Upanishad explains this holistic view through the concept of the Panchakosha, or the five sheaths of human existence: the physical body (Annamaya Kosha), vital energy (Pranamaya Kosha), mind (Manomaya Kosha), intellect (Vijnanamaya Kosha), and bliss (Anandamaya Kosha). Yoga functions as a practical discipline that nurtures each of these dimensions, enabling individuals to achieve balance and self-realisation.

A distinguishing feature of Indian Knowledge Systems is their epistemological plurality. Truth is approached through multiple valid means of knowing, or pramanas, including direct perception, inference, and testimony from reliable sources. This plurality allowed IKS to develop simultaneously as systems of rigorous philosophical debate, as in the Nyaya and Vedanta schools, and as systems of embodied practice, as in Yoga and Ayurveda. Knowledge in this tradition is not considered complete until it is internalised and lived; the Sanskrit term for a realised teacher, drashta, literally means "one who has seen" the truth directly, rather than merely reasoned toward it. This experiential orientation distinguishes IKS from purely theoretical systems and explains why Yoga, as a practice-based discipline, occupies such a central place within it.

It is also important to note that IKS is not a monolithic or static tradition. It comprises multiple, sometimes competing, schools of thought that debated the nature of the self, the reliability of the senses, and the path to liberation over many centuries. Yoga itself is one of the six classical schools of Indian philosophy (the Shad-Darshanas), traditionally paired with the Samkhya school, from which it draws its metaphysical framework of Purusha (consciousness) and Prakriti (matter). Understanding this philosophical lineage is essential to appreciating Yoga not as an isolated set of techniques but as the applied, practical arm of a sophisticated metaphysical system.

3. The Philosophy of Yoga

The term Yoga is derived from the Sanskrit root Yuj, meaning "to unite" or "to join." This union refers not only to the integration of body and mind but also to the harmony between the individual self and universal consciousness. Patanjali defines Yoga in the Yoga Sutras as Yogah citta-vrtti-nirodhah—the cessation of the fluctuations of the mind. This definition highlights Yoga as a science of mental discipline rather than merely a system of physical exercise.

"Yogas citta-vrtti-nirodhah" — Yoga is the stilling of the fluctuations of the mind. (Patanjali, Yoga Sutras I.2)

According to this formulation, ordinary consciousness is characterised by constant mental fluctuations (vrittis)—patterns of perception, memory, imagination, sleep, and misapprehension that obscure the true nature of the self. Patanjali classifies these fluctuations

and outlines methods for their restraint, culminating in a state of clarity in which the practitioner perceives reality without the distortions of ego and desire. This is a strikingly systematic approach to consciousness, developed centuries before the emergence of modern cognitive science, and it forms the theoretical backbone upon which the practical stages of Yoga are built.

3.1 Ashtanga Yoga: The Eightfold Path

The classical framework of Yoga is presented through Patanjali's Ashtanga Yoga, or Eightfold Path, which offers a systematic progression from ethical conduct to the highest states of meditative absorption. Each limb builds upon the preceding one, illustrating that Yoga is not a single technique but a graduated discipline encompassing conduct, body, breath, and mind.

- Yama (ethical restraints): non-violence (Ahimsa), truthfulness (Satya), non-stealing (Asteya), moderation (Brahmacharya), and non-possessiveness (Aparigraha).
- Niyama (personal observances): purity (Saucha), contentment (Santosha), disciplined effort (Tapas), self-study (Svadhyaya), and surrender to a higher principle (Ishvara Pranidhana).
- Asana (physical postures): the cultivation of a steady and comfortable bodily seat as a foundation for meditative practice.
- Pranayama (breath regulation): the conscious control of the breath to regulate vital energy (prana) and calm the nervous system.
- Pratyahara (withdrawal of the senses): the redirection of attention away from external sensory stimulation.
- Dharana (concentration): the sustained focusing of attention on a single object.
- Dhyana (meditation): the uninterrupted flow of concentration into a state of meditative absorption.
- Samadhi (self-realisation): the culmination of meditative practice in which the distinction between the observer and the observed dissolves.

Together, these eight stages provide a systematic approach to developing ethical behaviour, emotional resilience, mental concentration, and spiritual awareness. It is significant that the first two limbs are entirely ethical in character; classical Yoga does not treat morality as separate from psychological or physiological health but regards it as its very foundation. A practitioner who violates the principles of Yama and Niyama, the tradition holds, cannot achieve lasting benefit from the later, more technical stages of practice.

3.2 Yoga in the Bhagavad Gita

The Bhagavad Gita expands the philosophy of Yoga beyond Patanjali's meditative framework by describing multiple complementary paths suited to different temperaments: Karma Yoga, the path of selfless action performed without attachment to results; Bhakti Yoga, the path of devotion; Jnana Yoga, the path of knowledge and discernment; and Dhyana Yoga, the path of meditative discipline. This plurality of paths reflects a core insight of Indian Knowledge Systems: that human beings differ in temperament and capacity, and that a mature knowledge system must offer multiple valid routes to the same end—inner freedom and self-realisation. The Gita's teaching that one should act with dedication while remaining detached

from outcomes has particular relevance to contemporary discussions of workplace stress, burnout, and the psychology of motivation.

4. Yoga and Physical Well-Being

The greatest strength of Yoga lies in its holistic understanding of health. Modern healthcare increasingly recognises that physical illness is often closely linked with emotional stress, lifestyle choices, and psychological well-being. Long before these ideas gained scientific acceptance, Indian Knowledge Systems emphasised that health depends upon maintaining balance in all dimensions of life.

The practice of Asanas enhances flexibility, muscular strength, posture, and cardiovascular efficiency. Pranayama improves respiratory function while activating the parasympathetic nervous system, thereby reducing stress and promoting relaxation. Meditation cultivates mindfulness, emotional regulation, and cognitive clarity, enabling individuals to respond to challenges with greater resilience.

Numerous scientific studies have demonstrated that regular Yoga practice contributes to the management of hypertension, diabetes, obesity, chronic pain, anxiety, depression, insomnia, and stress-related disorders. By lowering cortisol levels and improving autonomic balance, Yoga enhances both physical and psychological health. Unlike conventional exercise programmes that focus primarily on physical fitness, Yoga integrates movement, breath, attention, and ethical awareness into a unified system of well-being.

Beyond its role in managing existing conditions, Yoga has been increasingly studied as a preventive health strategy. Regular practitioners report improvements in sleep quality, digestive function, and immune resilience, alongside reductions in markers of systemic inflammation. Because Asana and Pranayama practices can be adapted to nearly any age or physical condition, Yoga is unusually accessible as a lifelong health practice, suitable for children, working adults, pregnant women, the elderly, and individuals recovering from illness or injury alike. This adaptability distinguishes it from many forms of physical exercise that place specific demands on age or fitness level.

5. Yoga and Modern Psychology

One of the most significant contributions of Yoga to contemporary society is its relevance to psychology and mental health. Modern psychology has developed sophisticated approaches to understanding cognition, behaviour, and emotional disorders. However, Indian psychological traditions focus not merely on treating mental illness but on transforming consciousness and cultivating inner peace.

Yoga views the mind as capable of continuous refinement through disciplined practice. Emotional disturbances arise from attachment, ignorance, ego, and uncontrolled desires. Through meditation, self-reflection, and ethical living, individuals gradually develop self-awareness, emotional intelligence, compassion, and equanimity.

Contemporary psychological research increasingly supports these principles. Mindfulness-based interventions, cognitive regulation techniques, and positive psychology share significant conceptual similarities with Yogic practices. Meditation has been shown to improve attention, working memory, emotional regulation, and resilience while reducing symptoms of anxiety and depression. Consequently, many psychologists now integrate Yoga

and mindfulness into counselling, trauma recovery, and stress management programmes.

The convergence between Yogic psychology and contemporary clinical practice is perhaps most visible in the widespread adoption of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT), both of which draw substantially, if indirectly, on the contemplative techniques of Pratyahara and Dhyana. At the same time, scholars have cautioned against reducing the rich psychological framework of classical Yoga to a narrow set of clinical techniques stripped of their ethical and philosophical context. The Yogic model of mind treats attention training as inseparable from ethical self-cultivation, whereas many clinical adaptations isolate the attentional component alone. A fuller integration of Yoga into psychology, this paper argues, would attend also to the ethical and motivational dimensions—Yama and Niyama—that classical texts regard as prerequisites for lasting psychological change.

6. Yoga and Ayurveda: Complementary Systems of Holistic Health

Yoga does not exist in isolation within Indian Knowledge Systems; it developed alongside Ayurveda, the classical Indian system of medicine, and the two traditions share a common philosophical foundation in the Samkhya understanding of the person as a composite of body, mind, and consciousness. Where Ayurveda offers a detailed physiological framework—centred on the three doshas of Vata, Pitta, and Kapha—for diagnosing and correcting imbalance through diet, herbs, and daily routine (Dinacharya), Yoga offers the complementary practices of posture, breath, and meditation that regulate the same underlying physiological and psychological systems.

Contemporary integrative medicine has begun to recognise the value of combining these two systems, using Ayurvedic assessment to guide individualised Yoga prescriptions suited to a person's particular constitution and imbalance. This individualisation stands in contrast to standardised fitness or wellness programmes and reflects a broader IKS principle: that effective health interventions must account for the unique constitution of each person rather than applying uniform prescriptions. The renewed academic and clinical interest in Ayurveda-Yoga integration illustrates the continuing relevance of classical Indian frameworks to personalised medicine, a concept that has only recently gained prominence in mainstream biomedical research.

7. Yoga, Education, and Human Development

Education within Indian Knowledge Systems aims at the integrated development of character, intellect, and moral values rather than merely preparing individuals for employment. Yoga plays an essential role in this educational philosophy by fostering concentration, discipline, emotional stability, empathy, and ethical responsibility.

The National Education Policy (NEP) 2020 encourages the incorporation of Indian Knowledge Systems into educational curricula, recognising their potential to promote holistic learning. Schools and universities increasingly include Yoga sessions, breathing exercises, meditation, and mindfulness practices to improve students' academic performance and emotional well-being.

Beyond cognitive development, Yoga nurtures qualities such as patience, perseverance, self-confidence, and interpersonal harmony. These attributes contribute

significantly to personality development, leadership, and responsible citizenship. As educational institutions seek to address rising levels of student stress and anxiety, Yoga offers a preventive and developmental approach that complements conventional teaching methods.

The integration of Yoga into formal education also carries pedagogical implications for teacher training and curriculum design. Effective implementation requires that Yoga be taught not merely as a set of physical drills before the start of the school day, but as a structured component of the curriculum with clear developmental objectives at each grade level, supported by trained instructors capable of adapting practice to the physical and emotional needs of children at different ages. Institutions that have adopted such structured approaches report improvements not only in physical fitness but also in classroom attention, peer relationships, and self-reported emotional regulation among students, lending empirical support to the NEP's emphasis on holistic, IKS-informed education.

8. Yoga, Sustainability, and Global Relevance

The philosophy of Yoga extends beyond individual health to encompass social responsibility and ecological harmony. Principles such as Ahimsa (non-violence), Aparigraha (non-possessiveness), and Santosha (contentment) encourage sustainable patterns of living based on moderation, compassion, and respect for all forms of life. These values align closely with contemporary concerns regarding environmental conservation, ethical consumption, and sustainable development.

The global acceptance of Yoga demonstrates its universal appeal. Today, Yoga is practised in hospitals, educational institutions, rehabilitation centres, workplaces, and community organisations across the world. The United Nations' declaration of 21 June as the International Day of Yoga reflects international recognition of its contribution to public health and human well-being.

Nevertheless, the growing commercialisation of Yoga has often reduced it to a form of physical fitness while neglecting its ethical, philosophical, and spiritual foundations. Preserving the authenticity of Yoga requires integrating scientific research with a deeper understanding of its classical principles as articulated in Indian Knowledge Systems.

9. Challenges and Critical Perspectives

A balanced scholarly treatment of Yoga's contemporary relevance must also acknowledge several challenges. First, the global popularisation of Yoga has frequently involved its decontextualisation from the ethical and philosophical framework of Ashtanga Yoga, reducing a comprehensive discipline to a sequence of physical postures marketed primarily for fitness or aesthetic purposes. Second, questions of cultural attribution and commercial appropriation have generated ongoing debate regarding the ownership, teaching authority, and commodification of a tradition rooted in a specific cultural and spiritual context. Third, the evidence base for many claimed benefits of Yoga, while growing, still includes studies limited by small sample sizes, lack of standardised protocols, and variability in practitioner training, which constrains the strength of causal claims that can be made in the biomedical literature.

Fourth, inconsistent instructor training and certification standards across the global Yoga industry raise concerns about practitioner safety, particularly for individuals with pre-

existing musculoskeletal or cardiovascular conditions attempting advanced postures without adequate supervision. Addressing these challenges requires coordinated efforts among educational institutions, healthcare regulators, and cultural custodians of the tradition to ensure that the global spread of Yoga is accompanied by rigorous training standards, methodologically sound research, and respect for its philosophical origins.

10. Discussion

The preceding sections demonstrate that Yoga functions simultaneously on multiple registers: as a philosophical system addressing the nature of consciousness, as a physical practice with measurable health benefits, as a psychological framework anticipating several insights of contemporary clinical psychology, as an educational tool for holistic human development, and as an ethical orientation toward sustainable living. What unifies these registers is the foundational premise of Indian Knowledge Systems that human flourishing cannot be achieved by addressing the body, mind, or spirit in isolation.

This integrative premise has practical implications for policy and institutional design. Healthcare systems that incorporate Yoga alongside conventional treatment stand to benefit from its low cost, minimal side-effect profile, and applicability across diverse patient populations. Educational systems that adopt IKS-informed pedagogy, as encouraged by the NEP 2020, may better address the rising incidence of stress and attentional difficulties among young people. At the same time, the evidence reviewed in this paper suggests that such integration must proceed carefully, with attention to standardisation, practitioner training, and fidelity to the philosophical depth of the tradition, lest Yoga be reduced to a superficial wellness commodity disconnected from its capacity for genuine transformation.

11. Conclusion

Yoga remains one of the most enduring and influential contributions of Indian Knowledge Systems to global civilisation. Rooted in a profound philosophical tradition, it offers a comprehensive approach to physical health, psychological resilience, ethical living, and spiritual growth. Its emphasis on the integration of body, mind, and consciousness makes it particularly relevant in addressing the complex challenges of the twenty-first century, including stress, mental illness, lifestyle disorders, and environmental crises.

As contemporary societies increasingly recognise the importance of holistic well-being, Yoga provides a valuable bridge between ancient wisdom and modern scientific inquiry. Integrating Yogic principles into healthcare, education, psychology, and public policy can foster healthier individuals, stronger communities, and more sustainable societies. Rather than viewing Yoga solely as a system of exercise, it should be understood as a complete philosophy of life that continues to inspire personal transformation and collective well-being.

11.1 Recommendations

- Healthcare policy should support the inclusion of evidence-based Yoga therapy as a complementary intervention within preventive and integrative healthcare frameworks.
- Educational institutions should implement structured, age-appropriate Yoga curricula supported by qualified instructors, in line with the objectives of the National Education Policy 2020.

- Further empirical research employing standardised protocols and larger sample sizes is needed to strengthen the evidence base for the clinical applications of Yoga.
- Efforts to popularise Yoga globally should be accompanied by measures to preserve its ethical and philosophical foundations, avoiding reduction to a purely physical fitness regimen.
- Instructor certification standards should be strengthened internationally to ensure practitioner safety and fidelity to classical teaching methods.

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EFFECT OF SUSPENSION TRAINING PROGRAM ON OXYGEN SATURATION VARIABLE OF THE UNIVERSITY STUDENTS

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Abstract

Background:-*The objective of this study was to investigate the effect of suspension training program on oxygen saturation (SpO_2) levels of the university students. Suspension training is a method of strength training that utilizes a system of ropes and webbing, known as a "suspension trainer." This system enables individuals to perform exercises using their own body weight, thereby reducing the risk of injury. The present research focused on the application of suspension training among the university students.* ***Methodology:-****For this study, a total of 100 students aged between 18 and 25 years were selected from the Department of Physical Education and Sports at Gurukul Kangri (Deemed to be University). Of these students, 50 were assigned to an Experimental Group and 50 to a Control Group. Participants in the Experimental Group engaged in a 12-week suspension training program. Reliable data were collected using random sampling techniques. Data were recorded pre, mid, and post of the 12-week training period.* ***Results:-****The ANOVA statistical technique was employed to analyze the data and determine the effect of the suspension training program. Compared to the Control Group, no significant improvement in oxygen saturation levels was observed in the Experimental Group from baseline to follow-up ($p > 0.05$). However, slight variations in SpO_2 levels were indeed noted over time. Based on these findings, it was concluded that suspension training did not have a significant effect on the oxygen saturation levels of university students. The level of significance was set at 0.05.*

Keywords: *Oxygen Saturation, Suspension Training, Physiology, Students, University,*

INTRODUCTION

Suspension training is also known as total resistance exercise (TRX). Suspension training was created by Randy Hetrick, a former member of the U.S. Navy SEALs. Total resistance exercise is a specific type of suspension training. It utilizes gravity and body weight, while also focusing on core stability, strength, flexibility, and balance (Singh, 2023). TRX suspension training uses specialized equipment called a suspension trainer. TRX suspension training uses body weight and gravity to increase exercise intensity based on one's fitness. The inventors of this technique state that suspension training aims to integrate practical experience—derived from professionals in the fields of sports and the military—with academic research and scientific studies(Blasco et al., 2023).

'TRX' is an acronym used to describe a system of exercises aimed at improving physical strength. “Suspension training is performed using a suspension trainer, which refers to a

specialized system of ropes and webbing that allows one to exercise their physical strength using their own body weight (Singh & Sharma, 2024).” Suspension training can be viewed as a resistance exercise that allows for varying degrees of difficulty and multi-joint exercises. The primary objectives of TRX are to improve balance, flexibility, and joint stability, as well as physical strength. The suspension trainer helps build physical strength through functional exercises (Mishra, 2023).

The history of suspension training dates back to the 19th century when the TRX suspension exercise system was invented by Randy Hetrick, a former U.S. Navy SEAL and an MBA from Stanford University. He invented "total resistance exercise" and "suspension training" using body weight in the 1990s. Kurt Dasbach, a former professional footballer from Chile, discovered an ancient Andean exercise involving the use of ropes while playing for a South American team; around the same time, he also created his own product, which he named "Sikaflex"(Mozafaripour et al., 2024).

“This research examined the effects of a suspension training program on physical capacity, biomechanical risk factors for lower limb injuries, mental health, and work-related factors in Navy personnel. Results showed that compared to the control group, the intervention group had significantly higher ($p \leq 0.05$) physical capacity, biomechanical risk factors for lower limb injuries, and work-related factors, but there was no change in the mental health of the participants.” Based on the study results, the conclusions drawn indicate that suspension training had a positive impact on physical capacity, injury risk reduction, and work efficiency. Furthermore, it was stated that suspension training is an effective training technique that can be used by military instructors and sports specialists (Mohammed, 2016).

This research examined the effects of suspension training on athlete physiology and metabolism. The participants were 12 22-year-old men who performed a 60-minute suspension training program. The parameters measured were heart rate, blood lactate, and energy expenditure. The researchers concluded that suspension training is an effective form of cardiovascular and high-intensity exercise can help improve physical capacity and metabolic functions (TRX® Suspension Training, 2026).

Oxygen Saturation (SpO2):- This is an estimate of the percentage of oxygen-carrying hemoglobin within your red blood cells, relative to the total hemoglobin present in your blood. Simply put, it measures how effectively your blood is delivering essential oxygen throughout your body. A specific amount of oxygen must be present in the blood at all times; otherwise, the body cannot function properly. SpO2—or oxygen saturation—represents the ratio of oxygen-carrying hemoglobin in the blood to the amount of hemoglobin that is not carrying oxygen. Essentially, this abbreviation serves as an indicator of the quantity of oxygen being transported by the red blood cells within the body. SpO2 is measured as a percentage. For an adult, a healthy level typically ranges from approximately 95% to 100%, although readings above 92% are generally considered healthy.

Objectives of the Study: Examine the effect of suspension training on Oxygen Saturations of the university students.

Hypotheses: H0 - There would no significant effect of suspension training programme on Oxygen Saturation of the university students.

H1 - There would be significant effect of suspension training programme on Oxygen Saturation of the university students.

MATERIALS AND METHOD

Selection of Subject: - The research based on the Suspension Training of the University Students. For the present study, we will select 100 students (50 Experimental Group & 50 Control Group) studying in the Physical Education and Sports department from Gurukula Kangri (Deemed to be University) Haridwar aged between 18 to 25 years. They will be taking part in a 12-week Suspension Training Program.

Sampling Technique: - Random Sampling Technique

- **Independent Variables -** Suspension Training
- **Dependent Variables -** Oxygen Saturation (SpO2)

Design of the Study: - For the research Pre, Mid & Post Test design used to for the impact of suspension training program on university students. The group was exposed to suspension Training with exercises selected for specific purposes. The experimental groups will train with total resistance exercises and control group rest for 12 weeks. The training session conduct 5 days a week.

Measurement and Scoring:- Remove any nail polish, artificial nails, or dressings from the finger, as they block the sensor's light. Warm your hands if they are cold. Sit quietly and relax for at least 5 to 10 minutes before taking a measurement. Place the pulse oximeter on your index or middle finger, making sure your hand rests flat on a surface at heart level. Keep your hand as still as possible.Wait about 10 to 30 seconds for the numbers to stabilize. Most devices will display two numbers: your oxygen saturation percentage (SpO2) and your pulse rate (BPM).

RESULTS

Result Analysis through SPSS 2026 (Descriptive Statistics and Mixed Design ANOVA) of Effect of Suspension Training Program on Oxygen Saturations Variable of the University Students

Table 1

Measure: Oxygen Saturation (SpO2) - Values Mean, SD of Groups (Pre, Mid and Post)

Groups	**Pre-Test**		**Mid-Test**		**Post-Test**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Experimental Group (N = 50)	94.36	3.331	94.00	2.983	94.24	3.230
Control Group (N= 50)	94.02	3.074	93.76	2.882	93.82	2.939

Table 2

Measure: Result of Testing Phase (Pre–Mid–Post) and Testing Phase × Groups

Source	**df**	**F**	**p**	**Partial η^2**
Testing Phase (Pre–Mid–Post)	1.37, 135.06	7.583*	<.05	.072
Testing Phase × Groups	1.37, 135.06	0.642	>.05	.007

***Significance at 0.05 F (1.37, 135.06) = 3.92**

Table 3

Measure: Groups*Testing_Phase (Pre 1, Mid 2, Post 3) Comparison

Groups	(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.[b]
Experimental Group	1	2	.360*	.124	.014
		3	.120	.066	.215
	2	1	-.360*	.124	.014
		3	-.240	.135	.239
	3	1	-.120	.066	.215
		2	.240	.135	.239
Control Group	1	2	.260	.124	.115
		3	.200*	.066	.009
	2	1	-.260	.124	.115
		3	-.060	.135	1.000
	3	1	-.200*	.066	.009
		2	.060	.135	1.000

***. The mean difference is significant at the .05 level.**

b. Adjustment for multiple comparisons: Bonferroni.

Table 4

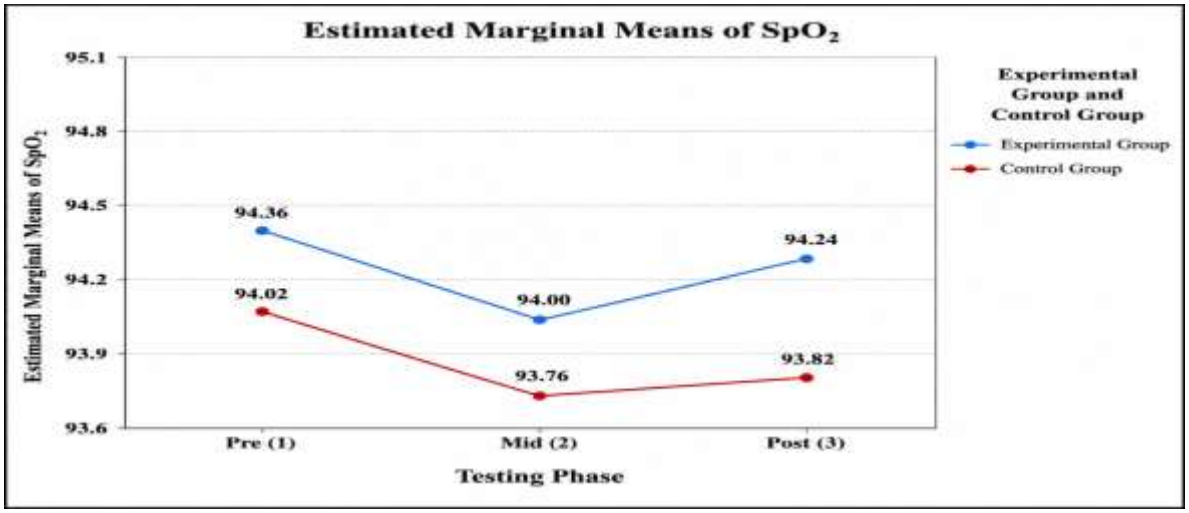
Measure: Groups Comparison

Time	(I) Experimental Group and Control Group	(J) Experimental Group and Control Group	Mean Difference (I-J)	Std. Error	Sig.[a]
1	Experimental Group	Control Group	.340	.641	.597
	Control Group	Experimental Group	-.340	.641	.597
2	Experimental Group	Control Group	.240	.587	.683
	Control Group	Experimental Group	-.240	.587	.683
3	Experimental Group	Control Group	.420	.618	.498
	Control Group	Experimental Group	-.420	.618	.498

a. Adjustment for multiple comparisons: Bonferroni.

Figure 1

Measure: SpO2 - Graph based on mean value of testing phase (Pre 1, Mid 2, Post 3)



Result Summary: The ANOVA regarding the impact of suspension training on Oxygen Saturation of the both groups was based on the descriptive statistics According to descriptive statistics, the mean SpO_2 for the Experimental Group was 94.36 in the Pre-test, 94.00 in the Mid-test, and 94.24 in the Post-test; whereas, the mean of Control Group is 94.02, 93.76, and 93.82, respectively. A minor difference was observed between the mean scores of groups. Mauchly's Test of Sphericity was significant ($W = .549$, $p < .001$), indicating a violation of the sphericity assumption. Therefore, the Greenhouse-Geisser correction was applied. Regarding Within-Subjects Effects, the effect of time was statistically significant: $F(1.378, 135.066) = 7.583$, $p = .003$, Partial $\eta^2 = .072$. This implies that there was a significant change in SpO_2 scores over time. However, the Time × Group interaction not found significant: $F(1.378, 135.066) = 0.642$, $p = .472$, Partial $\eta^2 = .007$. This indicates that there was no significant difference the changes occurring over time in the Experimental Group versus the Control Group. In other words, Suspension Training was not proven to have a specific effect on SpO_2 levels. Regarding Between-Subjects Effects, the Group effect was also not significant: $F(1, 98) = 0.300$, $p = .585$, Partial $\eta^2 = .003$. This clarifies that the overall SpO_2 scores for both groups remained approximately the same. According to Pairwise Comparisons, some significant differences were found between the Pre-test and Mid-test, as well as between the Pre-test and Post-test; however, no significant difference was found between the Mid-test and Post-test. Therefore, the pattern of change was consistent in both cases. Therefore, the null hypothesis H0 should be accepted, while the alternative hypothesis H1 should be rejected. This indicates that the suspension training program has no effect on Oxygen Saturation of university students.

DISCUSSION

The objective of study the effect of a suspension training program on university students with respect to SpO_2 (oxygen saturation). To this end, the pre-test, mid-test, and post-test scores of participants in the both groups were analyzed using a mixed-design ANOVA. According to descriptive statistics, the mean SpO_2 scores for the experimental group were found to be 94.36

in the pre-test, 94.00 in the mid-test, and 94.24 in the post-test, whereas the mean scores for the control group were 94.02, 93.76, and 93.82, respectively. This indicates that SpO_2 levels remained relatively stable in both groups, with only minor fluctuations observed over time.

Mauchly's Test of Sphericity was significant ($p < .001$), indicating a violation of the assumption of sphericity. Consequently, the Greenhouse-Geisser correction was applied. Within the results for "Within-Subjects Effects," the "Time" effect was found to be statistically significant: $F(1.378, 135.066) = 7.583$, $p = .003$. This implies that there was some variation in the participants' SpO_2 levels over time.

However, the "Time × Group" interaction was not found to be significant: $F(1.378, 135.066) = 0.642$, $p = .472$. This clarifies no significant difference in the pattern of change over time between the experimental group and the control group. In other words, the suspension training program was not demonstrated to have a specific effect on SpO_2 levels.

Furthermore, within the "Between-Subjects Effects," the "Group" effect was not found to be significant: $F(1, 98) = 0.300$, $p = .585$. This indicates that there was no significant difference the overall SpO_2 scores of the two groups. According to pairwise comparisons, significant differences were observed between the Pre-test and Mid-test, as well as between the Pre-test and Post-test; however, no significant difference the Mid-test and Post-test. In Experimental Group, a slight decline observed from the Pre-test to the Mid-test, followed by a minor improvement in the Post-test. Similarly, minor changes evident in Control Group.

These results indicate that the 12-week Suspension Training Program had no significant impact on the oxygen saturation levels of the university students. The primary reason for this may be that, in healthy young individuals, SpO_2 levels already fall within the normal range; consequently, the likelihood of substantial changes occurring as a result of training remains low.

CONCLUSION

Based on the current study, it was concluded that a 12-week suspension training program had no statistically significant effect on the oxygen saturation (SpO_2) levels of university students. Although slight variations in SpO_2 levels were observed over time, no significant difference between both groups. Therefore, it can be stated that the suspension training program did not prove effective in influencing the students' oxygen saturation capacity. While this training may exert positive effects on other physiological and fitness-related components, its impact on SpO_2 levels was found to be limited.

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SYNERGIZING YOGA AND ATHLETICS: ENHANCING PHYSICAL FITNESS AND ACADEMIC RESILIENCE IN COLLEGE STUDENTS

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Abstract

In the contemporary educational landscape, students experience more stress, academic pressure and health issues related to their lifestyle choices than ever before. This paper, therefore, is based on the premise of reclaiming ancient wisdom by integrating yoga, sports, and physical fitness into modern life for holistic health and wellness. It will provide an analysis of how athletic performance, physiological recovery (through the use of yogic practices) and mental resilience is impacted positively by incorporating yogic practices into formal physical education programmes of colleges and universities, as well as an overview of how the traditions of Indian Knowledge Systems (IKS) can be used to provide a solid foundation for understanding yoga and athletic performance as opposed to that of simply being a form of exercise. Given that college students are confronted with the challenges associated with moving from the transitional phase of being dependent on family to that of living independently (often while having very demanding academic requirements), physical education programmes that offer a full range of experiences dealing with athletic and sport activities that have also integrated elements of yoga will have many benefits. For example, by utilising Asanas (physical postures), students will improve functional flexibility and biomechanical balance; breath control (Pranayama) will assist in developing cognitive concentration; and the use of Dhyan (meditation) will provide an opportunity for students to learn to manage their emotions. The skills that college students acquire from participating in a physically integrated physical education curriculum will be used by them in both their athletic pursuits and their academic success in the classroom. By reclaiming the ancient wisdom of IKS, the educational systems of today will be able to meet the contemporary challenges of digital age disconnection, alienation, and ecological detachment.

Keywords: *Yoga, Physical Fitness, College Athletics, Mental Resilience, Indian Knowledge Systems.*

1. Introduction

Yoga, as well as Indian Knowledge Systems (IKS), is one of the world's most ancient ways of living and has long been a truly holistic approach that integrates our body, mind, intellect, spirit, and society. They have emerged over the course of thousands of years from the philosophical study of human beings and from the practical experience we go through as humans. They hold relevant solutions to the many crises we face today in a modern world where physical activity is recognised as a fundamental component of health and as a major contributor to development in adolescence. Additionally, there is an emerging view that the

integration of yoga into the training of traditional sports is not simply an option to be explored, but an imperative to the ongoing evolution of physical education.

Currently, there is intense competition among college students in the classroom, and with the pervasive, everyday use of technology and an increasingly fast-paced life, they often feel disjointed and overwhelmed. While traditional physical education is beneficial for cardiovascular fitness and muscular strength, it may not adequately address the student's overall need for growth. It is in this area that the wisdom of IKS can offer valuable assistance. The aim of this paper is to examine the sub-theme of 'Yoga, Sports, & Physical Fitness' in terms of how valuable yoga is in the lives of college students. The paper discusses the connection between yoga and athletics from a physiological and psychological perspective and outlines an overall map toward developing a single source of resilience for both college students and adult athletes while maintaining their respective focus and successful athletic development.

2. Historical Context of Yoga and Physical Education

To understand the role of yoga in contemporary fitness culture, one must first become familiar with its past. Classical yoga, as compiled by the legendary sage Patanjali, describes an Ashtanga system composed of eight components (principles) that lead one to achieve spiritual freedom through experience. Physical movement through asanas and breath through pranayama make up the first two limbs of the Ashtanga path, or yogic system. The earliest asanas and pranayama were created to prepare the body for sitting for long periods during meditation by developing strength, endurance, and a deep sense of balance and stillness within oneself.

In contrast, most modern-day sports and physical education systems are primarily based on a model that focuses on competition and achievement using performance metrics. While these models are good for developing high levels of explosive strength or cardiovascular capacity, they tend to neglect the internal parts of health associated with recovering, renewing, and restoring. The contemporary merging of these two practices—the complete and contemplative nature of the ancient Indian Yoga Science (IKS) and the dynamic, competitive nature of modern sports—creates an integrated system for human optimization. This relationship supports the idea that optimal physical performance is closely linked with mental focus and emotional balance, as illustrated by ancient Indian wisdom and, recently, the exploration of contemporary sport science.

3. The Physiological Synergy Between Yoga and Athletics

Whereas cardiovascular endurance, hypertrophy and competitive agility are usually emphasized in competitive sports; yoga provides athletes with an additional set of techniques for improving their athletic ability based on improving: the way in which their body moves (biomechanics), how flexible they are (fascial elasticity), and breath control. Consequently, this section will address how adding yoga to an athlete's training will physiologically help

them improve their performance.

First, practicing yoga on a regular basis will greatly increase an athlete's injury prevention capabilities and flexibility by performing dynamic postures that stretch and strengthen muscles, which often become tight due to sports-related activities. For example, tight hamstrings and hip flexors are common in runners and many weightlifters lose mobility in their shoulders due to having their arms above their head so much. The use of specific asanas for these tight areas will allow athletes to have complete use of the natural range of motion in those areas and will also maximize the likelihood of avoiding the micro tears in muscle that can occur due to chronic overuse of a muscle through sports-related activity.

Second, for an athlete, optimizing their breath is critical to their overall athletic performance. Pranayama, the science of controlling your breath through yoga, teaches athletes how to regulate their breathing rate, how to expand their lungs with deep breathing, and improve their overall breathing efficiency. Many athletes that have practiced pranayama report an increased ability to utilize oxygen (maximum VO2), improved recovery after high-intensity training; and have much longer periods of sustained energy when doing activities involving prolonged times of high-intensity effort. Additionally, the ability to control your breath helps to modulate your nervous system and keep your body relaxed during an intense competitive situation.

Third and finally, improvement in neuromuscular coordination and proprioception (an athlete's ability to feel their body's position in space) will vastly improve from doing yoga. The many different types of yoga require a different combination of active strength (static versus dynamic) and flexibility (active versus passive). To have an effective athletic body; it is imperative to have a high level of coordination and proprioception.

4. Psychological and Cognitive Benefits for Student Athletes

The mental and emotional challenges involved with collegiate athletics are just as demanding on the human body as the physical challenges of college athletics. In addition to maintaining an extremely busy training schedule, college athletes are also challenged with performing academically in the classroom, creating a plethora of stress and contributing to greater rates of burnout for student-athletes. Yoga can provide athletes with the psychological tools they need to deal with these challenges.

The very meditative nature of yoga teaches student-athletes mindfulness and ways to regulate their emotional states. Through the practice of yoga, student-athletes learn to calm the mind and create an aware experience where they can observe their bodies without any attachment. This will allow them to decrease the level of performance anxiety they may have during pre-competition. Mindfulness meditation is known to decrease the amount of cortisol produced in the body and activate the parasympathetic nervous system (also called the "rest and digest" state), both of which are critical to cellular recovery after exercise and emotional recovery after intense physical activity.

Additionally, the concentration that is required to maintain a difficult pose in yoga will help

improve the student's ability to concentrate while in the classroom and during competition. In practicing yoga, student's brains are conditioned to filter out irrelevant distractions that are often present during class and competition, helping them to take in more information during lectures and execute strategic plays during competition. Thus, the increase in mental clarity that results from a practice of yoga is an indication of how effective "Dharana" (focused concentration) is and how well ancient Indian practices can solve contemporary educational concerns.

5. The Critical Role in the Life of College Students

The years in college are a crucial time of growth and development for students, marked by high academic demands, social transitions, and increasingly independent lifestyles. At this time in their lives, yoga and physical fitness can be a tremendous asset to students as they go through this transitional and vulnerable time in their lives.

To Combat Sedentary Lifestyles: College's contemporary lifestyle is dominated by screens; as a result, students spend hours hunched over laptops and smartphones, developing postural deviations (i.e., "text neck" and Kyphosis) and living sedentary lifestyles. By engaging in yoga and integrated fitness programs regularly, students can effectively reverse many of the physical problems associated with living in today's world, including improving spinal health and enhancing cardiovascular fitness.

Mental Health Intervention: Many college students today are faced with anxiety, depression, academic burnout, and an overwhelming sense of disconnection from others. Yoga is an empowering, non-drug method of intervention that enables students to create a sense of calm, even amidst the chaos of their schedules. As students learn to manage their reaction to stress through yoga, they can also subsequently decrease the incidence of mental health crises on college campuses.

Developing Discipline and Holistic Wellness: Engaging in physical fitness and yoga regularly helps students develop a strong sense of self-discipline, time management skills, and respect for their bodies and thus encourages balanced living; this provides students with greater resilience to peer pressure and the pressures of attending college. This holistic approach to physical fitness and wellness is very well aligned with and should be the foundation of this program.

6. Implementing Integrated Curricula: A Path Forward

To take full advantage of the opportunities for synergy between physical education and the rest of the college or university experience, there needs to be a complete rethinking (or paradigm shift) regarding how physical education is structured. Rather than offering sports programs that are separate from each other and requiring students to earn credits for participation in gyms, colleges and universities need to develop integrated curricular approaches to wellness.

For example, physical education departments could require that all first-year students take introductory courses in yoga and mindfulness so that each student possesses a baseline level

of stress-management skills beginning on the day she or he arrives on campus. In addition, colleges and universities that have intercollegiate athletic programs can have certified yoga instructors work with athletic trainers in order to help improve student-athlete performance and reduce injury rates.

Additionally, colleges and universities should establish areas on campus where students can go for peaceful reflection, meditation, and unstructured yoga practice—indicating to students that the college or university is making a commitment to supporting the overall well-being of the student body through holistic approaches.

When colleges and universities incorporate Yoga and ancient Indian Knowledge System principles into the daily lives of students, they create a successful academic and athletic environment that is based on the well-being of students.

7. Conclusion

Combining yoga and sports as part of physical fitness isn't just about getting stronger; it's about being well-educated all the way around! As schools work to develop students who are socially responsible, ethics-based, and knowledgeable, schools will have to identify course requirements that promote the "whole student". The combined use of physically dynamic sports and the traditional oceanic practice of yoga creates a complete plan for developing young people. All students will have the necessary tools through the use of ancient knowledge systems found in India to achieve physical well-being, emotional stability, and academic excellence. This prepares the next generation of students who are not only physically fit but are also deeply grounded, resilient, and well-prepared to navigate the complexities of modern life with grace and strength.

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ENHANCING MENTAL HEALTH AND EMOTIONAL WELL-BEING THROUGH YOGA AND INDIAN NEUROTHERAPY: A HOLISTIC APPROACH

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Abstract

Mental health and emotional well-being are integral components of overall health and significantly influence an individual's quality of life, productivity, relationships, and social functioning. In recent years, rapid urbanization, technological advancement, changing lifestyles, academic competition, occupational pressure, and social isolation have contributed to a substantial increase in mental health disorders worldwide. Anxiety, depression, stress-related disorders, sleep disturbances, emotional instability, and burnout have become increasingly prevalent among individuals of all age groups. While modern medicine provides effective pharmacological and psychological interventions, there is growing interest in complementary and holistic approaches that can address the root causes of mental distress while promoting long-term wellness. Yoga and Indian Neurotherapy represent two traditional Indian healing systems that offer promising solutions for improving mental health and emotional well-being. Yoga is a multidimensional practice that combines physical postures, breathing exercises, meditation, and relaxation techniques to harmonize the body and mind. Indian Neurotherapy is a natural, drugless healing system that focuses on improving nerve function, blood circulation, and acid&alkali balance through specific stimulation techniques. Together, these approaches influence the nervous system, endocrine system, and gut-brain axis, thereby supporting emotional regulation, stress reduction, cognitive enhancement, and overall psychological resilience. This paper explores the importance of mental health, the role of Yoga and Indian Neurotherapy in enhancing emotional well-being, their physiological and psychological mechanisms, practical applications, and relevance to AYUSH and the One Health concept. The integration of these traditional therapies may offer a sustainable and holistic framework for mental wellness promotion and disease prevention.

Keywords: *Mental Health, Emotional Well-Being, Yoga, Indian Neurotherapy, Stress Management, Gut-Brain Axis, AYUSH, One Health.*

Introduction

Mental health is one of the most important determinants of overall health and well-being. It affects how people think, feel, behave, communicate, learn, and cope with life's challenges. According to the World Health Organization, mental health is not merely the absence of mental illness but a state of complete psychological and emotional well-being that enables individuals to realize their potential, cope with normal life stresses, work productively, and contribute meaningfully to society. Emotional well-being is closely related to mental health and refers to the ability to understand, manage, and express emotions in healthy ways. Individuals with good emotional well-being are generally more resilient, adaptable, optimistic, and capable of maintaining positive relationships.

The modern world presents numerous challenges to mental health. Rapid lifestyle changes, increasing work demands, financial pressures, environmental stressors, excessive screen exposure, and reduced social interaction have significantly contributed to emotional distress.

Students experience academic stress, professionals face occupational burnout, and older adults often encounter loneliness and social isolation. These factors collectively increase the risk of anxiety disorders, depression, sleep disturbances, and other psychological problems.

Mental health disorders have become a major public health concern globally. Anxiety and depression are among the leading causes of disability and reduced quality of life. Chronic psychological stress is also associated with various physical illnesses, including cardiovascular diseases, hypertension, diabetes, obesity, gastrointestinal disorders, and weakened immune function. Thus, mental health should be considered an essential component of holistic healthcare.

Furthermore, some individuals seek non-pharmacological approaches due to concerns regarding side effects, accessibility, and long-term dependence on medication. Consequently, complementary therapies such as Yoga and Indian Neurotherapy are gaining recognition as valuable tools for mental health promotion.

Understanding Mental Health and Emotional Well-Being

Mental health encompasses emotional, psychological, cognitive, and social dimensions of human functioning. It influences how individuals process information, regulate emotions, make decisions, interact with others, and respond to stressful situations.

Emotional well-being refers to a person's ability to maintain emotional balance, cope effectively with stress, and experience positive feelings such as happiness, contentment, gratitude, and self-confidence. Emotional well-being does not imply the absence of negative emotions; rather, it reflects the capacity to manage them constructively.

Several factors influence mental health and emotional well-being.

Biological Factors

The functioning of the brain and nervous system plays a critical role in mental health. Neurotransmitters such as serotonin, dopamine,, and norepinephrine regulate mood, motivation, concentration, and emotional responses. Imbalances in these chemicals may contribute to anxiety, depression, and mood disorders.

Hormonal fluctuations also affect emotional states. Chronic stress activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to excessive production of cortisol, the primary stress hormone. Elevated cortisol levels over prolonged periods can negatively impact mood, cognition, immunity, and overall health.

Psychological Factors

Psychological factors include personality traits, coping mechanisms, self-esteem, thought patterns, and past experiences. Negative thinking, unresolved trauma, poor emotional regulation, and low self-confidence can increase vulnerability to mental health problems.

Social and Environmental Factors

Family relationships, workplace conditions, financial stability, social support, and community interactions significantly influence emotional well-being. Social isolation and lack of support networks can contribute to loneliness, anxiety, and depression.

Lifestyle Factors

Lifestyle choices play an essential role in maintaining mental health. Lack of physical activity, unhealthy eating habits, inadequate sleep, excessive use of digital devices, and substance abuse can impair psychological functioning and increase emotional distress.

Poor mental health can manifest in various ways, including:

- Persistent sadness
- Excessive worry
- Irritability
- Fatigue
- Sleep disturbances
- Lack of concentration
- Emotional instability
- Reduced productivity
- Social withdrawal

Promoting mental health requires a comprehensive approach that addresses biological, psychological, social, and lifestyle factors. Yoga and Indian Neurotherapy offer such an integrated approach.

Yoga: An Ancient Science for Mental and Emotional Wellness

Yoga is one of the oldest systems of health promotion and self-development known to humanity. Originating in India over five thousand years ago, Yoga is a comprehensive discipline that aims to achieve harmony between the body, mind, and spirit.

The word Yoga is derived from the Sanskrit root "Yuj," meaning union or integration. Traditionally, Yoga is described as a method for calming the fluctuations of the mind and attaining inner balance.

Unlike conventional exercise programs that focus primarily on physical fitness, Yoga addresses multiple dimensions of health, including physical, mental, emotional, social, and spiritual well-being.

The major components of Yoga include asanas, pranayama, meditation, relaxation techniques, and ethical principles.

Asanas and Mental Health

Asanas are physical postures designed to improve flexibility, strength, balance, and circulation. They also influence the nervous system and endocrine system.

Regular practice of asanas reduces muscular tension accumulated due to stress and anxiety. Physical relaxation often leads to mental relaxation because the body and mind are interconnected.

Certain postures are particularly beneficial for emotional well-being. Tadasana improves posture and grounding. Vrikshasana enhances concentration and balance. Bhujangasana opens the chest region and promotes energy flow. Balasana induces calmness and relaxation. Shavasana facilitates deep physical and mental relaxation.

Scientific studies indicate that regular yoga practice reduces symptoms of anxiety and depression while improving overall mood and quality of life.

Pranayama and Emotional Regulation

Breathing is closely connected with emotional states. During stress and anxiety, breathing becomes rapid and shallow. Conversely, slow and controlled breathing promotes relaxation.

Pranayama consists of techniques that consciously regulate breathing patterns. These practices directly influence the autonomic nervous system.

pranayama lowers heart rate, reduces blood pressure, decreases cortisol levels, and improves

emotional stability.

Meditation and Mindfulness

Meditation is one of the most powerful components of Yoga for mental health enhancement. It involves training the mind to focus attention and develop awareness of thoughts, emotions, and bodily sensations.

Meditation also enhances mindfulness, which enables individuals to remain present in the moment rather than dwelling on past regrets or future worries. This quality is particularly valuable in managing anxiety and depression.

Neurophysiological Mechanisms Through Which Yoga Enhances Mental Health

The positive effects of Yoga on mental health are supported by several physiological and neurobiological mechanisms. These mechanisms explain how regular Yoga practice improves emotional well-being and reduces psychological distress.

Regulation of the Autonomic Nervous System

The autonomic nervous system consists of the sympathetic nervous system and the parasympathetic nervous system. The sympathetic nervous system prepares the body for stress by increasing heart rate, blood pressure, and alertness. In contrast, the parasympathetic nervous system promotes relaxation, recovery, digestion, and healing.

Modern lifestyles often lead to chronic activation of the sympathetic nervous system. Continuous exposure to stress results in anxiety, irritability, fatigue, and emotional instability. Yoga helps restore autonomic balance by stimulating parasympathetic activity. Slow breathing, meditation, and relaxation practices reduce physiological arousal and create a state of calmness.

Reduction of Stress Hormones

Stress activates the hypothalamic-pituitary-adrenal (HPA) axis, resulting in the release of cortisol and adrenaline. While these hormones are essential for short-term survival, prolonged elevation can negatively affect mental and physical health.

Regular Yoga practice has been shown to reduce cortisol levels and improve stress tolerance. Lower cortisol levels are associated with reduced anxiety, improved emotional regulation, better sleep quality, and enhanced immune function.

Improvement in Neurotransmitter Activity

Neurotransmitters are chemical messengers that regulate mood, behavior, and cognitive function. Yoga positively influences several neurotransmitters associated with emotional well-being.

Serotonin contributes to feelings of happiness and emotional stability. Dopamine is associated with motivation, reward, and pleasure.

Improvement of Sleep Quality

Sleep plays a crucial role in emotional regulation and mental health. Sleep deprivation increases the risk of anxiety, depression, irritability, and impaired cognitive performance.

Yoga promotes relaxation and regulates circadian rhythms, facilitating deeper and more restorative sleep. Practices such as Yoga Nidra, meditation, and pranayama are particularly effective in reducing insomnia and improving sleep quality.

Indian Neurotherapy: Principles and Applications

Indian Neurotherapy is a natural healing system that focuses on restoring health through

stimulation of specific body points and improvement of neural communication. It is a drugless therapy that emphasizes the body's innate capacity to heal itself when proper circulation and nerve function are maintained.

The central principle of Indian Neurotherapy is that disturbances in digestion and blood circulation can contribute to various physical and psychological disorders. By stimulating selected LMNT points and improving physiological functioning, Neurotherapy seeks to restore balance and promote health.

Indian Neurotherapy typically includes:

- Manual stimulation techniques
- Pressure application methods
- Gut brain Connection
- Circulatory enhancement techniques
- Oxygen regulation
- Acid Alkaline Balance

The therapy aims to improve communication between the nervous system and body organs while enhancing oxygen and nutrient delivery to tissues.

Historical Perspective

Indian Neurotherapy has evolved from traditional Indian healing concepts that emphasize the relationship between nerves, circulation, digestion, and overall health. It is based on the understanding that proper functioning of the nervous system is essential for maintaining physiological and psychological balance.

Neurotherapy was developed by Dr lapjatrai Mehra in 19's.later he developed a research team LMNTRTI(lajpatrai Mehra Neurotherapy Research Training Institute)and now it was handled by veda minds and by Dr Ram Gopal parihar and his team .Over the years, practitioners have applied Neurotherapy in managing various conditions including digestive disorders, musculoskeletal problems, stress-related disorders, sleep disturbances, and emotional imbalances.

Neurotherapy and Mental Health

Mental health is closely linked to nervous system functioning. Chronic stress, anxiety, and emotional disturbances can disrupt neural communication and physiological balance.

Indian Neurotherapy may contribute to mental wellness through several mechanisms:

Relaxation Response

Neurotherapy helps relax muscles and reduce physical tension associated with stress. Physical relaxation often results in mental calmness and emotional stability.

Improved Circulation

Enhanced circulation increases oxygen and nutrient supply to the brain, supporting optimal cognitive and emotional functioning.

Nervous System Regulation

Stimulation techniques may help normalize autonomic nervous system activity and promote a balanced physiological state.

Enhanced Recovery

By improving circulation and reducing tension, Neurotherapy supports the body's natural healing and recovery processes.

The Gut-Brain Axis and Indian Neurotherapy

One of the most important developments in modern health science is the recognition of the gut-brain axis. This complex communication network connects the gastrointestinal system with the brain and nervous system.

The gastrointestinal tract is often referred to as the "second brain" because it contains millions of nerve cells that communicate continuously with the central nervous system.

Research indicates that approximately ninety percent of the body's serotonin is produced in the digestive system. Consequently, digestive health has a profound influence on mood, emotional regulation, and cognitive function.

Disturbances in gut health may contribute to:

- Anxiety
- Depression
- Mood disorders
- Fatigue
- Brain fog
- Emotional instability

Indian Neurotherapy places significant emphasis on improving digestive function and circulation. Through Neurotherapy points that support gastrointestinal health, Neurotherapy may positively influence the gut-brain axis.

Potential benefits include:

- Improved digestion
- Better nutrient absorption
- Reduced inflammation
- Enhanced neurotransmitter production
- Improved emotional balance

When combined with Yoga, which also supports digestive and nervous system function, Neurotherapy may provide a powerful strategy for optimizing gut-brain communication and mental wellness.

Combined Effects of Yoga and Indian Neurotherapy

Although Yoga and Indian Neurotherapy can be beneficial individually, their integration offers a more comprehensive approach to mental health promotion.

Yoga primarily focuses on mind-body integration through movement, breathing, meditation, and self-awareness. Neurotherapy complements these effects by improving neural communication, circulation, and physiological functioning.

Together, they address multiple dimensions of health.

Physical Benefits

- Improved flexibility
- Better posture
- Enhanced circulation
- Reduced muscular tension
- Increased vitality
- Better sleep quality

Psychological Benefits

- Reduced stress levels
- Decreased anxiety
- Improved concentration
- Better cognitive performance
- Enhanced self-confidence
- Greater mental clarity

Emotional Benefits

- Improved emotional regulation
- Greater self-awareness
- Reduced irritability
- Enhanced emotional stability
- Improved interpersonal relationships

Neurological Benefits

- Better autonomic balance
- Enhanced gut-brain communication
- Improved nervous system functioning

The synergistic effects of Yoga and Neurotherapy make them particularly valuable as preventive and promotive healthcare strategies.

Relevance to AYUSH and One Health

The AYUSH system emphasizes preventive, promotive, and holistic healthcare. Yoga is already recognized as an important component of AYUSH, and Indian Neurotherapy shares similar principles of natural healing and self-care.

These approaches support:

- Prevention of lifestyle disorders
- Health promotion
- Stress management
- Community wellness
- Reduced healthcare burden
- Sustainable healthcare practices

The One Health concept recognizes that human health is interconnected with environmental and societal well-being. Mental health is a critical aspect of this framework because psychological well-being influences productivity, relationships, community participation, and overall quality of life.

By promoting emotional resilience and self-care, Yoga and Indian Neurotherapy contribute to healthier individuals and stronger communities.

Challenges and Future Directions

Despite encouraging evidence, several challenges remain. These include:

- Limited large-scale clinical trials
- Variability in practitioner training
- Need for stronger scientific validation
- Limited awareness among healthcare professionals Future research should focus on:
- Neurobiological mechanisms

- Long-term effectiveness
- Clinical applications
- Integration with conventional healthcare systems

Collaborative research involving Yoga experts, Neurotherapy practitioners, psychologists, neuroscientists, and public health professionals can help strengthen the evidence base.

Conclusion

Mental health and emotional well-being are fundamental to a healthy, productive, and fulfilling life. The growing prevalence of stress, anxiety, depression, emotional instability, and sleep disturbances highlights the urgent need for holistic and sustainable healthcare approaches.

Yoga offers a comprehensive system that integrates physical postures, breathing techniques, meditation, and relaxation practices to promote harmony between the body and mind.

Through its influence on the nervous system, endocrine system, neurotransmitters, and brain function, Yoga significantly enhances emotional resilience and psychological well-being.

Indian Neurotherapy complements Yoga by improving blood circulation, acid Alkaline balance,digestive health, and the body's natural healing capacity. Its potential role in supporting the gut-brain axis further strengthens its relevance in mental health promotion.

Together, Yoga and Indian Neurotherapy provide a multidimensional approach that addresses physical, psychological, emotional, and neurological aspects of health. Their integration can help reduce stress, improve mood, enhance cognitive performance, strengthen emotional regulation, and improve overall quality of life.

In alignment with AYUSH principles and the One Health framework, these traditional approaches offer safe, accessible, cost-effective, and sustainable methods for promoting mental wellness. Their incorporation into preventive and promotive healthcare strategies has the potential to contribute significantly to healthier individuals, stronger communities, and improved public health outcomes.

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YOGA AND DR. LAJPATRAI MEHRA'S NEUROTHERAPY: AN INTEGRATED INDIAN KNOWLEDGE SYSTEMS APPROACH TOWARDS SUSTAINABLE AND HOLISTIC LIVING

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Abstract

The Indian Knowledge Systems (IKS) tradition views health as a dynamic harmony among the body, mind, vital energy and consciousness. This paper examines Yoga and Dr. Lajpatrai Mehra's Neurotherapy as complementary Indian wellness systems that support sustainable and holistic living. Yoga functions as an active self-care discipline through asana, pranayama, relaxation and meditation, whereas Neurotherapy operates as a non-pharmacological and drugless therapeutic approach that supports the body's inherent capacity for functional balance through systematic stimulation of neural and musculoskeletal pathways. Together, these systems promote preventive healthcare, rehabilitation, self-reliance, community wellness and sustainable development. The paper explores their philosophical foundations, practical applications, relevance to modern lifestyle disorders and contribution to Indian Knowledge Systems.

1. Introduction

India's knowledge traditions have long emphasized harmony among body, mind, energy, society, and nature. The modern world is experiencing rising stress, chronic diseases, environmental challenges, and healthcare costs. Consequently, preventive and sustainable approaches have become increasingly important. Yoga and Neurotherapy provide practical and culturally rooted responses to these challenges. Their integration offers a pathway toward holistic living, self-reliance, and community well-being.

2. Indian Knowledge Systems and Holistic Health

Indian Knowledge Systems are based on interconnectedness. Human beings are viewed not as isolated entities but as participants in a larger ecological and cosmic order. Ancient traditions emphasize balance, moderation, ethical conduct, discipline, and self-awareness. Health is understood as harmony among physical, mental, emotional, social, and spiritual dimensions. The IKS framework does not separate lifestyle from health. Daily habits, food choices, sleep patterns, emotional regulation, social relationships, and spiritual values are considered essential determinants of wellness. This broad understanding provides an important foundation for addressing modern health concerns that are strongly influenced by lifestyle and behavior.

Neurophysiological and Psychological Significance of Integrating Yoga and Neurotherapy

Recent scientific developments have highlighted the close relationship between physical health, nervous system regulation, emotional well-being, and cognitive functioning. Chronic stress has been identified as a major contributor to numerous health conditions, including

hypertension, diabetes, cardiovascular disease, anxiety disorders, depression, sleep disturbances, and weakened immunity. Consequently, interventions that support nervous system balance have become increasingly important.

Yoga contributes to nervous system regulation through multiple mechanisms. Slow breathing practices influence autonomic nervous system functioning and promote parasympathetic activation, often referred to as the "rest-and-digest" response. Meditation practices enhance emotional regulation and improve attention, concentration, and psychological resilience. Regular Yoga practice has also been associated with reduced stress hormones and improved subjective well-being.

Neurotherapy complements these benefits by focusing on circulation, neuromuscular coordination, and physiological balance. The therapy seeks to facilitate conditions that support the body's natural regulatory processes. When physical discomfort is reduced and circulation improves, individuals often experience greater relaxation and emotional stability.

The integration of Yoga and Neurotherapy therefore offers a multidimensional approach to wellness. Yoga provides active techniques for self-regulation, while Neurotherapy offers supportive therapeutic intervention during periods when active participation may be limited. Together, they address both the physiological and psychological dimensions of health.

This integrated approach may be particularly valuable for individuals experiencing chronic stress, occupational burnout, age-related functional decline, rehabilitation needs, and lifestyle-related disorders. In each of these situations, restoring balance within the body and mind becomes essential for long-term recovery and well-being.

Another important benefit of this integration is its emphasis on self-efficacy. Individuals are encouraged to become active participants in their own healing journey rather than passive recipients of treatment. Such empowerment contributes to confidence, motivation, and long-term adherence to healthy lifestyle practices.

The combination of Yoga and Neurotherapy also aligns with contemporary holistic health models that recognize the interconnectedness of biological, psychological, social, and spiritual factors. By addressing multiple dimensions simultaneously, these approaches provide a comprehensive framework for sustainable health promotion.

3. Philosophical Foundations of Yoga

Yoga is one of the most comprehensive systems of self-development in the world. Patanjali's Yoga Sutras describe Yoga as a method for calming mental fluctuations and attaining higher states of awareness. The eight limbs of Yoga provide a structured path that includes ethical disciplines, self-observation, physical practices, breath regulation, concentration, meditation, and self-realization.

Yoga is not merely physical exercise. It is a philosophy of life that cultivates self-control, compassion, discipline, resilience, and mindfulness. These qualities are essential not only for personal health but also for social harmony and sustainable living.

4. Yoga and Physical Health

Regular Yoga practice improves flexibility, posture, balance, muscular endurance, respiratory efficiency, and circulation. It supports healthy aging and functional independence. Scientific studies indicate beneficial effects on hypertension, obesity, metabolic syndrome, cardiovascular risk factors, and musculoskeletal disorders.

Yoga encourages awareness of bodily signals. Practitioners become more conscious of their habits and are often motivated to adopt healthier lifestyles. This preventive dimension reduces dependence on corrective interventions and promotes long-term wellness.

5. Yoga and Mental Well-Being

Mental health has emerged as a global concern. Yoga offers practical tools for emotional regulation through pranayama, meditation, and relaxation practices. These methods influence stress physiology and help individuals manage anxiety, emotional instability, and mental fatigue.

Meditation enhances attention, self-awareness, and psychological resilience. Breathing practices regulate autonomic functioning and encourage calmness. Together, these benefits make Yoga an important resource for mental health promotion and stress management.

6. Understanding Neurotherapy

Dr. Lajpatrai Mehra's Neurotherapy is a non-invasive, drugless therapeutic approach based on stimulation of specific neural and circulatory pathways. The therapy emphasizes the body's natural capacity for self-healing. Rather than focusing exclusively on symptoms, it seeks to support conditions that allow the body to restore functional balance.

The approach highlights the importance of circulation, nerve communication, glandular functioning, digestion, and physiological coordination. Neurotherapy views health as an integrated process involving multiple interdependent systems.

7. Core Principles of Neurotherapy

The therapy is based on several important principles. First, the body possesses innate healing potential. Second, disturbances in circulation and nerve communication may contribute to illness. Third, targeted stimulation can support restoration of normal functioning. Fourth, preventive and rehabilitative care are as important as symptom management.

The therapy is designed to be affordable and accessible. Because it requires minimal infrastructure and does not rely on pharmaceuticals, it can be incorporated into community-based wellness initiatives.

8. Causes of Functional Disturbances:

According to Neurotherapy concepts, disturbances may arise due to poor digestion, inadequate nutrient absorption, impaired circulation, glandular dysfunction, hormonal irregularities, and insufficient nerve stimulation. These disturbances can affect physiological communication and influence overall health.

This perspective encourages a broader understanding of disease that considers root causes rather than focusing only on visible symptoms. Such an approach aligns with the holistic

principles of Indian Knowledge Systems.

Case-Based Relevance of Yoga and Neurotherapy in Contemporary Society

The growing prevalence of lifestyle-related disorders has increased the need for integrative and preventive healthcare approaches. Yoga and Neurotherapy have particular relevance in addressing health concerns associated with modern living patterns. Sedentary occupations, prolonged screen exposure, irregular sleep schedules, unhealthy dietary habits, and chronic stress have contributed significantly to the burden of disease worldwide.

For example, office workers frequently experience neck pain, back pain, poor posture, mental fatigue, and stress-related symptoms. Regular Yoga practice can improve flexibility, muscular strength, posture, and stress management, while Neurotherapy may provide supportive intervention for musculoskeletal discomfort and circulation-related concerns. Together, these approaches can contribute to improved workplace wellness and productivity.

Similarly, elderly populations often face challenges such as reduced mobility, joint stiffness, balance difficulties, and age-related functional decline. While adapted Yogic practices can enhance mobility and confidence, Neurotherapy offers a supportive option for individuals who may not initially be capable of active physical participation. The combination creates a gradual pathway toward improved independence and quality of life.

Students and young adults also face increasing levels of academic pressure, anxiety, digital dependence, and attention difficulties. Yogic breathing techniques, meditation practices, and relaxation methods can support concentration and emotional stability. Neurotherapy may complement these benefits by promoting relaxation and physiological balance.

The application of Yoga and Neurotherapy in diverse population groups demonstrates their versatility and adaptability. Rather than being restricted to specific age groups or health conditions, they offer a broad framework for health promotion, disease prevention, rehabilitation, and wellness enhancement. Such adaptability makes them valuable components of a sustainable healthcare model capable of responding to the diverse needs of contemporary society.

9. Active and Passive Healing

One of the strongest arguments for integrating Yoga and Neurotherapy is their complementary nature. Yoga is an active process requiring conscious participation. Neurotherapy is a supportive intervention delivered by a practitioner. Together they address different stages of the wellness continuum

.Individuals capable of regular Yoga practice can actively maintain health. Those facing pain, disability, restricted mobility, or rehabilitation needs may benefit from Neurotherapy. As recovery progresses, Yoga can be gradually incorporated to strengthen self-care capacity.

10. Accessibility and Inclusiveness

Many people are unable to participate fully in exercise-based programs. Elderly individuals, arthritis patients, stroke survivors, bedridden persons, and those experiencing severe pain often require alternative approaches. Neurotherapy provides supportive care for such

populations.

When combined with adapted Yoga practices, Neurotherapy contributes to an inclusive healthcare model. This inclusiveness is especially important in societies with diverse health needs and limited healthcare resources.

11. Applications in Lifestyle Disorders

Lifestyle disorders represent one of the greatest public health challenges of the modern era. Sedentary behavior, unhealthy diet, chronic stress, and insufficient physical activity contribute to diabetes, obesity, hypertension, and cardiovascular disease

Yoga addresses many of these risk factors through movement, breath regulation, mindfulness, and behavioral change. Neurotherapy may provide supportive intervention aimed at improving physiological functioning. Together they offer a holistic framework for lifestyle management.

Educational Significance and Awareness Generation

One of the most important requirements for the successful preservation and application of Indian Knowledge Systems is education. Awareness regarding Yoga and Neurotherapy should not be confined to specialized institutions but should become part of broader public health education initiatives. Educational institutions can play a significant role in promoting understanding of holistic health, preventive healthcare, and sustainable living practices.

The National Education Policy (NEP) 2020 emphasizes the importance of integrating Indian Knowledge Systems into contemporary education. Within this framework, Yoga and Neurotherapy can serve as practical examples of indigenous knowledge applied to modern challenges. Workshops, certificate programs, wellness camps, and community outreach activities can help disseminate knowledge while encouraging healthy lifestyle practices.

Universities and research institutions can contribute by conducting interdisciplinary studies examining the effectiveness, accessibility, and social impact of these wellness systems. Such research would strengthen academic understanding while facilitating evidence-based policy development.

Public awareness campaigns can further promote acceptance and utilization of preventive healthcare approaches. Increased awareness regarding self-care, stress management, healthy lifestyle habits, and natural wellness practices may contribute significantly to reducing the burden of chronic diseases. Community participation is particularly important because sustainable health improvements require collective engagement rather than isolated interventions.

Education also contributes to empowerment. When individuals understand the relationship between lifestyle choices and health outcomes, they are more likely to adopt responsible behaviors. This shift from dependence toward informed self-care reflects one of the central goals of Indian Knowledge Systems and strengthens the foundation for sustainable and healthy communities.

12. Rehabilitation and Recovery

Rehabilitation is an area where integration becomes particularly valuable. Individuals recovering from stroke, injury, chronic pain, or neurological conditions often require gradual and individualized support.

Neurotherapy can serve as an initial intervention for patients with limited mobility. As functional capacity improves, Yoga-based rehabilitation strategies may be introduced. This staged approach promotes recovery while encouraging long-term self-management.

13. Mental Health, Stress, and Emotional Balance

Stress-related disorders affect physical, emotional, and social well-being. Chronic stress influences endocrine function, immune responses, cardiovascular health, and mental stability.

Yoga directly addresses stress through relaxation, meditation, and breath awareness. Neurotherapy may complement these effects by promoting comfort, relaxation, and physiological balance. Their combined application supports emotional resilience and psychological well-being.

14. Sustainable Living

Sustainable living involves maintaining quality of life while using resources responsibly. Yoga and Neurotherapy support this goal because they require relatively few material resources. Both approaches emphasize prevention rather than excessive dependence on costly interventions

Their low-cost nature makes them suitable for communities with limited healthcare infrastructure. By empowering individuals to care for their own health, they contribute to sustainability at personal and societal levels.

15. Community Wellness and Public Health

Community wellness depends upon preventive health education, accessibility, and participation. Yoga and Neurotherapy can be incorporated into schools, universities, workplaces, community centers, and wellness programs.

Such initiatives improve awareness regarding healthy lifestyles and encourage collective responsibility for well-being. They may also reduce the burden of chronic disease and improve public health outcomes.

16. Preservation of Traditional Knowledge

Promoting Yoga and Neurotherapy contributes to preservation of indigenous knowledge traditions. These systems represent valuable intellectual and cultural resources developed over generations. Their documentation, research, and responsible dissemination strengthen cultural identity and support knowledge continuity

.17. Employment Generation and Entrepreneurship

The wellness industry is expanding rapidly. Training in Yoga and Neurotherapy creates opportunities for self-employment, wellness consultancy, rehabilitation services, health education, and community outreach. Graduates can establish wellness centers, conduct workshops, participate in research, and contribute to public health programs.

Such opportunities align with national goals related to entrepreneurship, skill development, and sustainable livelihoods

18. Relevance to Sustainable Development Goals

Yoga and Neurotherapy contribute to Good Health and Well-Being, Quality Education, Decent Work and Economic Growth, and Sustainable Communities. Their preventive and community-centered orientation makes them relevant to contemporary development priorities.

19. Future Directions

Future research should examine integrative frameworks that combine traditional wisdom and contemporary scientific inquiry. More systematic documentation, interdisciplinary collaboration, outcome assessment, and academic engagement are needed to strengthen evidence and public understanding.

Integrative Wellness: Bridging Traditional Wisdom and Modern Healthcare

The twenty-first century healthcare landscape increasingly recognizes the limitations of approaches that focus exclusively on disease treatment. There is growing appreciation for preventive, person-centered, and holistic models that address physical, mental, emotional, and social dimensions of health simultaneously. In this context, Yoga and Neurotherapy offer valuable contributions as complementary systems that can coexist with contemporary healthcare practices. An integrative wellness model does not seek to replace modern medicine but rather to complement it through preventive care, rehabilitation support, health education, and lifestyle modification. Many chronic conditions require long-term management rather than short-term intervention. Practices that encourage self-regulation, stress reduction, physical activity, and healthy behavior can therefore play an important role in improving overall health outcomes. The integration of Yoga and Neurotherapy reflects a broader movement toward healthcare systems that are participatory rather than purely treatment-oriented. Individuals become active contributors to their own well-being through regular practice, informed decision-making, and healthy lifestyle choices. This participatory approach promotes self-confidence, responsibility, and long-term sustainability. Furthermore, the integration of traditional wisdom with scientific inquiry can enrich healthcare innovation. Rigorous research, standardized training, and interdisciplinary collaboration will help create stronger evidence while preserving the philosophical foundations of these traditions. Such efforts can ensure that Yoga and Neurotherapy continue to evolve responsibly and effectively within contemporary society.

By combining ancient insights with modern understanding, integrative wellness models can contribute to healthier individuals, stronger communities, and more sustainable healthcare systems. This synthesis of tradition and innovation represents one of the most promising pathways for addressing the complex health challenges of the modern world.

20. Conclusion

Yoga and Dr. Lajpatrai Mehra's Neurotherapy represent complementary approaches to health

rooted in Indian Knowledge Systems. Yoga develops self-awareness, discipline, and active health maintenance. Neurotherapy supports restoration of functional balance and rehabilitation. Together they create an affordable, inclusive, sustainable, and culturally grounded model of wellness. Their integration demonstrates how traditional Indian knowledge can address modern challenges while contributing to healthier individuals, stronger communities, and a more sustainable future

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EFFECT OF COMBINED AUTOGENIC AND YOGIC TRAINING ON BODY COMPOSITION AND MUSCULAR PERFORMANCE IN TEAM SPORTS PLAYERS

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Introduction

1.1.0: Background

Muscular performance and body composition are critical components of athletic success in team sports like Basketball, Volleyball, Football,Hockey, and Cricket. The ideal body composition, which is defined by a higher lean muscle mass and a lower body fat proportion, improves speed, agility, stamina, and overall effectiveness of performance (Arazi et al.; Malina et al.). Muscular performance is crucial for tackling, throwing, and other activities, especially upper body strength and endurance. jumping and keeping up physical contact when competing (Wisloff et al.). Traditional training programs rely primarily on resistance and aerobic conditioning to enhance these factors. Nonetheless, emerging evidence indicates that mind-body therapies, like Yogic Exercises (YE) and Autogenic Training (AT), may offer further benefits for muscle function and body composition (Tran et al.; Vanithamani and Saikumar).

1.2.0: Autogenic Training and Body Composition

Schultz and Luthe developed autogenic training. Although AT is primarily recognized for its psychological and autonomic advantages (González-García et al.; Kowalski et al.), it may also influence body composition indirectly by reducing cortisol levels—a hormone linked to belly fat accumulation—and enhancing stress-related eating patterns (Stein et al.).

1.3.0: Yogic Exercises and Body Composition

Yogic practices that integrate breath control (pranayama), physical postures (asanas), and meditation have demonstrated a direct effect on muscle performance and body composition. Asanas like Sarvangasana, Dhanurasana, and Bhujangasana need bearing weight and isometric exercises that increase muscle endurance and strength (Tran et al.; Sharma et al.). Pranayama methods improve oxygen consumption and metabolic rate, which helps reduce fat. (Mondal and Chatterjee). Regular yoga practice lowers body fat, according to studies. enhances muscular fitness and increases % (Polsgrove et al.; Md Iftekher et al.).

1.4.0: Research Gap

Although AT and YE demonstrate individual benefits, Few studies have directly compared their effects on muscular function and body composition. The synergistic effect of combining both medications remains unexplored. This study aimed to address this gap by comparing the effects of Autogenic Training (AT), Yoga Exercise (YE), and Combined Training (AT+YE) on

physical performance (push-up test) and body composition (body fat percentage) in team athletes.

1.5.0: Objectives

1. To evaluate how AT affects muscle function and body composition.
2. To examine the effects of YE on body composition and muscular performance.
3. To evaluate the effects of Combined Training (AT+YE) in comparison to individual therapy.

1.6.0: Hypotheses

1. H_1: It is hypnotized that there is significantly improved both physical performance and body composition following AT.
2. H_1: It is hypnotized that there is significantly improved both physical performance and body composition after Yogic Exercises.
3. H_1: It is hypothesized that mixed training produces much greater benefits than either intervention on its own.

Methodology

2.1.0: Research Design

An authentic experimental randomized pre-test – post-test control group design was employed. in accordance with CONSORT standards.

2.2.0: Participants

A random selection of 160 participants, both male and female, between the ages of 22 and 28, participated in cricket, Basketball, hockey, football, and volleyball were chosen at randomly to the Dept. of Physical Education, Guru Ghasidas Central University,Bilaspur, Chhattisgarh, India.

- Inclusion Criteria:

There was age varied between 22–28 years. There was an active participation in structured team sports. They were capable of engaging in mild physical activity. They agreed to participate in every session for the full twelve weeks.

- Exclusion Criteria:

There were exclusion criteria known as respiratory, cardiovascular, or musculoskeletal conditions. prior experience with autogenic training or yoga. Medication use affecting metabolism or recuperation.

2.3.0: Group Randomization Procedure

Participants were randomly assigned to one of four groups (n = 40 each):

Table 2.1: Group Allocation

Group	Intervention	Frequency	Duration per Session	Total Weeks
Group A (EG-I)	Autogenic Training only	5 days/week	45 minutes	12
Group B (EG-II)	Yogic Exercises only	5 days/week	45 minutes	12
Group C (EG-III)	Combined (AT + YE) – alternating	6 days/week	45 minutes	12
Group D (CG)	No intervention (Control)	–	–	–

2.4.0 : Interventions

2.4.1 : Autogenic Training (Group A)

The usual six-stage AT protocol (Schultz and Luthe) was practiced by the participants: (1) heaviness in limbs, (2) warmth in limbs, (3) cardiac regulation, (4) respiratory regulation, (5) abdominal warmth, (6) forehead chilling. Every session consists of two minutes of silent prayer, three minutes of warm-up, six 30 minutes of autogenic exercises, 5 minutes of passive focus, and 5 minutes of return. Total: 45 minutes.

2.4.2 : Yogic Exercises (Group B)

Participants completed a prescribed Hatha Yoga protocol: silent prayer (2 min), warming up (3 minutes), 13 asanas (25 minutes), Kapalabhati kriya (3 minutes), Nadishuddhi pranayama, Bhastrika, Om chanting meditation (5 minutes), Bhramari (7 minutes). 45 minutes in total. Among the asanas were: Shavasana, Sarvangasana, Pawana Muktasana, Matsyasana, Makrasana, Bhujangasana, Baddha Konasana, Padakonasana, Ardha, Vakrasana, Dhanurasana, Paschimottanasana, and Ustrasana Chakrasana.

2.4.3 : Combined Training (Group C)

Yogic Exercises Training was active on Monday, Wednesday, and Friday; Autogenic Training only on Tuesday, Thursday and Saturday. Total: 45 minutes per workout, 6 days/week.

2.4.4 : Control Group (Group D)

Participants maintained normal daily habits and were asked not to begin any new During the 12-week period, engage in workout, yoga, or relaxation regimen.

2.5.0: Outcome Measures

At baseline (Week 0) and post intervention (Week 13), every outcome was evaluated.

Table 2.2: Outcome Measures

Variable	Assessment Tool	Unit	Reliability
Body Composition	Skinfold Calipers (3-site method)	Body Fat %	r = 0.87
Muscular Performance	Push-up	No. of successful push-ups	r = 0.94

2.6.0: Method

Pre-test (Week 0): Push-up and body composition tests were administered to all participants over two days. Intervention (Weeks 1-12): Training sessions were conducted at morning 06:30 every day in a well-hall with ventilation. The researcher and two certified research assistants provided supervision. Post-test (Week 13): The same evaluations were re-administered under identical conditions.

2.7.0: Analysis of Statistics

The data was analyzed the using of software SPSS version 26.0.

Table 2.3: Statistical Analysis

Analysis	Statistical Evaluation	Significance Level
Within-group comparison	Paired t-test	$p \leq 0.05$
Between-group comparison	One-way ANOVA	$p \leq 0.05$
Post-hoc pairwise comparisons	Tukey's HSD	$p \leq 0.05$
Descriptive statistics	Mean ± SD	–

Results 3.1.0: Baseline Features and Participant Flow

160 participants finished the trial (0% dropout). At baseline, groups were similar. 3.2.0 Within-Group Comparisons (Paired t-test)

Table 3.1: Body Composition (Body Fat %) – Pre-test vs. Post-test

Group	Pre-Test (%)	Post-Test (%)	Mean Diff	t-value	p-value	Remark
Group A (AT)	17.49 ± 2.19	16.73 ± 2.30	-0.76	2.532	0.015	Significant
Group B (YE)	17.36 ± 2.05	15.79 ± 2.02	-1.57	7.391	<0.001	HS
Group C	17.83 ± 2.12	15.27 ± 2.13	-2.56	4.471	<0.001	HS
Group D	17.54 ± 1.99	17.13 ± 2.19	-0.41	0.944	0.351	NS

HS = Highly Significant NS = Not Significant Key Finding:

Body fat % markedly decreased in Groups B and C ($p < 0.001$), while Group A showed a smaller reduction ($p = 0.015$). Group D showed no significant change.

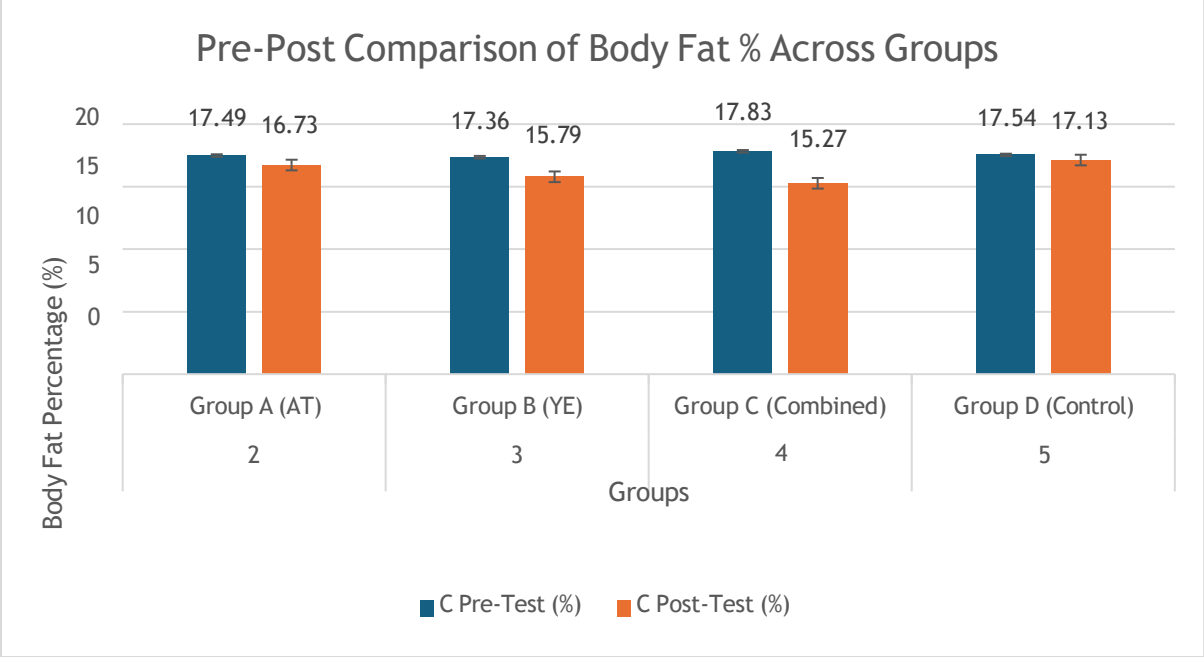


Figure 3.1: Mean Difference of Body Composition (Body Fat %) – Pre-test vs. Post-test Table

3.2: Muscular Performance (Push-up Test) – Pre-test vs. Post-test

Group	Pre-Test	Post-Test	Mean Diff	t-value	p-value	Remark
Group A (AT)	13.13 ± 3.55	17.93 ± 4.26	+4.80	16.476	<0.001	HS
Group B (YE)	14.48 ± 2.96	22.65 ± 4.23	+8.17	22.844	<0.001	HS
Group C	17.38 ± 3.77	29.15 ± 5.20	+11.77	18.117	<0.001	HS
Group D	14.20 ± 2.47	16.88 ± 2.40	+2.68	8.231	<0.001	HS

Important Discovery:

Push-up performance markedly enhanced for all three testing groups. performance ($p < 0.001$), with Combined Training demonstrating the biggest improvement (+11.77 push-ups),
+73.9%).

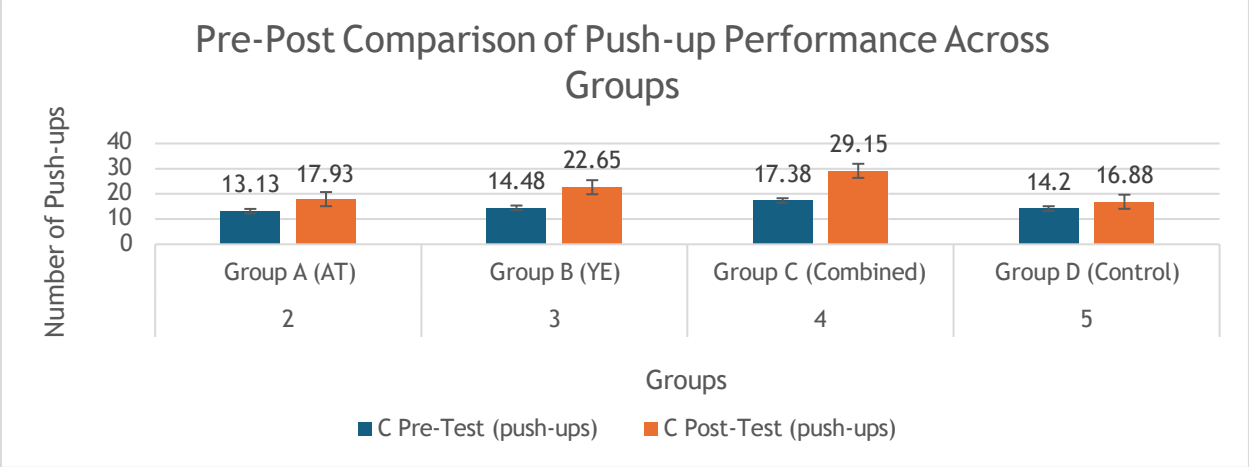


Figure 3.2: Mean difference of Muscular Performance (Push-up Test) – Pre-test vs. Post-test

3.3.0: Percentage Improvements

Table 3.3: Percentage Improvements

Variables	Group A (AT)	Group B (YE)	Group C (Combined)	Group D (Control)
Body Fat Reduction	-4.3%	-9.0%	-14.4%	-2.3%
Muscular Strength	+30.3%	+57.4%	+73.9%	+17.0%

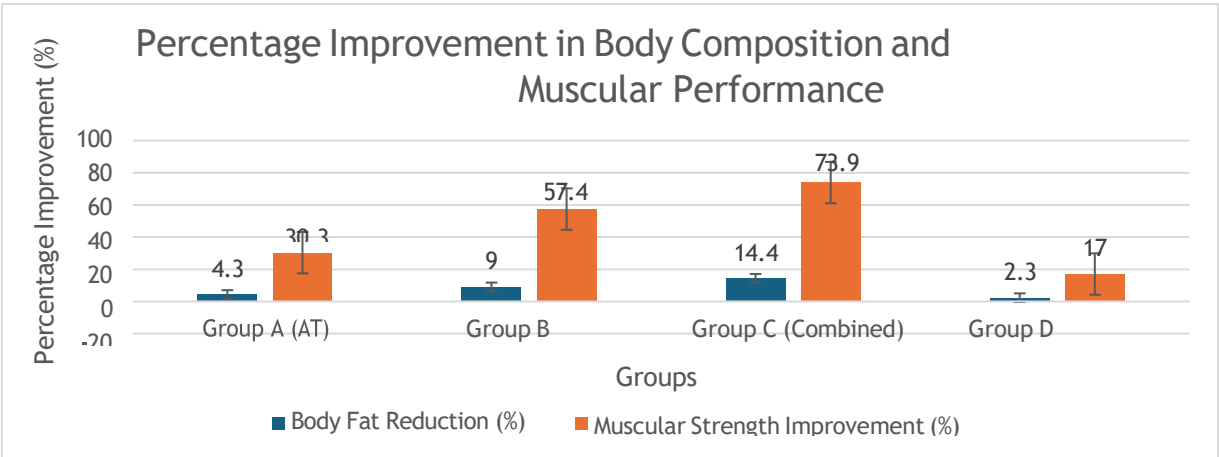


Figure 3.2: Percentage Improvements in Body Composition and Muscular Performance

3.4.0: Between-Group Comparisons (One-way ANOVA)

Table 3.4: One-way ANOVA for Post-Test Scores

Variable	Source	Sum of Squares	*df*	Mean Square	F-value	p-value
Body Composition	Between Groups	87.366	3	29.122	6.232	0.001
	Within Groups	728.953	156	4.673		
Muscular Performance	Between Groups	3757.050	3	1252.350	72.645	<0.001
	Within Groups	2689.350	156	17.239		

3.5.0: Post-hoc Analysis (Tukey's HSD)

Table 3.5: Tukey's HSD Post-Hoc Comparisons – Body Composition

Comparison	**Mean Difference**	**Std. Error**	**p-value**	**Significance**
C vs D	-1.863	0.483	0.001	**HS**
C vs A	-1.468	0.483	0.015	**Sig**
C vs B	-0.524	0.483	0.700	NS
B vs D	-1.339	0.483	0.032	**Sig**
B vs A	-0.944	0.483	0.211	NS
A vs D	-0.395	0.483	0.846	NS

Hierarchy for Body Composition:Combined = Yogic > (Autogenic = Control)

Table 3.6: Tukey's HSD Post-hoc Comparisons – Muscular Performance

Comparison	Mean Difference	Std. Error	p-value	Significance
C vs D	-1.863	0.483	0.001	**HS**
C vs A	-1.468	0.483	0.015	**Sig**
C vs B	-0.524	0.483	0.700	NS

B vs D	-1.339	0.483	0.032	**Sig**
B vs A	-0.944	0.483	0.211	NS
A vs D	-0.395	0.483	0.846	NS

Hierarchy for Body Composition:Combined = Yogic > (Autogenic = Control 6.0: Summary of Findings

Table 3.7: Summary of Findings

Finding	Result
Combined Training improved body fat % by 14.4%	■ Highly Significant
Combined Training improved push-ups by 73.9%	■ Highly Significant
Yogic Exercises alone = Combined Training for body fat %	■ Equivalent (p = 0.700)
Yogic Exercises alone > Autogenic Training for muscular strength	■ Significant (p < 0.001)
Autogenic Training alone improved body fat % modestly	■ Significant (p = 0.015)
Control Group showed no significant improvements	■ Expected

Discussion

4.1.0: Summary of Key Findings

The results of 12 weeks of autogenic training were compared in this randomized controlled experiment. Yoga poses and combined training for muscular performance and body composition in 160 athletes on a team. The main conclusions are:

1. Combined Training showed the best gains in both body composition (-14.4% body fat) and muscular strength (+73.9% push-ups).
2. For the body, yoga exercises by themselves were statistically comparable to combined training. composition (p = 0.700), showing that the yogic component is the predominant driver for fat reduction.
3. For muscular strength, yoga exercises by themselves were noticeably better than autogenic training. performance (p < 0.001), demonstrating that strength requires purposeful somatic engagement. growth.
4. Autogenic Training alone produced modest but considerable changes in body

composition (p = 0.015), possibly owing to cortisol decrease and stress management.

5. The Control Group exhibited no substantial gains, confirming that the adjustments seen were related to the interventions.

4.2 Body Composition (Body Fat Percentage)

The discovery that yoga exercises by themselves were just as successful in reducing body fat as combined training decrease (p = 0.700) is clinically meaningful. This implies that the metabolic and mechanical demands of asanas and pranayama are the key drivers for fat loss, rather than the cognitive relaxing component of AT. The slight but noteworthy increase in body composition after AT alone (-4.3%, p = 0.015) could be explained by cortisol modulation and stress reduction. Chronic stress elevates cortisol, which encourages the storage of fat, especially in the abdomen. AT-induced parasympathetic dominance may offset this impact (Kowalski et al.; Stein et al.).

4.3.0: Push-up Test for Muscular Performance

It is noted that Combined Training is superior for muscular performance (+73.9%). The hierarchy (Combined > Yogic > Autogenic = Control) clearly illustrates that interventions requiring physical mobility are necessary for strength development.

The finding showed Yogic Exercises alone were considerably superior to Autogenic Training

(p < 0.001) demonstrates that passive cognitive relaxation cannot substitute active mechanical loading for the development of strength. However, the fact that Combined Training surpassed Yoga alone implies that AT offers supplementary advantages, perhaps by relieving tense muscles, stronger motor imagery or better recuperation.

4.4.0: Useful Consequences for Athletes and Coaches

Table 4.1: Practical Implications for Coaches and Athletes Justification for the Recommendation

Recommendation	Rationale
For body fat reduction, use Yogic Exercises alone or Combined Training	Both are equally effective
For muscular strength development, use Combined Training for best results	Superior to either intervention alone
For athletes with time constraints, Yogic Exercises alone are sufficient for body composition goals	Equivalent to Combined Training
Autogenic Training alone is NOT recommended for strength	Insufficient

development	compared to yoga
Combine both interventions for holistic body composition and strength gains	Synergistic effect

Conclusion

This randomized controlled experiment provides compelling evidence that:

1. Yoga and autogenic training together are the best interventions for enhancing muscle performance and body composition in team athletes, resulting in a 14.4% decrease in body fat and 73.9% improvement in push-up performance.
2. For the decrease of body fat, yoga exercises alone are just as beneficial as combined training. ($p = 0.700$), suggesting that the main factor influencing metabolic gains is the yogic component.
3. Yogic Exercises alone are much superior to Autogenic Training for muscle strength development ($p < 0.001$), demonstrating that active somatic involvement is crucial.
4. Autogenic Training alone generates modest yet major increases in body composition ($p = 0.015$), possibly through stress reduction and cortisol regulation, but is insufficient
   for the development of strength.
5. The Control Group exhibited no substantial gains, confirming that the adjustments seen were related to the interventions. These findings support the incorporation of yoga and combined mind-body training into physical conditioning regimens for team sports athletes. Coaches and trainers should recommend Yogic Exercises alone for body composition goals and Combined Training for complete advantages for body composition and strength.

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DIGITAL AGE STRESS AMONG YOUTH: ROLE OF YOGIC INTERVENTIONS IN MENTAL WELL-BEING

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Abstract

The rapid development of digital technology has dramatically changed the modern lifestyle, especially for the youth. The dependence on smart phones, social media platforms, online education, gaming and constant internet connectivity has increased, which has contributed to rising levels of psychological stress, commonly referred to as "digital age stress" or "techno-stress". Excessive screen time, information overload, cyber-social comparison, sleep disturbances and lack of physical activity have negatively affected the mental well-being of young people. In the digital era, anxiety, depression, emotional imbalance, lack of attention and over tiredness are more observed between teenagers and adolescents people. So, the investigation for effective and integrated approaches to stress handling has become an instant necessity. The current paper depict the nature, causes and psychological influence of digital age stress between youth and the function of yogic interventions in promoting mental well-being. Yoga, is an ancient Indian universal health way, provides an united approach to stabilize body, mind and emotions throughout practices like asanas, pranayama, meditation and relaxation skills. The study emphasizes the therapeutic advantages of yogic skills like Anulom-Vilom, Bhramari Pranayama, Yoga Nidra and mindfulness meditation to diminish stress, develop emotional control, enhance focus and develop sleep quality. The paper is mainly based on a review of modern literature, research studies and scientific findings on yoga and mental health. Various studies have described that uniform yoga exercises can lower cortisol levels, improve parasympathetic nervous system movement, and boost psychological strength in teenagers. The research determined yoga is a cost-effective, non-pharmacological, and sustainable intervention for strain and psychological well-being of the digital era. Incorporating yoga into educational institutions and daily life may act a vital role in the healthier digital lifestyle and improving psychological health of youth populations.

Keywords: *Digital Age Stress, Techno-Stress, Youth, Yoga, Mental Well-being, Pranayama, Meditation, Digital Lifestyle, Stress Management, Mindfulness*

Introduction

The twenty-first century is often called the digital age because of the fast development and broad use of digital technologies in daily life. Today Modern society has become reliant on smart phones, laptops, social media, online education mode, and internet communication. This technological advancement has extremely improved access to information, communication, education and amusement. Teenagers are among the most dynamic users of digital technology as they depend on digital platforms for scholastic

activities, social interaction, game and leisure recreational purposes (Prensky, 2001).

Whilst digital technology grants many advantages, its extreme and uncontrolled usage can create psychological and emotional obstacles. The term **"**techno-stress" refers to the stress produce by ample digital employment and difficulty in cope with technological demands (Brod, 1984). Constant vulnerability to social media, online events, academic assignements, virtual contest, and information strain has significantly increased tension levels between youth (Tarafdar et al., 2015).

One of the primary sources of digital stress is extreme social media usage, which generally contribute to comparison, low self-esteem, anxiety, and sadness between youth (Twenge & Campbell, 2018). Furthermore, prolonged screen duration can adversely influence sleep, attention, emotive balance, and complete health, produce eye strain, headaches, bodily inactivity, psychological fatigue, and sleep disorders (WHO, 2022).

Youth are especially vulnerable to digital stress because of their widely usage of digital technologies for learning, work, and social connection. After the COVID-19 pandemic further increased credence on digital platforms, resultant in higher stress levels between students and adolescent people (UNESCO, 2021). Therefore, mental fitness and emotional well-being have become more significant concerns in the digital era.

Yoga is a integrated and powerful technique for handling stress and promoting mental well being. It includes bodily postures (asanas), breathing exercises (pranayama), meditation, and relaxation skills that develop conformity among the body and soul. According to classical yoga philosophy, yoga regulates mental processes and promotes inner balance (Patanjali, trans. 2009). Research also shows that yoga reduces stress, lowers anxiety, improves concentration, and enhances emotional regulation (Field, 2016).The use of yogic techniques like Anulom Vilom, Bhramari Pranayama, Yoga Nidra, and mindfulness meditation is highly efficient in alleviating stress and improving mental composure amongst youths.

Review of Literature

The rapid growth of digital technology has transformed communication, education, and social interaction, but excessive use has also created significant mental and physical health challenges, especially among youth.

Harish Ranjani et al. (2023) in his study they found yoga significantly reduced stress and improved concentration, attention, and emotional regulation among adolescents. The research recommended combined yoga into educational institutions to encourage mental healthy individual.

Acoording to WHO (2022) Excessive use of digital technology can contribute to stress, sleep disorders, anxiety, sadness, and behavioral issue between young individual. It recommended mindfulness, corporal movement, stress-handling skills, and balanced digital ways to promote mental health.

According to Twenge and Campbell (2018) they found a solid connection between extreme screen time and lower psychological well-being between adolescents. Their study associated heavy Smart phone and social media use with anxiety, sadness, aloneness, low self-esteem, and poor emotive health.Overall, these research suggest that extreme digital engagement adversely affects youth mental condition, whilst yoga and mindfulness training can effectively decrease stress and improve psychological well-

being

Objectives of the research

- Know the concept and causes of digital age stress between youth.
- Examine scientific literature on yoga and mental health in the digital age.
- Investigate the effects of digital tools on physical and mental health.
- Study psychological outcome such as anxiety, depression; sleep disturbance, and emotional disparity produce by digital lifestyles.
- Examine the role of yogic interventions in handling digital stress and promoting mental well-being.
- Assess the effectiveness of Asana, Pranayama, Dhyana (Meditation), and Yoga Nidra in stress decrease.
- Propose practical means to combine yoga and healthy digital habits in everyday life**. Methodology**

The study titled "Digital Age Stress among Youth: Role of Yogic Interventions in Mental Well-being" is based on a descriptive and review-based research design using secondary data from books, journals, research articles, WHO and UNESCO reports, and online academic sources. The study examines the causes and effects of digital stress between youth and access the role of yogic practices like; asana, pranayama, meditation, mindfulness, and yoga nidra in develop mental health, emotive stability, concentration, and stress management. The study is qualitative in nature and purpose to explain how yoga helps to maintain a balanced and healthy life in the digital era.

Concept of Digital Stress

Digital stress, or **"**techno-stress,**"** is a psychological state resulting from extreme usage of digital technologies and difficulty handle with digital demands. Initially introduced by Brod (1984**)**, the theory now presently stress caused by social media, online learning, virtual communication, extreme screen time, game dependency, and information burden. Constant exposure to information, messages, emails, and digital probability frequent contribute to cognitive overload, mental strain, emotional tiredness, and reduced relaxation, especially between youth (Tarafdar et al., 2015).

Digital stress is a multi-dimensional outcome that affects emotional, psychological, physical, and social well-being. It is frequently caused by information burden, which contribute to confusion, anxiety, reduced concentration, and decision tiredness (Przybylski et al., 2013). Regular stress to stay linked and responds quickly to messages and social media contact further increases mental pressure and decrease opportunities for rest. Extreme digital device usage can adversely impact sleep, physical activity, relation, and emotional stability (Twenge & Campbell, 2018**).**

Youth are primarily vulnerable to digital stress because they consume much of their time in virtual surrounding for education, social interaction, and fun. Online classes, game habit, competitive digital culture, and long screen exposure have inflated stress, anxiety, anger, and depression among teenagers and young people. Extreme screen time is also connected to poor mental health and deminish psychological well-being (WHO, 2022).

Causes of Digital Age Stress

Digital age stress has become as a major psychological consequences due to increasing addiction on digital technologies in day to day life. Whilst technology provides

convenience and access to information, extreme and uncontrolled use can lead to mental, emotional, and physical strain.

- Extreme screen time
  One of the main causes of digital stress is extreme screen time.Youth waste long hours on smart phones, laptops, and tablets for study, work, and fun. Continuous screen vulnerability leads to mental fatigue, poor concentration, eye stress, headaches, and sleep problems (WHO, 2022). It also reduces physical exercises and social contact, adversely affecting mental well-being.
- Information overload
  Another primary reason of digital stress is information overload. Continuous vulnerability to extreme information via websites, social media, news, and online apps creates confusion, anxiety, and difficulty in decision-making (Bawden & Robinson, 2009).
- Social media pressure
  Social media influence is a primary contributor to digital age stress. Different Platforms like Instagram, Face book, Snap chat, and X encourage constant comparison and require for social consent through likes and followers. Idealistic online portrayals of achievement and lifestyle can lead to soft self-esteem, separation, anxiety, and degradation among teens (Twenge & Campbell, 2018).
- Academic and professional demands
  Academic and professional requirement in the digital setting also increase stress. After COVID-19 pandemic more reliance on online modes, leading to higher grade of stress and burnout between students and professionals(UNESCO, 2021**).**
- Sleep disturbance due to digital device usage
  Sleep disorders is other main reason of digital stress. Extreme usage of smart phones and laptops at midnight disrupts the body's natural sleep rhythm. Blue light released from screens suppresses melatonin creation, leading to poor sleep quality, fatigue, anger, and mental health issues (Harvard Medical School, 2020).
  Effects on Physical and Mental Health
  Extreme usage of digital tools has greatly simulated the physical and mental health of youth. Regular involvement with smart phones, computers, social media, online game, and virtual study can induce to various health issues**.**
- **Eye Strain and Visual Fatigue**: long time of usage screen exposure may induce dry eyes, unclear vision, headaches, and Computer Vision Syndrome (CVS) (American Optometric Association, 2021).
- **Sleep Disturbance:** Extreme usage of screen, mostly before bedtime, disrupts melatonin creation, lead to poor sleep quality, stress, fatigue, and lower cognitive performance (Harvard Medical School, 2020**).**
- **Musculoskeletal Problems:** Sitting for a long hours and poor posture can result in neck pain, shoulder stiffness, back pain, and setting such as "text neck" (WHO, 2022).
- **Anxiety:** Regular online connectivity, social comparison, academic strain, and FOMO give anxiety and emotional insecurity among youth (Twenge & Campbell, 2018).

- **Depression**: Extreme usages of social media and decrease face-to-face contact can rise loneliness, emotional privacy and depressive signs specially between adolescents and young people (Keles et al., 2020).

Yogic Interventions

In the digital age, yoga has become as an powerful and universal approach to handling stress and boost mental well-being. Derived from the Sanskrit word *Yuj* ("to unite"), yoga combines physical postures, breathing exercises, meditation, and ethical practices to create harmony between body and mind. According to Patanjali, yoga is the control of mental fluctuations (Patanjali, trans. 2009). Yogic interventions help reduce anxiety, mental fatigue, emotional imbalance, and physical discomfort caused by excessive digital use. Some specific, asanas develop flexibility, strength, circulation, and nervous system functioning, helping to oppose the effects of long screen time and sedentary life.

Various yogic practices are effective in handling digital age stress:

Tadasana (Mountain Pose) improves posture, whilst **Bhujangasana (Cobra Pose)** deminish neck, shoulder, and back hardness caused by usage of long long screen time. **Balasana (Child's Pose)** and **Shavasana (Corpse Pose)** boost deep relaxation and help decrease physical and mental pressure (Iyengar, 2005).

Pranayama serve regulate breathing, calm the mind, and deminish stress. Different yogic Techniques of pranayama like **Anulom-Vilom**, **Bhramari**, and **Nadi Shodhana** develops mental purity, emotive balance, and relaxation. Systematic practices of pranayama have been shown to lower stress levels and boost psychological well-being (Brown & Gerbarg, 2005).

Meditation and mindfulness develop concentration; regulate emotions and mental peace whilst helping individuals deal with distractions and information strain. The study reveals that meditation decrease stress, depression, and tiredness (Goyal et al., 2014).

Yoga Nidra (yogic sleep) is a strong relaxation technique that helps in deminish physical, mental, and emotional strain and is especially beneficial for sleep disorders, fatigue, and mental exhaustion due to extreme screen time.

Advantages of Yoga in Digital Age

Now a day's technology-driven world, yoga give a integrated approach to maintaining physical, mental, and emotional well-being whilst helping a person cope with digital stress.

- **Stress Reduction:** Yoga training like meditation, pranayama, and Yoga Nidra quite the mind, decrease stress hormones, and aid relaxation (Brown & Gerbarg, 2005).
- **Improved Concentration and Cognitive Function:** Meditation and mindfulness increase focus, memory, mental purity, and decision-making skills, that helping the individual to manage digital confusion effectively (Goyal et al., 2014).
- **Emotional Stability and Psychological Well-being:** Yoga is very helpful in decrease anxiety, depression, aloneness, and low self-esteem whilst improving emotional strength, self-awareness, and positive mood (Field, 2016).
- **Physical Health Benefits:** Daily practices of yoga refine posture, flexibility, strength, blood circulation and decrease the negative effects of prolonged sitting and extreme usage of screen.
- **Digital Discipline and Mindful Living:** Yoga promotes self-control, awareness,

balanced living, and helpful in individuals to decrease digital dependency and keep a healthier work-life balance. In general, yoga is a powerful tool for promoting mental well-being and a harmonious way of life in the digital era.

Suggestions and Recommendations

To diminish digital age stress and develop overall well-being, the following steps are recommended:

- **Include Yoga in everyday Life:** Daily practices of yoga, pranayama, meditation, and Yoga Nidra helpful in decrease stress, increase concentration, and improve emotional stability.
- **Encourage Digital Detox:** Limiting usage of screen time and taking certain breaks from digital devices can shorten mental tiredness and encourage healthier activities like exercise, reading, and social contact.
- **Introduce Yoga and Mindfulness in Education:** Schools, colleges, and universities should integrate yoga, meditation, and stress-management course to develop students' mental health and strength.
- **Promote Workplace Wellness Programs:** Organizations should apply yoga-based wellness initiatives, meditation break, and stress handling activities to support workers well-being and productivity.
- **Encourage Meditation and Mindfulness:** Daily mindfulness and meditation practices serve to handle anxiety, improve emotional balance, and decrease digital distractions.

Conclusion

Extreme usage of digital technology has enlarged stress, anxiety, sleep problems, and psychological health issues, particularly between youth. Factors like overuses of screen, social media strain, and digital dependency negatively affect general well-being. Yogic practices like asanas, pranayama, meditation, mindfulness, and Yoga Nidra help relief stress, enhance mental health, and restore balance. Therefore, yoga is an powerful and sustainable path for handing digital age stress and promoting a strong lifestyle.

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INDIAN KNOWLEDGE SYSTEMS AND CONTEMPORARY EDUCATION: LINKING WITH ENGLISH LANGUAGE TEACHING (ELT)

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Abstract

After the execution of National Education Policy (NEP) 2020 in India, the Indian knowledge system expanded its influence in the Contemporary Educational field. Indian Education influences Traditional system and Western Education and also follows a diverse system compared to the other Countries policies. Moreover Macaulay Minutes influence the existing status of the Education system. The Indian system of education follows a basic educational pattern from Pre-Primary to University level. After the implementation of NEP,10 +2+3,the existing structure of the educational framework replaced the new structure 5+3+3+4. This structure helps to improve their holistic development in all levels of learners from primary to higher level. New Education policy stresses inclusive education also. Contemporary Education focusses learning by doing, development of skills, increase research aptitude, technical based education, creativity, students centered learning, using multimedia platforms etc., New National Education policy reforms there basic structure of education pattern and give importance to Indian knowledge learnings like environment, literature, yoga, veda, ayurveda arts, philosophy, architecture etc. NEP promotes holistic development, critical thinking and national consciousness, experiential Learning, value education vocational learning, priority to regional language etc. The curriculum of all subjects linked with above mentioned features of the NEP. This article analyzes how the knowledge system integrated with contemporary education using modern teaching technology and current learning needs of English learners. This research paper check how these knowledge systems use in their English language teaching learning process and also analyses how the knowledge system influences day to day life of the learners and teachers.

Key Words: *National Education Policy, Knowledge System, Contemporary Education, Western Education, experiential Learning*

Introduction

Education is a process of learning. It helps to acquire knowledge, social values,good personal habits, skills etc.It is life long from birth to grave. Education mould the learners academically, publicly and culturally. Now we can see a connection between the recent education field and the Indian knowledge system. After the implementation of the National Educational Policy, the Government of India reforms the educational system of India. There is a drastic
change in the Indian educational field after the year 2020. Government of India reforms early educational policy named National Policy of Education NPE (1986) to National Education Policy (2020).National Policy of Education emphasise universal education for

learners,vocational training,impart three language policy encourage information communication technology,Indian knowledge system is one of the major features included in National Educational Policy.NEP implement on July 29 2020 by Ministry of Education the first draft was recommended by Kasturirangan.Our current education policy (NEP) integrated with Indian knowledge system and give more importance to India's traditional,cultural,philosophical values. Contemporary education focused on critical thinking,social constructivism, learner centred method, communicative competency,creativity. National Educational policy(NEP) avoids more dependence of Western education and mould the learners mind to inculcate traditional or cultural knowledge.Based on this situation contemporary education teaches the learners and to instill and preserve our cultural existence and through this awareness learners get holistic learning. English language teaching trains learners how to improve their English competency for their further future in the global world. Integration of the Indian knowledge system and English language teaching generates an evolved impactful experience among the learners. Moreover,through these integration they help the learners to cherish Indian culture,values and tradition and also include topics related to knowledge system and add the language activities to improve language competency.

Indian Knowledge System

Indian knowledge system suggested by Indian Ministry of Education based on National Education policy 2020. The headquarters of Indian Knowledge System in Delhi and it was formed in October 2020. The Indian Knowledge system merged early native concepts like Philosophy,Yoga,Architecture,Painting,Astronomy,Literature with contemporary education. It had four divisions

1.Philosophical and Spiritual 2.Scientific and Technical

3.Literary and Linguistic

4.Cultural and Artistic

First dimension is Philosophical and spiritual,Philosophical means the guiding spirit.It encompasses four Vedas named Rig Veda Yejurveda,Samaveda, Adharvaveda,Yoga Upanishad,Indian ethics philosophy and some School of thoughts like Buddhism and Jainism also included in this category. Spirituality gives prominence to a learner’s character development,moral values.These two dimensions refer to holistic development of a learner and also spiritual growth.

The second dimension contains Ayurveda Astronomy,practices of agriculture mathematics metallurgy etc.This focuses the knowledge of ancient Indian scientific practices of the above mentioned Knowledge system.

Third one explains the knowledge of epics named Ramayana Mahabharata and also focusses Sanskrit focal literature. This dimension helps the learners to get the knowledge of classical literature and the knowledge of indigenous language and the cultural development.

Lastly focus on classical painting, theatre,music,variety of dance ,culture etc. It also promotes Indian culture and traditional heritage.This dimension gives more importance to our ancient paintings,sculpture,classical dance performance,folk music.

The Indian Knowledge system stresses learner’s holistic development through value education,environmental harmony,learning by doing,multidisciplinary.

Contemporary Education combined with Indian Knowledge System

Contemporary education stresses creativity, skill growth of learners,communicative competency,development of technology all these factors integrate with teaching. The beginning of the 21st century put more stress on western teaching methods and the learners didn't get the actual knowledge about our cultural heritage or tradition. This led to the learners detached from their original roots and they copied Western teaching learning models. Solution for the detachment of the original Indian roots leads to the foundation of the Indian Knowledge system.Indian knowledge system fills the gap and National Education Policy formulate new curriculum based on the assimilation of modern subjects like artificial intelligence,data science logistics,digital skills incorporated with traditional subjects.National education policy 2020 fully supports the integration of traditional subjects and culture apply towards all levels of

learners.This method of teaching learning creates an aesthetic feeling and deep rooted in our Indian culture and tradition.

Indian Knowledge System embed with English Language Teaching

1. **Inculcate cultural and traditional based stories in English language learning**

   Curriculum makers of English language textbooks using Indian traditional stories,folk stories and Indian classical text make the students more aware about Indian culture.Extract

   selected from Indian Epic also included in the lessons of English language teaching using these lessons introducing various activities for improving language skills,grammar knowledge,vocabulary etc. Through these activities learners get the content knowledge of

   culture and also they improve their communicative competency.

2. **Awareness of Environment**

   At the current scenario learners are mostly addicted to electronic gadgets especially mobile phone,television. They had no connection between their surroundings or their environment.Indian knowledge system connects a link between environment and human

   beings.Biodiversity,sustainable development,plastic free environment, environmental balance are stressed by the Indian Knowledge system. Learners need to be aware of nature's love and natural calamities like flood drought.So the English teachers added environment related lessons to the curriculum. Teachers included environment related poems,speeches by environmental activists named Mehta Patkar Sunder lal Bahuguna,Vandana Shiva, articles related to natural calamities and also added comprehension passages related to nature conservation etc.

3. **Experiential Learning**

   This is one of the features of NEP and also experiential learning means learning by doing.

   Learners study the lessons through their experience like field visit,role play, interviews,group discussions.Experiential learning helps the learners to do the activities at their own risk and also the learners get four language skills,and also get day today life practices.

4. **Improve Communicative Competence**

National educational policy stresses classrooms should be active and learner centered. Learners should be free to express their opinions in front of their classroom in any place or in any situation. In ELT classroom teachers include the topic of Indian Knowledge system and formulated activities like discussion,debate,story telling, essay writing,cartoons or painting presentation etc.These activities help the learners to improve their language skills.

Inclusive learning and Multilingual education

National Educational Policy suggests inclusive education to all learners especially supporting economically weaker category especially tribal groups.Indian Knowledge System also supports inclusive and multilingual learning.Students can get the chance to speak the mother tongue at the time of their class they get confidence to speak out and use English fearlessly in and outside the classrooms. Students are able to translate the regional proverbs to English and compare their native culture with English.These all help the learners to use both the English and their regional language in a smooth way without facing stress.

6. **Improve Critical Thinking**

Teachers give the topics of philosophy, yoga architecture to the learners and ask them to write or speak about the pros and cons of the topics. It helps the learners to get the content

knowledge and also get communicative competents.

7. **Value Education**

This is one of the features of the Indian Education system and National Educational Policy.Learners of the contemporary age didn't know about the values like love ,compassion, respect ,responsibility because learners are confined to their nuclear family.Comparing to the joint family few members are we seen in the nuclear family.and grand parents and the elders in the joint family control their children and route their path in proper way.In the nuclear family they have only link with their parents,school friends,relatives and teachers and also the learners are addicted for their mobile phone.They have no relation with society and the surroundings they belongs.Language classrooms include the value education lessons and also learners need to be aware about the values they keep in the society.

Challenges faced by the language teachers integrated with Indian knowledge system in their classrooms

- Shortage of study materials related to Indian knowledge system linked with English language teaching
- Lack of trained English teachers in Indian knowledge system
- Restricted knowledge about Indian Knowledge system among learners and teachers
- Herculean task to link current curriculum with Indian Knowledge System
- Scarcity of research and study in the field of Indian knowledge system
- Teachers find it difficult to handle the learning material of Modern topics with Indian traditional subjects.

How to connect Indian Knowledge system with English Language Teaching

1. Include Indian culture or traditional based lessons in English textbooks

2. Conduct training programs for English language teachers to be aware about Indian knowledge subjects.
3. Teachers supervised traditional and cultural activities in English language
4. Teachers give assignment,projects related to Indian Knowledge System
5. Teachers connect learners with indigenous local traditions using English language it helps the learners to know about their culture in English language
6. Spread among multilingual teaching learning materials
7. Introduces famous persons related to the local traditional culture and arrange their speech to the learners

Conclusion

This article analyses the integration of the Indian Knowledge system and knowledge of English Language Teaching.Teachers impart IKS through the English lessons. Moreover learners know about the content knowledge and also get the language skills. Through these integration

learners know about our Indian tradition,culture,legacy and also learners deeply rooted in their culture. This integration face challenges by teachers and learners because of inadequate teaching materials,lack of proper trainings.So the curriculum makers fill the learning gap of the learner's Indian Knowledge System and using the appropriate teaching materials for English Language Teaching.Therefore integration between Indian Knowledge System and English Language Teaching helps the learners to get the knowledge of our ancient cultural or tradition and also developing the language competency of the learners.

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YOGA AS A REMEDY FOR BACK PAIN IN WOMEN: AN EXPERIMENTAL STUDY

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INTRODUCTION

Back pain is among the most prevalent health concerns affecting women today. The incorrect alignment of bones, hormonal shifts caused due to menstruation, pregnancy and menopause, lifestyle factors as heavy lifting, job oriented prolonged sitting etc., contribute significantly to back pain. Research has shown that the practice of yoga can help manage a wide range of health issues including back pain. It can improve flexibility, agility, balance, balance structure, memory, mental stability, etc. The origin of the word yoga is from Sanskrit word yuj which means join or yoke.

METHODOLOGY

Thirty individuals with back pain from the district of Kayamkulam, Kerala was selected for the study. Initially, a two-hour orientation and training session on yoga practices were given. Following this, they underwent a three-month yoga training programme. During this the participants were taught and practiced twelve selected yoga postures. At the end of the training programme, a follow up survey was conducted to evaluate the changes and experiences.

SELECTED YOGA ASANAS

1. Balasana (Child's pose)

Bala means "child", and Asana means "pose". Balasana is an effective posture that stretches the spine, shoulders, hip flexors, and thighs. The asana began in a hands-and-knees position. Then the knees were separated toward the edges of the mat while keeping the big toes together. Following that the hips were lowered towards the heels, arms were extended forward and forehead was rested on the mat.

2. Uttana Shishosana (Puppy pose)

Uttana means "intense", shisho means "puppy", and asana means "pose". It is a very good stretch for the back and shoulders. The asana began on the hands and the knees. Then the hips were stacked over the knees. Gradually the hands were walked forward while lowering the chest or chin toward the mat.

3. Marjarysana-Bitilasana(Cat-Cow pose)

Marjary means "cat", asana means "pose" and bitil means "cow". Marjarysana-Bitilasana is one of best yoga for the entire spine as the posture initiates movement from crown to tail. Also, it is helpful for strengthening the core and the back. The asana began on the hands and knees with the shoulders over the wrists and the hips over the knees. On an inhalation, the head is lifted, belly was dropped, and tail was lifted. The naval was kept drawn in toward the spine. This is "Cow pose", a position of spinal extension. On an exhalation, head was dropped, back was rounded, and tail was tucked. This is "Cat pose", a position of spinal flexion. It was continued for 5-10 breaths.

4. Salamba Bhujangasana (Sphinx Pose)

Salamba means "supported", bhujanga means "cobra" and asana means "pose". This

asana is beneficial for strengthening the spine and opening the chest. Participants were instructed to lie on their stomach with the chest supported by the forearms. The elbows were positioned directly beneath the shoulders and the forearms were kept parallel to each other. Gentle pressure was applied through the forearms to lengthen the spine and create space between the shoulders and the ears. The posture was maintained for five to six breaths.

5. Viparita Karani (Legs up the wall pose)

Viparita means "inversion" and Karani means "to do". Individuals with glaucoma should avoid this inversion poses. This asana gently stretches the lower back and the backs of the legs. The yoga mat was placed close to a wall and the participants were instructed to sit sideways with one side of the body against the wall, keeping the knees drawn toward the chest. They then rolled onto their backs while simultaneously extending the legs upward against the wall. The posture was maintained in a relaxed position for a comfortable duration while breathing normally.

6. Bhujangasana (Low Cobra Pose)

Bhujanga means "cobra" and asana means "pose". This asana is best for the strengthening of back muscles and chest muscles. Each participant was instructed to lie on their stomachs with the palms placed flat on the mat directly beneath the shoulders and the elbows pointing backward. During inhalation, they pressed the tops of the feet into the mat and kept the pelvis grounded while gently lifting the chest using the back muscles without applying pressure through the hands. During exhalation, the chest was slowly lowered back to the mat. The posture was repeated three times.

7. Salbhasana (Locust Pose)

Salabha means "locust" and asana means "pose". This asana strengthens the back, abdomen, legs, and glutes. Participants were instructed to lie on their stomachs with their arms resting alongside the body. During inhalation, they pressed the tops of the feet and the pelvis into the mat while gently lifting the chest and arms off the floor. A folded towel or yoga pad was placed under the hip bones, if required, to provide additional support and comfort. Participants who were able to perform the posture comfortably were instructed to lift their feet off the floor to increase the intensity of the pose.

8. Trikonasana (Triangle pose)

Trikona means "triangle" and asana means "pose". This asana can improve the back and core strength, elongate the spine, and improve balance. Participants were instructed to stand with their feet placed wide apart and the arms extended horizontally at shoulder level. The right foot was turned outward while the left foot remained slightly inward to maintain proper alignment. They then bent sideways from the hip, extending the right hand toward the right shin, ankle, the floor, or a yoga block, depending on their flexibility. Simultaneously, the left arm was extended vertically upward, and the chest was gently rotated upward while the gaze was directed toward the raised hand. After maintaining the posture for several breaths, participants returned to the starting position and repeated the posture on the opposite side.

9. Uttanasana (Standing forward fold)

Uttana means "intense" and asana means "pose". This asana helps to stretch the backs of the legs and decompresses the spine. Participants were instructed to stand in Mountain

Pose at the front of the mat with the feet together and the body aligned. During inhalation, they raised both arms overhead, lengthening the spine. During exhalation, they bent forward from the hips while keeping the spine elongated, allowing the hands to move toward the floor or the legs according to their flexibility. The knees were kept slightly bent if necessary to reduce strain on the hamstrings. The head and neck were relaxed, allowing the upper body to hang naturally while maintaining steady and controlled breathing.

10. Adho Mukha Svanasana (Downward Facing Dog)

Adho means “down”, mukha means “face”, svana means “dog” and asana means “pose”. The asana strengthens and stretches the entire back. Participants were instructed to assume a hands-and-knees position with the toes tucked under. They then lifted the hips upward while pressing the palms firmly into the mat, creating an inverted "V" shape with the body. The spine was elongated, the legs were extended as much as comfortable, and the heels were gently directed toward the floor without forcing the movement. The shoulders were kept relaxed and stable, and the head remained in a neutral position between the arms. The posture was held for five to ten breaths before participants slowly returned to the starting position.

11. Supta Matsyendrasana (Supine Spinal Twist)

Supta means “reclined”, matsyendra means “Lord of Fishes” and asana means “pose”. The asana relieves stiffness and improves spinal mobility. Participants were instructed to lie on their backs with both legs extended. The right knee was gently drawn toward the chest and then guided across the body toward the left side while keeping the shoulders in contact with the mat. The hips were adjusted slightly to the right to maintain proper spinal alignment. The right arm was extended laterally at shoulder level, and the head was gently turned to the right so that the gaze was directed toward the right hand. The posture was maintained for several breaths before being repeated on the opposite side.

12. Setu Bandhasana (Bridge Pose)

Setu means “bridge”, bandha means “lock” and asana means “pose”. This asana focuses on srengthening your glutes, abdomen, back, and thighs muscles. Participants were instructed to lie on their backs with the knees bent and the feet placed flat on the mat, hip-width apart. The feet were positioned close enough to the body so that the heels could be reached with the fingertips. During inhalation, participants pressed the feet firmly into the mat and engaged the gluteal muscles to lift the pelvis off the floor. To further open the chest, the fingers were interlaced beneath the back, and the shoulders were gently rolled inward. The head was kept in a neutral position throughout the posture. After holding the pose for several breaths, the pelvis was slowly lowered back to the mat. The posture was repeated three times.

RESULT

After the completion of the three-month training programme, all the thirty participants were asked to evaluate their back pain. The participants reported a noticeable improvement in their condition. Overall findings suggest that regular yoga practice contributed to the reduction of back pain and improved physical well-being of the participants.

SUGGESTIONS

1) Regular yoga practice is recommended for the management and relief of back pain.

2) Yoga may be incorporated into daily routine to promote overall physical and mental well-being.

3) Individuals should practice yoga under the guidance of a qualified instructor, particularly during the initial stages.

4) Further studies with larger samples and longer intervention is recommended to validate these findings.

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CULTIVATING PHYSICAL LITERACY IN KERALA: PATHWAYS FROM SCHOOLYARDS TO A SPORTING SOCIETY

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Abstract

Kerala's sustained investments in education and health have created fertile ground for nurturing physical literacy, yet systemic gaps limit its full realisation. This paper examines Kerala's policy framework, curricular reforms, infrastructure initiatives, teacher capacity, inclusiveness measures, and digital efforts connected to physical literacy, drawing on state plans, SCERT curriculum revisions, and programmatic innovations such as Healthy Kids and Vidyakiranam. It identifies strengths — wide school coverage, curriculum integration, and targeted projects — and weaknesses — uneven access to facilities, insufficient teacher numbers, lack of a state-wide statutory mandate for daily physical activity, and limited digital dashboards. The paper proposes a roadmap for transforming physical literacy into a justiciable, scalable public good.

Keywords: *Physical Literacy, Policy framework, curriculum integration, infrastructure initiatives, inclusiveness, digital efforts.*

Introduction

Physical literacy has become a transformative framework worldwide, weaving together lifelong movement, health, education, social inclusion, and human development. While the concept first took shape through Margaret Whitehead's philosophical work, physical literacy has since grown into a multidimensional concern for international policy—bringing together movement competence, motivation, confidence, knowledge, and sustained participation in physical activity throughout life.[1] Nations around the world now see physical literacy as vital for tackling sedentary lifestyles, mental health struggles, educational inequality, and the weakening of community movement cultures. In developing countries, the stakes are particularly high: physical literacy cuts across public health, educational access, gender equity, inclusion, and social justice. This paper explores physical literacy from global, Indian, and Kerala-specific perspectives, arguing that Kerala holds unique structural advantages that could position it as a model state for physical literacy in the Global South. The discussion places physical literacy within the wider debates—geopolitical, economic, and cultural—that shape human development and rights-based educational reform.

Kerala Background and Significance

Kerala occupies a distinctive place in India's development story. The state's internationally celebrated "Kerala Model of Development" has long prioritised education, literacy, health care, and social welfare as the bedrock of progress.[2] These

strengths lay the groundwork for embedding physical literacy within educational and community systems. Kerala's broad school network, robust public institutions, and inclusive social policies offer a potentially scalable platform for making physical literacy a rights-based public good.

Yet the data reveal a stark gap: of 7,454 schools in Kerala, fully 5,585—about 74 per cent—have no sports teachers. Just 1,869 physical education teachers serve 31 lakh students.[3] This represents a critical disconnect between policy intent and what happens on the ground.

Global Concept and Policy Frameworks

Physical literacy has travelled from a philosophical framework to major international policy discourse. The concept is most closely linked to Margaret Whitehead, who described it as "the motivation, confidence, physical competence, knowledge, and understanding that individuals develop to maintain physical activity at an appropriate level throughout their life."[1] This holistic vision has reshaped physical literacy from a narrow educational idea into a wide-reaching developmental framework, one with implications for health, education, economics, urban planning, inclusion, and social policy.

Canada has become one of the world's leading hubs for physical literacy policy and assessment, driven by initiatives like the Canadian Assessment of Physical Literacy.[4] Wales wove physical literacy into both educational and community sport systems, while England commissioned national evidence reviews. Australia and New Zealand expanded the conversation, linking physical literacy to active living and inclusive education.[4]

A recurring lesson from international experience is clear: successful physical literacy systems work as ecosystems, not isolated programmes. They knit together schools, communities, families, sport systems, local governance, public health institutions, and built environments into coordinated frameworks that support active living.[4]

Physical Literacy, Education, and Human Development

Schools remain the single most important setting for building physical literacy. They offer equitable access to movement experiences, regardless of socio-economic background. International research consistently points to physical education as the most scalable way to reach nearly all children. But the evidence also shows that quality, frequency, inclusiveness, teacher competence, and supportive school culture matter far more than simply including physical education in the formal curriculum.

The UNESCO International Charter of Physical Education, Physical Activity and Sport (2015) declares that "every human being has a fundamental right to physical education, physical activity and sport without discrimination."[5] Adopted at UNESCO's 38th General Conference, this charter reflects India's international commitments in this area.

Educational systems oriented around physical literacy typically feature structured physical education classes, opportunities for active play, movement-based pedagogy, inclusive sports participation, recess and active breaks, engagement between schools and communities, and the cultivation of lifelong movement habits. Increasingly, physical literacy is being linked to cognitive development, emotional regulation, social skills, academic engagement, and student well-being. Dean Dudley's conceptual model underscores that observable physical literacy encompasses both physical competence and

affective-dimensional engagement.[10]

Global evidence points to rising inactivity among children and adolescents. The India Report Card on Physical Activity for Children and Adolescents 2022 found that only about half of Indian children meet the recommended levels of physical activity, while sedentary behaviour remains a pressing public health concern.[11]

Physical Literacy in India: Emerging Challenges

India's conversation around physical literacy is unfolding against a backdrop of rapid urbanisation, educational pressure, declining physical activity, and widening health disparities. Indian scholarship increasingly frames physical literacy as a matter of public health, constitutional and educational concern, social justice, developmental necessity, and a rights-based framework.

The report "From Stasis to Movement: Actualising a Fundamental Right to Physical Literacy in India" marks an important shift in Indian discourse. It moves beyond sports promotion toward a systemic active-living framework.[6] The authors argue that schools and colleges are the most effective sites for population-scale intervention, and they propose integrated governance mechanisms to connect education, health, and movement culture. Nandan Kamath, Desh Gaurav Sekhri, and Shubham Jain advocate recognising physical literacy as a fundamental right, rooted in Articles 21 (right to life) and 21A (right to education) of the Indian Constitution.[6]

Common challenges in Indian schools include limited access to playgrounds, inadequate equipment, insufficient daily physical activity, too few trained physical education teachers, academic pressure, uneven rural-urban infrastructure, and limited inclusive programming. In many schools, physical education is scheduled irregularly or scaled back during examination periods. According to ASER 2018, only 57% of government schools in India have playgrounds, compared to about 78% of private schools.[6]

India also has unique cultural resources to draw upon. Yoga holds a particularly important place, integrating physical movement, breathing, concentration, flexibility, and emotional regulation. Within physical literacy frameworks, yoga can foster body awareness, motivation, confidence, emotional balance, stress management, and inclusive participation.[6] At the same time, scholars caution that yoga should complement—not replace—comprehensive physical education systems.

Kerala's Policy and Curriculum Evolution

Kerala moved relatively early compared to many Indian states in integrating Health and Physical Education (HPE) into school curricula. Curriculum reforms introduced through the State Council of Educational Research and Training (SCERT) have progressively strengthened the institutional presence of movement education. Major revisions came in 2008 and 2013, and the Kerala Curriculum Framework 2023, aligned with the National Education Policy (NEP) 2020, now recognises Health and Physical Education as a scholastic subject, supported by structured assessment and activity-based learning.[7]

The "Healthy Kids" programme provides lower-primary students with roughly 135 minutes of structured physical activity weekly, while upper-primary and secondary students receive about 90 minutes through a revised curricular allocation. Kerala has also developed extensive educational resources: teacher handbooks, activity packages, sports and games sourcebooks, digital learning materials, and training modules.

But policy inclusion alone does not guarantee effective implementation. Significant gaps persist between the curriculum's vision and institutional reality. The Samagra and KITE digital platforms offer educational resources from Std 1 to 12, yet a unified physical literacy dashboard remains absent.[8]

Infrastructure, Access, and Teacher Capacity

Kerala's large school network provides a solid infrastructural foundation for physical literacy. Government initiatives like "One Panchayat, One Ground" signal awareness of community-level infrastructure needs.[2] The Kerala State Sports Council runs talent identification and training initiatives, and the Kayika Kshamatha Mission aims to raise the physical fitness levels of students and the general public.[9]

Still, several structural concerns persist: uneven playground quality, underutilisation of school grounds, limited equipment availability, restricted community access, inconsistent maintenance, and urban space constraints. Access regulation is a particular issue—at many institutions, playground use outside school hours depends on staff's discretion rather than statutory policy.

One of Kerala's most acute implementation challenges is the shortage of trained Physical Education teachers. Despite strong curricular frameworks, fewer than 2,000 regular Physical Education teachers and around 500 contract teachers serve more than 11,000 schools.[3] This imbalance undermines programme consistency and quality. The results include irregular activity sessions, limited supervision, reduced skill development, inadequate inclusion support, weak assessment practices, and overburdened staff. Research on teacher-related issues in India reveals that physical educators are often used as disciplinarians or generalist substitute teachers, employed on contract and paid less than teachers of core subjects.[13]

Inclusion, Equity, and Cultural Dimensions

Kerala has taken meaningful steps toward inclusive sports and physical education. Current initiatives encompass inclusive sports meets for Children With Special Needs (CWSN), RCI-approved special educators, inclusive sports manuals, gender-sensitive programming, transgender sports meets, self-defence training, Kalaripayattu-based initiatives, and scholarships for marginalised groups.

Kerala also possesses important cultural resources that can enrich physical literacy. Traditional movement practices—Kalaripayattu, folk games, indigenous play traditions, community festivals, yoga, and local recreational cultures—can make physical literacy culturally meaningful rather than externally imposed. This cultural dimension is especially relevant in developing countries, where imported sports systems sometimes fail to engage communities in ways that feel authentic. Ramakrishna Bhat emphasises that play as learning contributes immensely to children's language and sociability development.[12]

Nevertheless, Kerala still lacks uniform institution-level physical literacy committees, dedicated grievance redress mechanisms, standardised inclusion protocols, and universal accessibility standards. These institutional gaps limit the consistency of inclusive implementation.

Governance, Financing, and Digital Systems

Kerala currently runs physical education and sports initiatives through multiple

departments: General Education, Higher Education, and Sports and Youth Affairs. While this multi-departmental structure enables coordination, it also breeds fragmentation. Kerala has no dedicated empowered authority with a statutory responsibility specifically for physical literacy governance.

Key governance concerns include the absence of a dedicated physical literacy authority, lack of ring-fenced financing, weak accountability systems, fragmented monitoring, inconsistent data collection, and limited public transparency. Sports, Health, and Physical Education funding depends largely on annual budget allocations rather than protected long-term financing frameworks.

Digital governance also lags behind. Although Samagra, KITE, SIET, and SCERT provide digital educational resources, Kerala lacks a unified dashboard to monitor playground inventories, infrastructure utilisation, teacher deployment, student participation, fitness indicators, inclusion outcomes, community access, and grievance systems.[8]

Geopolitical, Economic, and Cultural Perspectives

Developing countries are increasingly recognising that human development cannot be separated from physical well-being. Sedentary lifestyles, non-communicable diseases, declining mental health, and social isolation impose long-term economic costs. Physical literacy contributes to human capital development, workforce productivity, reduced healthcare expenditure, social cohesion, educational engagement, and youth development.

Educational debates in developing countries often focus narrowly on literacy, examinations, and employability. Yet contemporary educational theory increasingly emphasises holistic development. Physical literacy aligns with rights-based educational approaches by treating movement, play, and physical development as integral dimensions of human capability. This perspective is especially important for girls facing mobility restrictions, children with disabilities, economically disadvantaged communities, and students lacking recreational access.

Many developing countries have rich traditions of movement that remain marginalised within modern schooling systems. Kerala's indigenous movement practices can strengthen cultural continuity, community participation, identity formation, inclusive engagement, and intergenerational transmission of knowledge. Integrating local games and movement traditions into physical literacy systems can help resist purely commercialised or elite-centric sporting cultures.

Key Research Gaps and Emerging Challenges

Despite rapid growth in the field of physical literacy scholarship, several major research gaps remain. Globally, there is no universally accepted definition; assessment frameworks remain contested; evidence is concentrated in high-income countries; and longitudinal intervention studies are limited. In India, and specifically in Kerala, nationally representative data remain insufficient, long-term implementation studies are limited, district-level comparisons are underdeveloped, monitoring systems are weak, teacher preparedness studies are inadequate, and research on community participation remains limited.

Additional challenges include digital addiction and screen saturation, academic pressure,

urban space limitations, climate-related barriers, inequalities in access, and declining active play. Future research must examine not only participation rates but also governance systems, social barriers, inclusion models, and long-term developmental outcomes.

Recommendations: Pathways from Schoolyards to a Sporting Society

Kerala has the institutional capacity to become a global model for physical literacy in developing regions. Realising this potential, however, will require coordinated legal, educational, infrastructural, financial, and governance reforms.

Legal and Policy Reforms: Enact a Kerala Physical Literacy Act guaranteeing daily physical activity opportunities for all schoolchildren; establish statutory rights for supervised community access to school playgrounds outside school hours; create legally mandated physical literacy standards for all educational institutions; constitute a State Empowered Committee for Physical Literacy with statutory authority and multi-sector representation.

Financing and Institutional Architecture: Establish a ring-fenced Kerala Physical Literacy Fund; ensure multi-year funding commitments for infrastructure, inclusive equipment, maintenance, and teacher development; strengthen local government participation in facility management and community programming.

Teacher Capacity and Professional Development: Recruit additional regular Physical Education teachers; implement mandatory continuous professional development systems; introduce digital certification and accreditation frameworks; develop specialised training modules for inclusive physical literacy.

Infrastructure and Community Access: Expand the "Open Playgrounds" initiative statewide; upgrade underutilised infrastructure; ensure minimum equipment standards across schools; introduce community supervision and liability frameworks.

Inclusion and Cultural Integration: Expand adaptive sports and mixed-ability programming; integrate indigenous games, Kalaripayattu, and local movement traditions into curricula; strengthen participation pathways for girls, transgender students, and marginalised communities.

Digital Governance and Monitoring: Develop a unified state-level physical literacy dashboard; monitor infrastructure, participation, teacher deployment, and inclusion indicators; enable anonymised public data access for research and accountability; establish digital grievance redress mechanisms.

Research and Evaluation: Conduct longitudinal district-level studies; link physical literacy indicators with health and academic outcomes; partner with universities and research institutions; develop Kerala-specific assessment frameworks aligned with local cultural contexts.

Conclusion

Physical literacy represents far more than an educational reform or sports-development strategy. It is a multidimensional developmental framework that connects health, education, social inclusion, cultural identity, public policy, and human capability.

Globally, physical literacy has emerged as a response to rising inactivity, declining movement cultures, mental health concerns, and widening inequalities in access to active living. Developing countries face especially urgent challenges, as educational systems,

urban environments, and socio-economic inequalities increasingly restrict children's opportunities for movement, play, and community participation.

Within India, physical literacy is gradually evolving from a sports-centred discussion into a broader rights-based and public-health-oriented framework. Kerala, with its strong educational foundations and human-development-oriented governance traditions, is uniquely positioned to lead this transformation.

The state already possesses several important strengths: curriculum integration, inclusive educational initiatives, strong public institutions, and broad access to schools. Yet significant implementation gaps remain—in teacher recruitment, infrastructure access, governance coordination, financing, monitoring, and accountability.

To transform physical literacy into a durable public good, Kerala must move beyond curricular intent toward enforceable systems backed by statutory guarantees, dedicated financing, digital governance, inclusive infrastructure, and community participation.

If effectively implemented, Kerala can create a model in which schoolyards evolve into community movement ecosystems and physical literacy becomes a lifelong developmental right rather than a privilege limited to competitive sport or elite participation. Such a model would not only strengthen sporting culture but also contribute to healthier citizens, stronger communities, educational equity, and sustainable human development.

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YOGA NIDRA AS A COMPLEMENTARY RECOVERY STRATEGY FOR SLEEP-DEPRIVED ATHLETES: A NEUROPHYSIOLOGICAL PERSPECTIVE

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Abstract

Sleep deprivation is a major problem in modern sports because of its heavy competition schedules, trans meridian travel, psychological stress, academic demands and intensive training loads. Sleep deprivation negatively affects autonomic regulation, cognitive function, emotional stability, and athletic recovery, resulting in impaired performance and increased injury risk. Even though traditional recovery modalities are widely used, many athletes are still experiencing chronic or acute sleep insufficiency. As a result, there is a rising demand for complementary and accessible recovery strategies which support psychophysiological restoration when there is sleep deprivation. Yoga Nidra is a guided state of conscious relaxation or non-sleep, deep rest that exists between wakefulness and sleep. Because of its potential neurophysiological effects on autonomic recovery and stress modulation, Yoga Nidra has recently gained scientific attention. Emerging evidence suggests that Yoga Nidra may influence autonomic regulation, vagal activity, respiratory function, and stress-related neuroendocrine responses. This may support recovery through reductions in mental fatigue and stress while improving emotional regulation and autonomic flexibility. These effects may be mediated through mechanisms involving slow breathing, enhanced vagal activity, improved heart rate variability, and greater parasympathetic activation, which are increasingly recognised as important components of athletic recovery. This narrative review examines the neurophysiological rationale for Yoga Nidra as a complementary recovery strategy for sleep-deprived athletes. In addition, the review compares the neurophysiological characteristics of Yoga Nidra with those of normal sleep to clarify its potential role within sports recovery programmes. Although existing evidence indicates promising psychophysiological benefits, Yoga Nidra should be considered a complementary recovery strategy rather than a substitute for normal sleep. Athlete-specific research remains limited, and future studies integrating heart rate variability, respiratory dynamics, endocrine responses, and sport-specific performance outcomes are required to establish its practical value in sports recovery.

Keywords: *Yoga Nidra, Sleep Deprivation, Athletic Recovery, Neurophysiology, Autonomic Nervous System, Heart Rate Variability, Non-Sleep Deep Rest, Respiratory Regulation.*

Introduction

Sleep is considered an important factor that influences athletic recovery, adaptation, and long-term performance (Kaczmarek et al., 2025). However, many athletes are experiencing chronic or acute sleep deprivation. Some of the reasons are their demanding training schedules, competition anxiety, intensive travel through different time zones, media obligations, and physiological stress from intensive exercise loads (Roberts et al., 2019; Walsh et al., 2021). Elite and sub-elite athletes show poor sleep

quality and reduced sleep duration than required for their optimum recovery. During competition and heavy training periods these athletes' sleep efficiency is very low and they fail to achieve the recommended duration for sleep (Cook & Charest, 2023; Vlahoyiannis et al., 2021). Damaged reaction time, decreased accuracy, reduced skill proficiency, lower muscular strength, reduced aerobic capacity, and impaired energy metabolism are some of the physical and mental functions that may be at risk due to the lack of sleep (Charest & Grandner, 2022; Smithies et al., 2021). Performance results and injury chances may get affected even from a small impairment on neuromuscular coordination, awareness, and decision making (Nobari et al., 2023). Additionally, inadequate sleep will contribute to autonomic imbalance and the elevation of stress hormones like cortisol. This will heighten the sympathetic activity and hypothalamic-pituitary-adrenal axis dysregulation, consequently compromise the recovery efficiency and facilitate psychophysiological fatigue (Halson, 2014; Kong et al., 2025). So, sleep deprivation has become a major concern for contemporary sports science and recovery physiology which brings about rising demand for systematic monitoring, education, and targeted interventions for protecting the athletes' health and performance (O'Donnell et al., 2018).

In sports the recognition of sleep for recovery is gradually increasing but efficient recovery interventions are hard to implement regularly in a sports environment (Bonnar et al., 2018). The common traditional recovery modalities which are used in most professional sports settings are massage, hydrotherapy, nutritional supplementation, compression garments, sleep extension, and cryotherapy. They dominate the research on sports recovery modalities (Cunha et al., 2023; Mihajlovic et al., 2023). Still there are many practical barriers that restrict athletes to get enough restorative sleep, especially during tournaments, travelling, and heavy training phases (Bonnar et al., 2018). This limitation has increased the demand for complementary recovery strategies that can help recovery when sleep is inadequate (Crosswell et al., 2024). This is where Yoga Nidra plays a role among some other mindfulness-based interventions such as non-sleep deep rest approach, meditation practices, and breathing exercises (Boukhris et al., 2024; Rusch et al., 2019). The structured combination of supervised relaxation, awareness control, lower sensory exposure, and physical awareness makes Yoga Nidra special compared to other practices (Di Fronso et al., 2024; Di Fronso & Bertollo, 2021). Yoga Nidra helps reduce stress, improve autonomic function, and enhance perceived recovery status, which is essential for sports recovery and it shows the potential significance of Yoga Nidra (Di Fronso & Bertollo, 2021; Musto & Hazard Vallerand, 2023). Even so, there is insufficient research that links Yoga Nidra to athletic recovery (Moszeik et al., 2025; Pandi-Perumal et al., 2022). This narrative review evaluates the potential role of Yoga Nidra as a complementary recovery method for athletes who have sleep deficiency (Di Fronso & Bertollo, 2021). Evidence from sleep science, exercise physiology, autonomic nervous system research, and mind-body research is synthesized to study how Yoga Nidra influences physical and mental function (Datta, Mallick, et al., 2022; Musto & Hazard Vallerand, 2023; Renaghan et al., 2023). In addition, this paper provides a conceptual framework to understand the application of Yoga Nidra in sports recovery science and it intends to provide directions for future research on Yoga Nidra (Boukhris

et al., 2024; Dutta et al., 2026).

Sleep and Athletic Recovery

Sleep deprivation causes biological dysregulations including disruption of the endocrine regulation and autonomic regulation which are very essential for the post exercise restoration and adaptation (Walsh et al., 2021). Studies show that inadequate sleep reduces the parasympathetic recovery responses and elevates the sympathetic nervous system activity. From this cardiovascular and metabolic recovery becomes impaired (Greenlund & Carter, 2022). Chronic sympathetic activation is connected to elevated heart rate, low heart rate variability, damaged glucose metabolism, and altered glucose regulation (Cincin et al., 2015). At the same time inadequate sleep causes high cortisol and reduces the availability of testosterone and secretion of growth hormone. It will result in the impairment of glycogen restoration, muscle recovery, and protein synthesis (Kaczmarek et al., 2025). Oxidative stress and heightened physiological strain may increase recovery time after intense workout and both of these are related to sleep deprivation (Zhang et al., 2025). Recent evidence shows that the autonomic dysregulation caused from sleep loss may increase the cardiovascular burden during competition and training(Cincin et al., 2015; Saputro et al., 2025). Along with physiological problems sleep deprivation also causes damage to cognitive functions (Charest & Grandner, 2022). Competitive performance and tactical execution can be influenced by attentional control, motor coordination, reaction time and emotional regulation, therefore to keep them stable sufficient sleep is necessary (Saddoud et al., 2023). Generally athletes and exercisers show reduced attention, slower cognitive processing, impaired working memory, and reduced decision making ability due to insufficient sleep and these deficits are connected to reduced executive brain functions (Kayser et al., 2022; Kong et al., 2025). Motor coordination and control over skills may also get affected from sleep loss in sports (Khcharem et al., 2026). Athletes who play sports that need quick tactical transition and accuracy in tough situations have more problems from insufficient sleep like lack of concentration, reduced understanding of surroundings, and less situational alertness (Song et al., 2025). All of these together reduce the recovery quality and results in poor performance and chances of injury (Magnuson et al., 2023).

Sleep deprivation can affect athlete's performance to a large extent. If athletes are not getting sufficient sleep it might affect their sprinting speed, endurance, precision skills, and cognitive and reaction ability during competition (Bonnar et al., 2018). Particularly team athletes show slower reactions, poor decision making, and more mistakes due to insufficient sleep during busy match schedules and travel (Cunha et al., 2023). Athletes who reduce weight rapidly and experience pre competition anxiety in combat sports usually have sleep deficiency and it can lead to reduced mental sharpness and increased recovery time between bouts (Romdhani et al., 2019). Endurance athletes feel difficulty in maintaining their pace and regulating their body temperature due to lack of sleep. There by the chances of decline in overall performance is high, consistent with moderate decreases in endurance performance after sleep loss (Lopes

et al., 2023). Across many sports it has observed that inadequate sleep increases the injury risk. The major reasons behind this are impaired coordination, slower reflexes,

disrupted tissue recovery and impaired muscle repair (Chennaoui et al., 2021). According to sleep intervention research conducted on athletes sleep duration and sleep quality can help to improve physical performance and cognitive function through methods like sleep extension, naps, and better sleep hygiene, though the effects may vary as per the protocol and outcome (Cunha et al., 2023). However it is difficult for elite athletes to get optimum sleep because of their travel, late competitions, media obligations, and stress (Gong et al., 2024). Therefore, there is an increasing interest on additional recovery strategies like napping, mindfulness, light exposure adjustment etc for managing mental and physical fatigue (Romdhani et al., 2020).

Understanding Yoga Nidra

Yogic sleep is the commonly translated name for Yoga Nidra. It is a relaxation and mindfulness technique based on traditional yoga and tantric tradition (Pandi-Perumal et al., 2022). Even though it is originated from the ancient mediation practices, 20th century was the period when modern systematic form of Yoga Nidra was popularised and it was mostly done by yoga guru swamy Satyananda saraswati (Pandi-Perumal et al., 2022). Yoga mainly focuses on physical movement and poses but when it comes to Yoga Nidra it is completely different. It is performed by lying down and listening to guided instructions about body awareness, breathing, visualising, and attention focusing (Musto & Hazard Vallerand, 2023). The most important thing about Yoga Nidra is that it is not like regular sleep since the practitioners try to sustain awareness when they fall into deep state of relaxation (Fialoke et al., 2024). Researchers refer to it as hypnagogic or aware sleep state, associated with reduced sensory engagement and changes in the brain activity (Zaccaro et al., 2021). Recent studies link Yoga Nidra to non-sleep deep rest (NSDR), because both are conscious practice that create restorative state without the complete loss of awareness (Zaccaro et al., 2021). Therefore, Yoga Nidra can be considered as a dynamic relaxation state existing between wakefulness and sleep. This distinguishes Yoga Nidra from resting and traditional meditation (Di Fronso & Bertollo, 2021). Physiologically, Yoga Nidra seems to reduce metabolism, slow down breathing and heart rate, boost parasympathetic activity and lower stress levels (Moszeik et al., 2025; Sharpe et al., 2023). Studies related to meditation and relaxation technique show that they increase vagal activity and heart rate variability. This helps our body to manage stress efficiently and boost relaxation (Giorgi & Tedeschi, 2025). In Yoga Nidra slow and mindful breathing helps to improve the natural process of respiratory sinus arrythmia and vagal respiratory coupling, which can assist the cardiovascular recovery and emotional regulation (Grossman, 2024; Singh et al., 2025). According to the brain wave studies Yoga Nidra can create changes in the brain. Especially it elevates the calm alpha waves and theta waves which are connected to relaxation and early stages of sleep (Sharpe et al., 2023). Some studies show that there is brain activity which is similar to deep sleep during Yoga Nidra, although the participants are awake (Datta et al., 2023). Recently there has been increasing interest in Yoga Nidra particularly more studies are carried out for reducing stress, improving sleep, and balancing the nervous system (Datta et al., 2023). Studies focused on athletes are still limited but early evidence indicates that Yoga Nidra improves stress recovery, sleep improvement and perceived restoration in elite athletes (Di Fronso & Bertolo, 2021). The distinct state of being relaxed yet awake

during Yoga Nidra might help athletes who are fatigued from busy schedule, travel, heavy training, and stress from busy competition stress (Sharpe et al., 2023). However to ensure these benefits more research and specific studies are required (Musto & Hazard Vallerand, 2023).

Neurophysiological mechanisms of Yoga Nidra

Autonomic nervous system plays a major role in the recovery of athletes after workouts because it controls the heart function, energy restoration, stress response, and mental adaptation (Michael et al., 2017). Optimal recovery is connected with parasympathetic nervous system which is the calming branch of the autonomic nervous system and excessive sympathetic activity which is the fight or flight part can cause fatigue, poor adaptation, and overreaching (Laborde et al., 2024). Heart rate variability is a popular method used to measure autonomic regulation and cardiac vagal tone. This is widely used in both clinical and athletic populations (Laborde et al., 2017). Simple values like root mean square of successive differences (RMSSD) and high frequency power help to show how efficiently the parasympathetic nervous system is functioning (Kromenacker et al., 2018). Generally athletes with enhanced vagal activity attain better recovery, manage emotions efficiently, and handle physical stress more effectively (Mosley et al., 2017). According to early investigations Yoga Nidra helps to improve heart rate variability by reducing stress and boosting vagal functions (Kuppusamy et al., 2020; Sevoz-Couche & Laborde, 2022). Relaxing techniques that promote slow breathing and reduce cognitive load can foster an adequate environment for recovery and restoration of cardiovascular function (You et al., 2022). Prolonged exposure to intense training, stress, travel fatigue, and insufficient sleep can cause continuous activation of sympathetic nervous system and damage the balance of physiological systems of athletes (Georgieva-Tsaneva et al., 2025). When athletes over train, usually their heart rate variability reduces, resting heart rate increases, encounter greater fatigue, and experience difficulty in managing emotions (Bellenger et al., 2016). This will affect physical and mental recovery and become a problem for the preparation of next training session and competition (N. et al., 2026). Yoga Nidra is considered to be beneficial for reinstating autonomic balance. Since it involves stillness, guided focus and deep breathing simultaneously (Di Fronso et al., 2024). Research suggests that regular yoga practice generally enhances vagal activity and induces a low stress state (Frank et al., 2020). Even though studies based on athletes are very limited, early research indicates that Yoga Nidra may assist recovery, increase sleep quality, and elevate restoration feeling under high pressure sports settings (Di Fronso & Bertollo, 2021). This practice can be beneficial during demanding competition periods and when athletes fail to obtain quality sleep (N. et al., 2026). Through the lens of mind-body interaction, better balance in these systems can manage emotions, elevate focus, and build stress tolerance (Frank et al., 2020). Therefore Yoga Nidra is not only a relaxation method but also an applicable recovery method that can positively influence sports performance (Zou et al., 2018). Apart from autonomic nervous system regulation, some brain function and electrical signalling variables serve a function in how Yoga Nidra helps in recovery (Sahu & Pradhan, 2025). Studies conducted using electroencephalography (EEG) suggest that Yoga Nidra and similar meditation techniques are creating changes in alpha and theta

brain waves (Kora et al., 2021). These brain waves are connected to relaxation, reduced sensory inputs, and the early stages of sleep (Datta, Mallick, et al., 2022). According to the studies conducted on skilled practitioners, an increase in theta wave activity and certain slow-wave brain function observed while they are awake. This shows that without falling into optimum sleep some brain restoration is possible (Fialoke et al., 2024). These changes in brain activity indicates calming of the brain and reduction of overstimulation. This is particularly significant for athletes who are experiencing mental and physical stress (Di Fronso & Bertollo, 2021).

Continuous competition anxiety, excessive brain activity, and inadequate sleep can continuously keep brain in a heightened state which makes it difficult for athletes to achieve relaxation and recovery (Pandi-Perumal et al., 2022). Advanced brain imaging and EEG studies suggest that Yoga Nidra may change the manner in which different brain regions communicate, leading to a state that is relaxed yet aware. This is considered as a state in-between wakefulness, meditation, and light sleep (Datta, Mallick, et al., 2022). This unique state can be beneficial for athletes experiencing anxiety after competition and sleep deprivation from travelling (Pandi-Perumal et al., 2022). So, the ability of Yoga Nidra to reduce brain overstimulation and promote a calmer state can be useful to compensate for compromised recovery time due to insufficient sleep (Di Fronso et al., 2024).

Another mechanism that may explain the restorative effect of Yoga Nidra is its ability to influence a system in our body called hypothalamic pituitary adrenal (HPA) axis. This system controls the physiological response to stress (Ring, 2025). When experiencing physical stress or mental stress, this system helps the body to release hormones like cortisol and catecholamines (Padgett & Glaser, 2003). To adapt and respond to stress temporary increase in cortisol is necessary. However if cortisol remains at a high level continuously due to lack of recovery and sleep deprivation, it may weaken the immune system, restrict muscle recovery, and negatively affect mood (Alotiby, 2024). Cortisol dysregulation is frequently evident among athletes who face intense training, travel stress, and constant mental pressure. This can be a reason for physical strain and fatigue (Cadegiani & Kater, 2017). When the stress response system remains continuously activated recovery becomes difficult and higher levels of fatigue may occur (Xu et al., 2025).

Mind-body practices that involve relaxation and breath control help reduce stress levels in the body (Chin & Kales, 2019). Yoga Nidra might work in a similar way because it is a form of guided meditation (Musto & Hazard Vallerand, 2023). Previous studies show that Yoga Nidra facilitates stress reduction, physical tension reduction, anxiety reduction, improves sleep, and promotes a sense of wellbeing (Ghai et al., 2026). By calming the stress responses in the body, it might help to balance the stress related hormones and improve recovery from stressful situations (Birdee et al., 2023). This can be useful to athletes who have sleep deprivation, competition anxiety, and emotional exhaustion (Di Fronso et al., 2024). Emotional regulation and lower levels of stress hormones might boost focus, help recovery, and maintain overall well-being (Moszeik et al., 2025). Additional research is required because of the small sample size and difference in the research methods. Even so, the link between **physiological responses,**

hormonal regulation, and mental well-being provides a reasonable basis for the concept that Yoga Nidra can promote healing and well-being in sports (Musto & Hazard Vallerand, 2023).

Breathing plays a key role in how Yoga Nidra helps athletes suffering from sleep deprivation. Slow breathing pattern practiced in Yoga Nidra is connected to enhanced vagal capacity and better control of the autonomic nervous system (Laborde et al., 2022). Slow and steady breathing improves baroreflex sensitivity and strengthens the parasympathetic system.

Additionally, it reduces sympathetic arousal and stress responses (Anasuya et al., 2020). Deep breathing supports emotional regulation, heart recovery, and brain processing by creating a dynamic interaction between breathing centers and higher brain areas (Noble & Hochman, 2019). The speciality of breathing is that we can control it voluntarily, which gives us a simple means to influence our mental and physical state (Zaccaro et al., 2018). Evidence indicates that slow breathing techniques can improve heart rate variability, reduce anxiety levels, and produce alterations in brain activity that promote relaxation and attention (Giorgi & Tedeschi, 2025). While doing Yoga Nidra, reducing breathing rate and directing attention inward can synchronise the body's recovery response and brain function (Chhabra et al., 2024). This aspect is particularly significant because during intense training and sleep deprivation athletes show breathing problems and irregular breathing pattern along with fatigue, stress, and unbalanced nervous system (Nicolò et al., 2020). Along with this there is an increasing interest in breathing patterns and how they can be used as indicators of recovery and fatigue in sports science (Nicolò et al., 2017). Monitoring respiratory rate, breathing stability, and the link between breathing and vagal activity can be helpful to get information regarding stress during exercise and recovery (Giorgi & Tedeschi, 2025). Recent studies on Yoga Nidra have also suggested that there is a decrease in the rate of respiration while practicing Yoga Nidra which indicates a shift towards recovery-friendly state (Sharpe et al., 2023).

Integrating Yoga Nidra and wearable devices that can monitor breathing and heart rate variability could help athletes to assess their recovery and support the body's normal healing process (Di Fronso & Bertollo, 2021). This can be helpful for athletes experiencing sleep problems and fatigue, especially for those who are in sports like football, combat sports, and endurance events (Di Fronso et al., 2024). By focusing on breathing, Yoga Nidra can be connected to the body's self-regulation mechanism and recent recovery methods used in high performance sports (Petviset et al., 2025). It is crucial to consider that recovery is not just physical repair and energy replenishment but factors like emotional management, cognitive ability, perceived tiredness and motivation also play a significant role (Di Fronso et al., 2024). Sleep deprived athletes, often report irritability, mood swings, emotional instability, and mental fatigue. This can adversely affect training and performance (Datta, Yadav, et al., 2022). In addition, mental fatigue can cause impaired concentration, poor decision making, and higher perceived exertion during workouts (Di Fronso & Bertollo, 2021). Early research suggests that Yoga Nidra can help athletes feel more relaxed, improve recovery, and manage stress and emotions efficiently (Di Fronso et al., 2024). In summary, there is a strong scientific base for Yoga Nidra in modern sports science as a complementary recovery strategy because of its

combined effect on autonomic regulation, cognitive function, breathing patterns, hormonal balance, and emotional control (Petviset et al., 2025).

The proposed neurophysiological mechanisms through which Yoga Nidra may support recovery in sleep-deprived athletes are summarized in Figure 1.

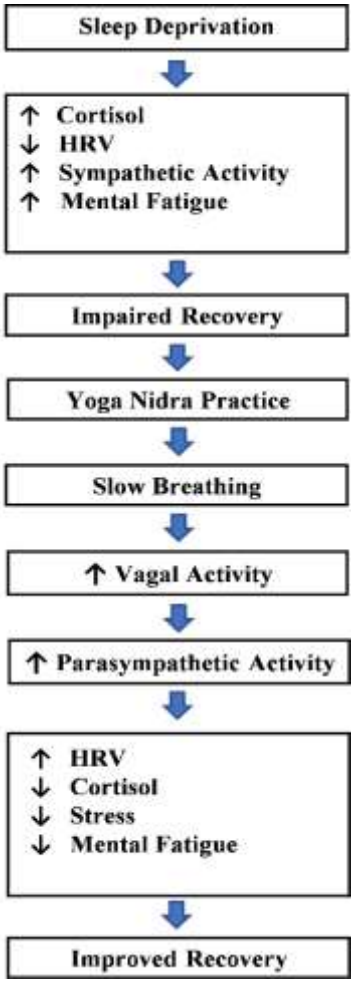


Figure 1: Proposed neurophysiological pathways through which Yoga Nidra may support recovery in sleep-deprived athletes.

Yoga Nidra and recovery in sleep deprived athletes

Yoga Nidra is becoming popular in sports field due to sleep deprivation of athletes during training, competitions and travel (Musto & Hazard Vallerand, 2023). Team athletes have to deal with late-night competition, travel across different time zones, tight schedule and high-pressure situations. All of these can adversely affect recovery and overall wellbeing (Bonnar et al., 2018). Combat athletes, particularly those who are undergoing rapid weight loss and having pre-fight anxiety frequently experience sleep problems (Musto & Hazard Vallerand, 2023). Such challenging situations can cause sleep deprivation. Therefore attention towards recovery techniques that can help to restore body and mind is increasing (Bonnar et al., 2018). Yoga Nidra can be beneficial for this purpose because Yoga Nidra is an accessible, low resource intervention that can be practiced almost anywhere (Musto & Hazard Vallerand, 2023). When feeling tired, practicing Yoga Nidra merely 20 to 30 minutes may assist to reduce physical and mental stress (Kong et al., 2025). Evidence suggests that Yoga Nidra aids in improving perceived recovery,

emotional regulation, and sleep quality. Thus, it indicates that Yoga Nidra is a useful tool to overcome the constraints created by sleep deprivation and competition stress (Di Fronso et al., 2024; Fullagar et al., 2015).

Balancing recovery and stress level through efficient control of body and mind is one of the most effective means in which Yoga Nidra helps sleep deprived athletes (Di Fronso & Bertollo, 2021). Sleep deprivation in athletes can cause elevated stress levels, reduced nervous system recovery, mood disturbances, and experiencing fatigue during exercise. It can impair performance and interfere with training (Charest & Grandner, 2022). Yoga Nidra facilitates physical relaxation and promotes mental calmness. This may provide a short-term recovery for athletes by alleviating tension and enhancing feelings of refreshment (Malviya et al., 2025). Emotional regulation, restoring focus, and reducing mental fatigue are all part of recovery, not just muscle repair (Doherty et al., 2021). This makes Yoga Nidra advantageous particularly for athletes who continuously suffer from stress. For example footballers who have congested tournament schedule and combat athletes who need quick recovery in between fights, this may be beneficial (Nédélec et al., 2015). Some evidence indicates that Yoga Nidra increases awareness and helps athletes to efficiently manage their fatigue and stress responses (Musto & Hazard Vallerand, 2023). Yoga Nidra is not a substitute for regular night-time sleep but it can be used as an additional tool for reducing the adverse effect of insufficient rest during high pressure situations (Walsh et al., 2021). In modern day sports recognition for Yoga Nidra is increasing, especially the possibilities of supporting athletes' recovery and overall wellness are attracting attention (Walsh et al., 2021).

In high performance sports programs wearable technologies are widely used to observe heart rate variability, sleep quality, breathing patterns, and how rested athletes feel. This data helps to control training load and reduce fatigue (Halappa, 2023). Stress regulation and breathing can be improved by Yoga Nidra, so it is considered as one of the best methods for personalised recovery plans. During intense competitions scheduled Yoga Nidra sessions can be useful for athletes who have lower vagal activity and elevated fatigue, especially after training and during travel (Laborde et al., 2022). Another uniqueness of Yoga Nidra is that it is affordable and drug-free. Therefore, Yoga Nidra may serve as a practical recovery strategy for both elite athletes and developing athletes when advanced recovery methods are not easily available (Musto & Hazard Vallerand, 2023). The idea of non-sleep deep rest further increases the importance of Yoga Nidra in sports science (Di Fronso et al., 2024). Even so, there are still many questions that remain unanswered. For instance, how long these interventions should last, how to individualise them for different athletes, and how they influence performance directly. So, this shows the necessity of more research that evaluates brain function, hormone levels, and sports specific performance metrics collectively (Musto & Hazard Vallerand, 2023).

Comparative discussion: Yoga Nidra and normal sleep

Yoga Nidra is often known as yogic sleep or a form of deep rest, unlike normal sleep. Even though there are some similarities (Datta, Mallick, et al., 2022). Normal sleep is essential for the body, which includes non-rapid eye movement (NREM) and rapid eye movement stages of sleep cycles (Stich et al., 2022). Each stage plays a separate role in

recovery. For instance, deep NREM sleep is crucial for growth hormone secretion, removing toxins from the brain, immune system regulation, reinstating energy stores, and repairing tissues. Concurrently, REM sleep helps in emotional processing, memory consolidation, and improving brain's adaptability (Cao et al., 2020; Kaczmarek et al., 2025). Yoga Nidra does not fully replicate the physiological functions of normal sleep. Instead, it creates a unique state of deep relaxation while awareness remains. During this phase, decrease in some brain activities can be observed (Datta, Mallick, et al., 2022). According to studies, while practicing Yoga Nidra the practitioner's brain shows slow-wave activity, changes in brain wave pattern, and reduction in stress response. Although, the individual may appear awake to outside observers (Sharpe et al., 2021). However, Yoga Nidra and sleep share certain common neural features. Through the processes such as reducing stress level, lowering energy expenditure, increasing parasympathetic activity, slowing breathing, and changing brain wave activity similar to primary stages of sleep, Yoga Nidra may help to imitate some restorative benefits of sleep (Zaccaro et al., 2021).

Yoga Nidra is different from normal wakefulness, since participants deliberately detach from external disturbances while remaining aware throughout the practice (Fialoke et al., 2024). In contrast to resting, Yoga Nidra involves guided attention, breathing exercises, and awareness of internal sensations. It helps to calm body and mind, and stabilise emotions (Lazzarelli et al., 2024). According to neuroimaging studies, Yoga Nidra can alter how different brain networks interact with one another and helps to reduce cortical connectivity, supporting the concept of "restful but aware" neurophysiological state (Vishnubhotla et al., 2021). From a sports recovery perspective this is very useful because athletes usually struggle to achieve mental detachment from stress, competition anxiety, and circadian misalignment from travel (Doherty et al., 2021). Therefore, when achieving optimum sleep gets hard Yoga Nidra may provide a purposefully induced state of recovery in a systematic manner (Musto & Hazard Vallerand, 2023). However, current evidence is not sufficient to determine how much Yoga Nidra can compensate for prolonged inadequate sleep (Gibson, 2019). Only by completing the total sleep cycle, key recovery functions like hormone cycles, brain connection maintenance, and metabolic clearance will be totally reproduced and conscious relaxation practices are not capable of achieving this. So Yoga Nidra should be considered as a complementary recovery strategy not a replacement for sufficient sleep (Chong et al., 2022).

Table 1: Comparison of Normal Sleep and Yoga Nidra as Recovery Modalities in Athletes

Characteristic	Normal Sleep	Yoga Nidra
Conscious awareness	Absent	Maintained
Parasympathetic activation	High	Moderate–High
Stress reduction	High	High
Heart rate variability enhancement	High	Moderate
Emotional regulation	High	High
Mental fatigue reduction	High	Moderate–High
Growth hormone secretion	High	Not established
Glymphatic clearance	High	Not established
Memory consolidation	High	Limited evidence
Physical restoration	High	Low–Moderate
Practicality during travel/competition	Often limited	High
Typical duration	7–9 h	20–40 min
Can replace nocturnal sleep?	N/A	No

Note. *Information synthesized from (Cao et al., 2020; Di Fronso et al., 2024; Di Fronso & Bertollo, 2021; Kaczmarek et al., 2025; Musto & Hazard Vallerand, 2023; Pandi-Perumal et al., 2022; Sharpe et al., 2021; Zaccaro et al., 2021) and related literature reviewed in this paper.*

Limitations and Future Research Directions

Recently, Yoga Nidra and related non-sleep deep rest practices are gaining increasing scientific interest but currently available evidence is still limited. Along with that, it is difficult to reach a robust conclusion regarding its effectiveness in sleep deprived athletes due to its methodological limitations (Di Fronso et al., 2024). Most of the studies are conducted on clinical populations, healthy adults, and general wellness populations. Studies are limited on elite sporting environments, especially athletes experiencing physiological stress, intensive training load, and competition related sleep deprivation. So, there are constraints in directly applying these findings to the athletic population (Doherty et al., 2021). Sports- related studies also have limitations such as small sample sizes, short intervention durations, and heterogeneous methodologies involving variations in session length, instructional style, practice frequency, and participant experience (Di Fronso & Bertollo, 2021). Additionally, objective neurophysiological outcomes like electroencephalography, heart rate variability, respiratory dynamics, endocrine responses, and sleep architecture are not evaluated uniformly across all studies. Studies that integrated electroencephalography, heart rate variability, hormonal biomarkers, and sport-specific performance measures, into a single experimental framework are also very few (Gong et al., 2024). Therefore, several potential mechanisms that explain how Yoga Nidra influences athletic recovery are still theoretical instead of validated using scientific evidence (Musto & Hazard Vallerand, 2023). So, in the future athlete-centered longitudinal studies should be given more importance. Especially, by involving athletes who experience sleep deprivation during

real competition conditions. In addition, studies should be conducted by integrating multiple physiological variables monitoring, wearable technologies, respiratory variability, heart-breathing interaction, brain imaging, mental assessment, and sports specific performance indicators. These approaches will help to understand the practical and mechanistic relevance of Yoga Nidra in evidence based sports recovery science (Bonnar et al., 2018; Di Fronso & Bertollo, 2021).

Conclusion

Sleep deprivation is a growing concern in modern-day sports, due to its adverse effect on hysiological recovery, cognitive function, emotional regulation, autonomic balance, and sports performance. Busy training schedules, competition stress, travel, and other sport-related requirements can disrupt athletes' sleep architecture. The evidence reviewed in this paper indicates that Yoga Nidra may offer a practical solution for athletes who suffer from sleep deprivation. By mechanisms that involve autonomic regulation, slow breathing, enhanced vagal activity, reduced stress responses, and improved emotional regulation, Yoga Nidra may create a state which supports recovery. Considering the neurophysiological responses associated with Yoga Nidra and the characteristics it shares with normal sleep,

Yoga Nidra has the potential to promote recovery. Especially, by enhancing heart rate variability, reducing stress, and lowering mental fatigue. However, no evidence supports the use of Yoga Nidra as a substitute for sleep. It is a complementary recovery strategy that may assist athletes to manage some adverse effects of inadequate sleep. Although current studies about the effectiveness of Yoga Nidra and related non-sleep deep rest practices on athletic recovery are limited and several questions are still remaining unanswered, scientific interest in these interventions has increased in recent years. Existing studies are mostly on non-athletic populations, direct investigations that incorporate elite athletes, competition schedules, and real-world sleep deprivation are rare. Additionally, the differences in intervention protocols, study designs, outcome measures, and participant characteristics make it difficult to draw a definitive conclusion regarding the effectiveness of Yoga Nidra. Even though, several proposed mechanisms connecting Yoga Nidra and recovery are biologically reasonable, confirmation is required using integrated assessments of heart rate variability, respiratory dynamics, endocrine responses, cognitive functions, and sport- specific performance outcomes. Therefore, athlete-centered longitudinal studies are essential for finding the practical value of Yoga Nidra in evidence-based sports recovery programs and for determining optimal intervention characteristics. However, available evidence gives adequate physiological and theoretical rationale to consider Yoga Nidra as a promising, accessible, and low-cost recovery strategy. So, further research is necessary to clearly understand its applicability and effectiveness in athletic populations.

Author Contributions VR conceived the review topic, conducted the literature search, synthesized the evidence, and prepared the initial manuscript draft. SBS, AE, and AC contributed to literature review, manuscript development, and critical revision of the manuscript. RM supervised the study, provided academic guidance throughout the

review process, performed the final editing and corrections, and reviewed the manuscript for intellectual content. All authors read and approved the final version of the manuscript.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Conflict of Interest The authors declare that they have no competing interests and no conflict of interest to disclose.

Ethical Approval Ethical approval was not required for this study because it is a narrative review based on previously published literature.

Informed Consent Informed consent was not required because no human participants were involved in this study.

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YOGA, MENTAL HEALTH, AND EMOTIONAL WELL-BEING

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Abstract

Yoga is a training of mind and body to bring about an emotional balance. The main concept in this paper is that yoga may help youth to cope with stress and thus improves their mental well-being and motivates them to adopt Yoga and Meditation to be self-guided, self-motivated and also self-driven. When the mind or psyche is not functioning properly, it may pave the way for many psychological and physiological disorders and illnesses due to a weak immune system. Thus, securing and maintaining the health of the mind and emotions is to be replaced by is of utmost importance to ensuring good health. A healthy person makes important contributions to family, society, country, and world progress; as such, a person would be more productive and constructive. Emotional health: Emotional health consists of maintaining all aspects of emotions, namely, lively and correct expression of emotions, controlling emotions, understanding the emotions of others properly, and experiencing emotions physiologically in the right way. It is also concerned with maintaining a proper emotional environment. A person with good emotional health, therefore, manages and understands the emotions of self and others efficiently. Such a person is called an emotionally intelligent person. Yoga is a discipline in which we learn to rule over your subtle nature through training of mind and body; the training takes place in and on our mind and body, so that we can see and place us as the real one. Thus, Yoga expresses harmony with your own individual consciousness and nature. Its technique starts from the gross roots level, which is the physiological level. Physiological level can be further classified into inner/outer level and subtle level, one's mind comprises of thought, emotions, feeling and genetic, molecular level. The practice and adaptation of Ashtanga Yoga in one's life is helpful in removing 'Chittavrittis' and Vikshep It gives a steady and calm mind, which is free from all kinds of 'Klishta' and 'Alklisht Vrittis', which helps a person control, manage, and regulate his/her mind in the right way. The concept of 'Chittprasadnam' in Yoga talks about how one can remain positive even in adverse situations by cultivating positive thoughts.Asthanga Yoga: Asthanga Yoga is way to control the mind which is root cause of all psychosocial problems. Asthanga Yoga is basically focused upon the spiritual development, but it is also very relevant to attain holistic health. If Asthanga Yoga is adopted and follows properly in one's life then physical, intellectual, emotional, social and spiritual development and health of a person remain intact. Yoga can empower individuals' positively to take charge of their own psychological wellness and save a large expenditure for treatment and prevention of mental health problems. Yoga can take the form of a new therapy for curative, preventive, protective and promotive objectives at schools, hospitals, health care centres and in family. Yoga is a way of life and this helps to an individual to live a life in right way, aim is to bring mind-body in harmony and leads to path on peace and happiness and emotional well being.

1. Introduction

Modern lifestyles are characterized by chronic stressors that contribute significantly to the global burden of mental health disorders. Anxiety, depression, and stress-related illnesses compromise both individual well-being and public health infrastructure. “Dr Brock Chisholm, the first Director-General of WHO, state that ‘There is no health without mental health’. Today, 10 October, is globally recognized and celebrated as World Mental Health Day, thus sending out a clear message for the masses that mental health is more than a mere lack of mental disorders. The perception of wellness, capability, skills, independence, knowledge, and self-growth forms the core of mental health. This perception helps a person to recognize his/her emotional and cognitive abilities and potential too. Only a healthy person can make a healthy family, and only a healthy family can make a healthy society, and only a healthy society can make a healthy nation. Therefore, mental health deserves as much care as one would give to any other aspect of health.

Consequently, there is growing clinical interest in integrative, self-directed wellness practices. Yoga offers a multi-dimensional framework that addresses both the physical and psychological dimensions of human suffering. Rather than viewing mental health merely as the absence of illness, yoga promotes subjective well-being—a state of thriving characterized by emotional resilience, self-awareness, and inner peace. Yoga improves mental health by reducing cortisol and calming the nervous system. It boosts "feel-good" brain chemicals like endorphins and GABA.

Regular practice—combining physical poses, breathwork, and mindfulness—effectively relieves anxiety, depression, and stress while promoting emotional balance.

2. Neurobiological and Physiological Mechanisms

The mental health benefits of yoga are grounded in its measurable impact on the human nervous system and brain chemistry.

2.1 Autonomic Nervous System Regulation

Chronic stress hyperactivates the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis, resulting in chronically elevated cortisol levels. Yoga shifts the autonomic nervous system balance from sympathetic dominance ("fight-or-flight") to parasympathetic dominance ("rest-and-digest"). This shift lowers heart rate, reduces blood pressure, and decreases systemic inflammation by suppressing pro-inflammatory cytokines.

Neurotransmitter System Modulation

Regular yoga practice directly influences brain chemistry:

- **GABA (Gamma-Aminobutyric Acid):** Studies show that yoga increases thalamic GABA levels, the brain's primary inhibitory neurotransmitter, which helps reduce brain activity and alleviate acute anxiety.
- **Serotonin and Dopamine:** Yoga stimulates the synthesis of these "feel-good" chemicals, which are crucial for mood stabilization and reward pathways.

3. Psychological and Behavioral Benefits

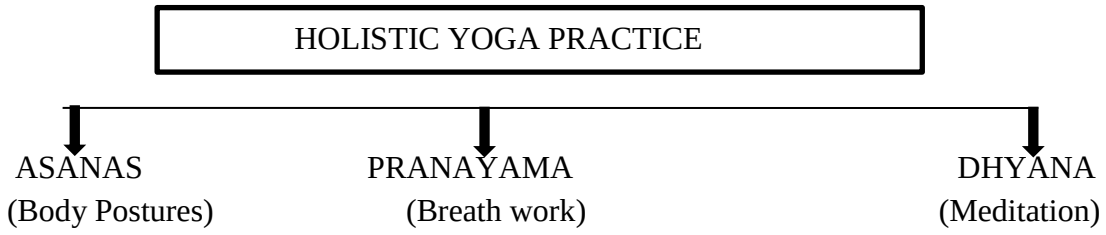
Yoga addresses the psychological vulnerabilities that sustain mental illness, primarily through the cultivation of mindfulness. Clinical trials consistently demonstrate that yoga decreases symptoms of generalized anxiety disorder (GAD) and major depressive disorder (MDD).

3.1 Enhanced Emotional Regulation and Resilience

Through the deliberate discomfort of holding challenging physical postures, individuals develop distress tolerance. Practitioners learn to observe difficult bodily sensations and emotional fluctuations without judgment or immediate reaction. This somatic awareness translates directly into everyday life, improving emotional self-regulation and coping strategies during crises.

4. Primary Components of Yogic Interventions

A comprehensive yogic approach to mental health relies on three distinct yet interconnected pillars:



In Yoga philosophy, mind or intellect can be understood as 'Chitta'. The 'Vrittis' (disturbance of mind) is understood as the root cause of all mental illness. Vrittis are created in mind by 'Kleshas' (afflictions). False knowledge, desire, and attachment create Kleshas in the mind.Diseases or illnesses in body, such as psychosomatic diseases, arise due to mental conflicts or stress.

Mental Health Problems Worldwide

Mental health problems are spreading at a fast rate due to multiple reasons. In 2017, a study was conducted by the Institute for Health Metrics and Evaluation reported in their flagship of global burden of disease study that approximately 792 million people across the world suffer from mental disorders and that lead a poor quality of life. This is slightly more than one in ten people globally (10.7%) (Global Burden of Disease study, 2017). Among mental disorders, depression is most common among people. The National Institute of Mental Health (NIMH) had conducted a survey in 2015-16 across India. According to this survey, 10.6% were suffering from mental health problems.

According to Patanjali Yoga Sutra, five Kleshas, or afflictions are the main reasons for all mental suffering. The five negative states of mind or 'afflictions' are as given below.

1. Avidya (ignorance)
2. Asmita (egoisms)
3. Raga (attachment to material world)
4. Dvesa (aversion or hatred)
5. Abinivesah (fear of death and attachment for life).

The practice and adaptation of Ashtanga Yoga(Yama, Niyama, Asana, Pranayama, Prathyahar, Dharna, Dhyana, Samadhi) in one's life is helpful in removing 'Chittavrittis' and Vikshep It gives a steady and calm mind, which is free from all kinds of 'Klishta' and 'Alklisht Vrittis', which helps a person control, manage, and regulate his/her mind in the right way. The concept of 'Chittprasadnam' in Yoga talks about how one can remain positive even in adverse situations by cultivating positive thoughts.

Asthanga Yoga: Asthanga Yoga is way to control the mind which is root cause of all psychosocial

problems. If Asthanga Yoga is adopted and follows properly in one's life then physical, intellectual, emotional, social and spiritual development and health of a person remain intact.

It consists of eight limbs; therefore, it is called and known as Asthanga Yoga (eight-limbed Yoga). The limbs of Asthanga Yoga are as follows Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi. These eight limbs have been further divided into two parts known as Bahiranga Yoga and Antaranga Yoga.

Bahiranga Yoga consists of Yama, Niyama, Asana, Pranayama and Pratyahara while Antaranga Yoga consists of last three Dharana, Dhyana and Samadhi.

Yama: Ahimsa-satya-asteya-brahmacarya-aparigrahah-yamah P.Y.S. 2.30

Yama can be understood as code of social conduct and behavior.

Niyama: Sauca-santosa-tapah-svadhyaya-isvara-pranidhanani-niyamah P.Y.S. 2.32

Niyama literal means binding rules and observances or discipline.

Asana: Sthira-sukham-asanam P.Y.S. 2.46.

Asana means correct posture and or seat. It regulates pranic flow in whole body and optimizes the functioning of all organs and systems of body. It gives strength, flexibilities and mobility to the body.

Pranayama: Tasmin sati svasa-prasvasayor-gativicchedahpranayamah P.Y.S. 2.49

Pranayama. It helps to activate the Parasympathetic nervous system, which plays significant role in emotion regulation. Regular practice of Pranayama balances the autonomic nervous system which gets disturbed in stressful situation. It is used to slow down negative emotion and maintain the peace of mind in adverse situation.

Pratyahara: Sva-visaya-asamprayogecitta-svarupanukaraivendriyanam pratyaharah P.Y.S. 2.54

It means the withdrawal of senses from their respective external object. It comes after Pranayama when a person is able to regulate his/her breathing then he/she should learn to control the senses and make it inward. Our senses play an important role in our mental state because when we make any impression or view on the basis of the information which is received by our senses, that impression leads certain emotion and our chitta or mind gets disturbed. So, key to maintain tranquillity is to achieve Pratyahara. Therefore we need to withdraw our senses from worldly things for controlling our mind and protect ourself from emotional turbulences. Our senses follow the mind so by controlling the senses, mind can be controlled/stablized. Pratyahara can be achieved by self-analysis and introspection which leads journey inwards from outward.

Dharana: Desabandhas-cittasyadharana P.Y.S. 3.1

Dharana means controlling or focusing the mind on single point. It is on important tool to for the purification of mind and achieving Chittashuddhi. After Dharan a person can move towards Dhyana. It leads towards emotional, intellectual and spiritual development.

Dhyana: Tatrapratyayaikatanatadhyanam P.Y.S. 3.2

At this stage , a person has a stable mind and Chittashudhdi is achieved.

Samadhi: Tadevarthamatra-nirbhasamsvarupa-sunyamivasamadhih P.Y.S. 3.3

An individual reaches at a stage of blissfulness and inner peace. Samadhi is state of self-realization.

6. Conclusion

Yoga teaches to manage our thoughts, feelings and emotions in regulatory and balanced manner so that to integrate inner and outer life in meaningful and contented way. It helps to lead a conscious life.Yoga offers an empirically supported, cost-effective, and low-risk intervention for improving global mental health and Emotional well-being. By down-regulating the body's stress response and fostering a mindful, non-judgmental relationship with the self, yoga effectively bridges the gap between physiological health and psychological resilience. Integrating yoga into mainstream mental health frameworks can empower individuals with self-sustaining tools for lifelong emotional well-being.

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PERSONALITY TRAIT PROFILES OF COMPETITIVE KARATE AND BOXING ATHLETES: A COMPARATIVE ANALYSIS

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Abstract

Background: *Combative sports involve regulated one-on-one physical confrontations that integrate striking, grappling, or both within defined rules and safety standards. Disciplines such as boxing, wrestling, judo, karate, and taekwondo require exceptional physical conditioning, technical precision, tactical awareness, and psychological resilience.*
Objective: *The prime purpose of this study was to investigate the characteristics and significant difference of personality traits between karate and boxing athletes.*
Methods: *To accomplish the objective, 40 female players—20 each from boxing and karate—were selected. The minimum level of participation required for inclusion in the study was competition at the state-level tournament or championship between the ages of 18 and 23. To locate the sources of data, karate players were selected from the Manipur Amateur Karate-do Association (MAKA) and boxing players from the Manipur Amateur Boxing Association (MABA). The Cattell's Sixteen Personality Factor (16PF) Questionnaire, Fifth Edition, developed based on Raymond B. Cattell's theory of personality was adopted to measure the personality traits of the selected combative discipline. The independent t-test was used in 0.05 levels of significance.*
Results: *The independent t-test ($p < 0.05$) revealed insignificant differences between karate and boxing athletes for all factors A, B,C,E,F,G,H,I,L,M,N,O,Q1,Q2,Q3 and Q4.*

Keywords: *Personality traits, karate, boxing and combative sports.*

1. Introduction

Sport is widely regarded as one of the most ecologically rich contexts for studying human personality, given that athletic participation simultaneously reflects, shapes, and reinforces enduring psychological dispositions (Allen & Laborde, 2014; Weinberg & Gould, 2019). Within this broader landscape, combative sports occupy a particularly compelling niche. Broadly defined as competitive physical disciplines in which two opponents engage in direct, rule-governed confrontation through striking, grappling, or a combination of both, combative sports encompass a diverse array of practices — including boxing, wrestling, judo, karate, and taekwondo — each codified by regulatory bodies to safeguard participant well-being while preserving competitive integrity (Amtmann & Cotton, 2005; Buse, 2006). What unites these ostensibly disparate disciplines is a shared structural characteristic: performance outcomes are determined almost exclusively through one-on-one encounters in which an athlete must simultaneously execute technical skill under duress, respond tactically to an unpredictable opponent, and sustain high-intensity physical output across intermittent bouts — demands that differentiate combative sports

from the collective interdependence of team games and the environmental variability of open-skill team contexts (García-Naveira & Díaz-Morales, 2010; Malinauskas, 2010).

The unique interpersonal dynamics inherent to combative sports — particularly the sustained direct physical confrontation with a single rival — impose distinctive psychological demands that extend well beyond aerobic capacity and technical proficiency. Effective performance in these disciplines necessitates the integration of courage, controlled aggression, rapid tactical decision-making, and precise emotional self-regulation, qualities that are inseparably intertwined with the psychological architecture of the competing athlete (Allen & Laborde, 2014; Weinberg & Gould, 2019). It is this intimate relationship between psychological disposition and competitive demand that renders combative sports a uniquely productive context for investigating personality profiles and their implications for athletic behavior (Kravitz, 2015; Malinauskas, 2010).

Personality — defined as the relatively stable and enduring constellation of psychological characteristics that consistently influence an individual's cognition, affect, and behavior across contexts — has long been recognized as a meaningful determinant of athletic functioning (Allen & Laborde, 2014; Roberts et al., 2018). Empirical evidence indicates that successful athletes tend to present systematically lower neuroticism and higher extraversion and conscientiousness relative to less accomplished competitors or non-participating individuals, suggesting that specific personality configurations may confer measurable advantages in training adherence, competitive resilience, and psychological preparedness (Allen et al., 2011; Laborde, Guillén, & Mosley, 2016). In the domain of combative sports specifically, athletes engaged in boxing, judo, wrestling, and taekwondo have been reported to display elevated conscientiousness and greater emotional stability than counterparts in many team-based disciplines, though the consistency of these findings across different combative sub-disciplines remains an area of ongoing inquiry (Madic et al., 2019; Malinauskas, 2010). The mechanisms underlying this convergence remain a subject of theoretical debate, with scholars invoking both the gravitational hypothesis — whereby individuals with predisposed personality configurations self-select into sport environments that are congruent with their dispositions — and the sport socialization hypothesis, which posits that the culture, discipline, and rigors of prolonged training actively shape and reinforce particular traits over time (Jagiello & Sawczyn, 2012; Allen et al., 2011).

Against this backdrop, the systematic investigation of personality profiles across different combative sport disciplines carries significant practical import. Establishing whether distinct combat sports attract or cultivate meaningfully different psychological profiles can provide actionable insights for talent identification, athlete-specific coaching strategies, and the design of psychological preparation programs tailored to the cognitive and emotional demands of each discipline (Allen & Laborde, 2014; Vealey & Chase, 2016). To date, however, few studies have conducted a rigorously comparative assessment of personality across multiple combative sports within a standardized psychometric framework.

The present study, therefore, aimed to compare the personality profiles of athletes from selected combative sports using the Sixteen Personality Factor Questionnaire (16PF), developed and standardized by Raymond B. Cattell and Herbert W. Eber. The 16PF is a comprehensive, empirically derived measure of normal-range personality that assesses sixteen primary source

traits — including Warmth (A), Reasoning (B), Emotional Stability (C), Dominance (E), Liveliness (F), Rule-Consciousness (G), Social Boldness (H), Sensitivity (I), Vigilance (L), Abstractedness (M), Privateness (N), Apprehension (O), Openness to Change (Q1), Self-Reliance (Q2), Perfectionism (Q3), and Tension (Q4) — and has demonstrated robust construct validity and extensive applicability in sport psychology research contexts (Cattell & Eber, 1970; Schurr et al., 1977). The breadth of this instrument makes it particularly well-suited to generating nuanced, multidimensional personality profiles of combative sport athletes, addressing a gap in the existing literature and contributing to a more granular understanding of the psychological characteristics associated with participation in distinct combat disciplines.

2. Objective

The prime purpose of this study was to investigate the characteristics and significant difference of personality traits between karate and boxing athletes.

3. Methodology

3.1 Participants and procedure

Subjects: Stratified random sampling method was employed to collect a sample of 40 female players—20 each from karate and boxing—were selected. The minimum level of participation required for inclusion in the study was competition at the state-level tournament or championship.

Inclusion Criteria: Participating subjects must be between the ages of 18 and 23 and in accordance with the objective of the study, the researcher traced reliable sources to the best possible extent. To locate the sources of data, karate players were selected from the Manipur Amateur Karate-do Association (MAKA) and boxing players from the Manipur Amateur Boxing Association (MABA).

Procedure: Permission to conduct the study was obtained not only from the subjects but also from each trainer/coach and the head of the institutions. Subjects were selected based on meeting the criteria. The investigator provided information about the research content and questionnaire survey. Subjects were given a consent form and an evaluation form to complete. Any questions or doubts regarding the questionnaire were clarified by the investigator.

3.2 Measurement tools

For the present study, athletes participating in selected combative sports were administered the Cattell's Sixteen Personality Factor (16PF) Questionnaire, Fifth Edition, developed based on Raymond B. Cattell's theory of personality. The 16PF is a standardized psychological assessment designed to evaluate an individual's personality profile across multiple dimensions. It comprises sixteen primary personality factors, which include: A – Warmth, B – Reasoning, C – Emotional Stability, E – Dominance, F – Liveliness, G – Rule-Consciousness, H – Social Boldness, I – Sensitivity, L – Vigilance, M – Abstractedness, N – Privateness, O – Apprehension, Q1 – Openness to Change, Q2 – Self-Reliance, Q3 – Perfectionism, and Q4 – Tension. These factors collectively provide a comprehensive assessment of personality characteristics relevant to behavioural tendencies and performance patterns in sports contexts.

3.3 Statistical Analysis

To investigate the differences of personality traits among the selected combative sports,

independent t test was employed at 0.05 level of confidence ($p<0.05$). For statistical analysis, SPSS version 22 was employed.

4. Results

To investigate the characteristics and significant difference of personality traits between karate and boxing athletes, mean (M), Standard deviation, t test, p-value and result were computed and data pertaining to this has been presented in Table 1.

Table 1: Descriptive and Comparative Analysis of Personality traits for the selected combative sports- Karate and Boxing

	Measure	Karate	Boxing	t	Sig
		M±SD	M±SD		
A	Warmth	5.00±1.12	5.10±1.45	0.24	0.81
B	Reasoning	7.95±1.73	8.15±2.16	0.32	0.75
C	Emotional Stability	6.95±1.76	7.65±2.16	1.12	0.27
E	Dominance	8.10±1.83	8.70±2.05	0.98	0.34
F	Liveliness	7.65±1.35	8.15±1.66	1.04	0.30
G	Rule bound ness	6.70±1.56	6.70±1.75	0.00	1.00
H	Social Boldness	6.25±1.65	7.00±2.75	1.05	0.30
I	Sensitivity	6.65±1.31	6.55±1.23	0.25	0.81
L	Vigilance	6.70±1.66	6.75±1.77	0.09	0.93
M	Abstractedness	5.65±1.14	5.75±1.59	0.23	0.82
N	Privateness	7.30±1.75	7.35±1.95	0.	0.

				71	93
O	Apprehension	8.40±1.90	9.00±1.92	0.99	0.33
Q1	Openness to change	6.20±1.74	6.15±1.79	0.09	0.93
Q2	Self-reliance	5.70±1.34	5.95±1.76	0.22	0.63
Q3	Perfectionism	6.85±1.60	6.95±1.82	0.19	0.86
Q4	Tension	8.10±1.74	9.00±1.72	1.65	0.11

* *Significant at 0.05 level of confidence; $t_{0.05}(38)= 2.024$*

Table 1 indicated insignificant differences between karate and boxing athletes for all factors A, B,C,E,F,G,H,I,L,M,N,O,Q1,Q2,Q3 and Q4 (all p > 0.05) as the calculated t value are lesser than the table value $t_{0.05}(38)= 2.024$.

The mean differences of Personality traits for the selected combative sports- Karate, and Boxing are graphically presented in figure 1.

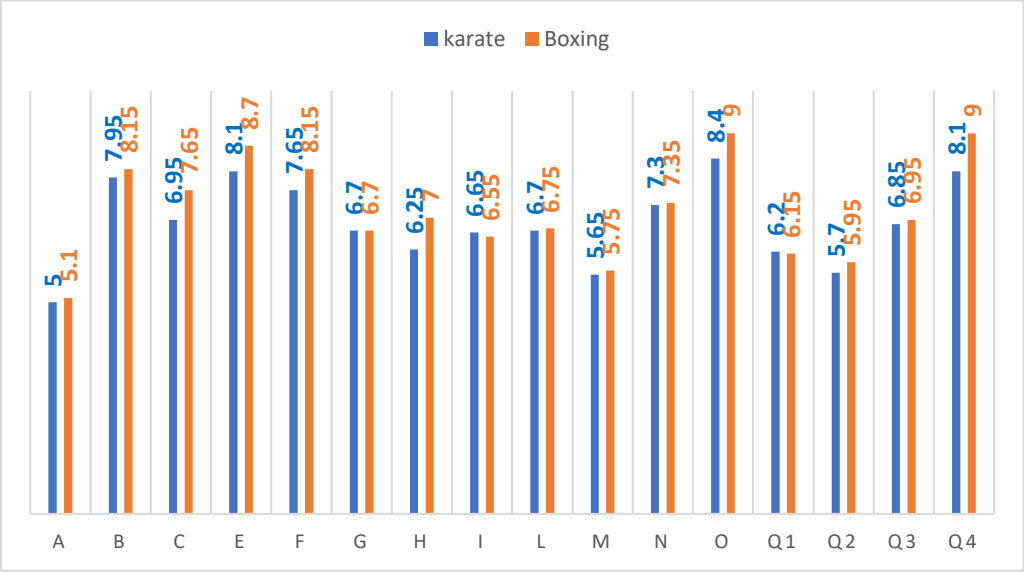


Figure 1: Graphical representation of Personality traits for the selected combative sports- Karate and Boxing.

5. Discussion and Conclusion.

The present findings, indicating no statistically significant differences between karate and boxing athletes across all sixteen primary personality factors of the 16PF, can be explained

through a confluence of theoretical frameworks and empirical precedents. As both karate and boxing are classified within the overarching combat sports domain, they impose structurally comparable psychological demands — including controlled aggression, mental resilience, tactical acuity, and emotional regulation — and are grounded in analogous training cultures and competitive contexts. Such shared environmental conditions are known to foster convergent personality profiles among athletes within the same sport classification (Bojanić et al., 2019; Leuzzi et al., 2024). From a dispositional standpoint, the gravitational hypothesis offers a compelling explanation, proposing that individuals are drawn toward sport environments that are congruent with their pre-existing personality dispositions; consequently, athletes competing in structurally similar combat disciplines would be expected to exhibit reduced inter-group personality variance (Allen et al., 2013). This perspective finds empirical support in the seminal work of Kroll and Crenshaw (1970), who, employing the same 16PF instrument, reported homogeneous personality configurations among athletes engaged in sports with comparable structural and psychological characteristics — a pattern that aligns directly with the null findings of the present investigation. Furthermore, the maturity principle underscores that sustained engagement in any combat sport exerts a parallel developmental influence on personality, progressively shaping athletes toward greater emotional stability, conscientiousness, and self-regulation irrespective of the specific discipline practiced (Allen et al., 2013; Leuzzi et al., 2024). The instrument-level limitations of the 16PF may also be implicated, as Schurr et al. (1977) demonstrated that the questionnaire's discriminant sensitivity is markedly stronger when contrasting broadly divergent sport categories than when differentiating between closely related sub-types such as two combat sports. Taken collectively, these theoretical and methodological considerations substantiate the non-significant outcomes observed across all 16 personality dimensions and are consistent with prior investigations reporting the absence of significant personality differentiation between athlete cohorts drawn from structurally analogous sport disciplines (Nia & Besharat, 2010).

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SACRED LANDSCAPES, DHARMIC ETHICS, AND ECOLOGICAL CONSCIOUSNESS IN INDIAN EPICS AND SPIRITUAL LITERATURE

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Abstract

Indian epics and spiritual literature preserve a richly layered ecological imagination in which forests, rivers, mountains, animals, and seasonal rhythms participate actively in ethical and spiritual life. This paper studies the Ramayana, Mahabharata, and selected Bhakti and Upanishadic traditions through ecocritical close reading, comparative hermeneutics, and environmental humanities discourse informed by deep ecology and spiritual ecology. Although scholars such as Ramachandra Guha, Greg Garrard, and Lawrence Buell have significantly shaped debates on ecology and literature, Indian eco-spiritual traditions continue to be approached more often as philosophical ideals than as sophisticated literary articulations of ecological ethics (Guha; Garrard; Buell). This paper addresses that critical gap by arguing that Indian epics imagine nature not as decorative scenery surrounding heroic action but as a sacred moral force that shapes dharma, restraint, suffering, and coexistence. The study further demonstrates that exile narratives, sacred groves, river symbolism, and meditative landscapes generate an ethics of reciprocity between human and non-human worlds. In the Ramayana, the forest emerges as "tapasya-bhumi," a space of discipline, humility, and inner transformation, whereas the Mahabharata repeatedly associates ecological ruin with violence, greed, and moral disorder. Bhakti poetry likewise presents birds, rain clouds, flowering trees, and changing seasons as living presences within spiritual experience rather than ornamental imagery. Such literary moments resist anthropocentric domination and foreground ecological interdependence, ethical restraint, and reverence for the natural world. By reinterpreting Indian literary traditions through contemporary ecocritical frameworks, this paper argues that Indic spiritual thought offers an alternative ethical imagination urgently relevant to the present climate crisis. Future research may further recover vernacular eco-spiritual narratives, oral traditions, and Indigenous literary memory as vital resources for global environmental humanities scholarship.

Keywords: Dharmic Ecology; Ecocriticism; Eco-spirituality; Indigenous Environmental Thought; Sacred Landscapes

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international journals.

Introduction

The twenty-first century has witnessed an unprecedented ecological crisis. Climate change, deforestation, biodiversity loss, polluted rivers, and environmental displacement have transformed ecology from a scientific concern into a deeply cultural and ethical issue. Literature, in this context, becomes more than artistic expression; it emerges as a site where civilizations negotiate their relationship with nature. Ecocriticism, therefore, examines not only how nature is represented in literary texts but also how literature shapes environmental imagination and ethical responsibility. Cheryll Glotfelty views ecocriticism as a literary approach that explores interactions between human culture, textual representation, and the environment (xviii). What appears increasingly significant today is the realization that ecological wisdom did not begin with modern environmental movements alone. Many ancient literary traditions had already developed sophisticated ecological visions rooted in ethics, spirituality, and cultural memory. Indian epics and spiritual literature occupy a crucial place within this intellectual tradition. Texts such as the Ramayana, the Mahabharata, the Bhagavad Gita, and the Upanishads imagine nature not as an inert backdrop but as a living, sacred, and morally responsive presence. Rivers speak through symbolism. Forests become spaces of transformation. Mountains evoke humility and transcendence. Human beings are repeatedly reminded that they exist within a larger cosmic order rather than above it. This ecological sensibility differs sharply from modern industrial attitudes that often reduce nature to a consumable resource.

The environmental consciousness embedded within Indian literary traditions is inseparable from the concept of dharma. Dharma is not merely social duty or religious obligation; it signifies balance, moral order, interconnectedness, and responsibility toward all forms of existence. When dharma collapses, disorder affects not only society but the natural world as well. Such a vision becomes remarkably relevant in contemporary times where environmental destruction frequently accompanies ethical and spiritual crises.

Scholars like Lawrence Buell, Greg Garrard, and Arne Naess have emphasized that ecological thinking requires a shift away from anthropocentric worldviews toward relational modes of existence (Buell 3; Garrard 9; Naess 98). Indian epics appear to anticipate this shift in profound ways. At the same time, Indian literary traditions cannot simply be romanticized as perfect ecological models. They must be examined critically, historically, and textually.

While scholars have explored environmental ethics and sacred ecology in Indian traditions, comparatively less attention has been paid to how narrative structures, sacred landscapes, and dharmic imagination collectively construct ecological consciousness within the epics.

This study argues that Indian epics and spiritual literature cultivate an ecocritical consciousness through the interrelationship of sacred landscapes, dharmic ethics, and spiritual interdependence, offering alternative frameworks for rethinking human–nature relations in the contemporary ecological moment. It further contends that these texts offer an alternative ethical imagination capable of contributing meaningfully to contemporary ecological discourse.

Research Gap

Considerable scholarship exists on Indian epics from religious, mythological, feminist, political,

and philosophical perspectives. Similarly, ecocriticism has evolved into a major field within literary studies since the late twentieth century. Yet there remains a noticeable gap in interdisciplinary research connecting Indian spiritual literature with ecological ethics in a theoretically sustained manner.

Many studies discussing ecology in Indian traditions remain descriptive rather than analytical. They celebrate the sacredness of rivers or forests without examining how these sacred landscapes function structurally within ethical and narrative systems. Ecological motifs are frequently discussed as symbolic or religious elements, while their role in shaping ethical and environmental worldviews receives comparatively limited attention.This creates a fragmented understanding of Indian ecological thought.

Another limitation involves the treatment of dharma. Most scholars interpret dharma primarily through moral, social, or theological frameworks while neglecting its environmental dimensions. However, in Indian epics, ethical imbalance frequently manifests through ecological disruption. Nature responds to human conduct. Forests become sites of moral testing. Rivers symbolize continuity and purification. Furthermore, earlier scholarship frequently isolates the Ramayana, the Mahabharata, Bhakti literature, and spiritual philosophy from one another. Such compartmentalization obscures the continuity of ecological consciousness across Indian literary traditions. Contemporary ecocritical approaches require a more integrated reading.

In addition, relatively little attention has been paid to the narrative mechanisms through which sacred landscapes and dharmic values generate ecological consciousness within these texts.

Recent scholars such as Guha, Shiva, and Huggan have contends that environmental criticism must include indigenous and non-Western epistemologies to challenge the dominance of Eurocentric ecological models (Guha 71; Shiva 42; Huggan and Tiffin 12). Yet Indian epics still remain insufficiently explored within global ecocritical discourse. This paper seeks to address these gaps through a close textual and ecocritical reading of Indian epics and spiritual literature.

Methodology and Theoretical Framework

This study adopts a qualitative and interpretive methodology grounded in ecocritical literary analysis. Ecocriticism investigates how literature represents ecological relationships, environmental ethics, and human interactions with the nonhuman world. Greg Garrard observes that ecocriticism engages with concepts such as wilderness, pollution, apocalypse, dwelling, and environmental justice in order to understand the cultural dimensions of ecological crisis (6).

The paper also incorporates insights from deep ecology. Arne Naess argues that all forms of life possess intrinsic value independent of human utility and that ecological awareness requires recognition of interconnected existence (95). Such ideas resonate strongly with Indian spiritual philosophy, particularly the Upanishadic idea that all beings participate in a unified cosmic reality.

Close textual analysis forms the central methodological approach of this study. Close reading enables sustained attention to narrative detail, symbolic patterning, and ethical structures, revealing how sacred landscapes and dharmic imagination participate in the construction of ecological consciousness. Selected episodes from the Ramayana, the Mahabharata, and the Bhagavad Gita are examined alongside insights from Bhakti traditions and modern environmental

thought. Attention is given to representations of forests, rivers, sacred geography, exile, asceticism, and ethical conflict. Rather than treating mythology as mere fantasy, the study reads epic narratives as cultural sites where sacred landscapes, dharmic ethics, and ecological consciousness are imaginatively Sacred Geography, Narrative Ethics, and Ecological Imagination

One of the most striking features of Indian epics is their treatment of landscape. Nature is never entirely passive. Forests, rivers, mountains, and seasons possess emotional, ethical, and spiritual significance. Sacred geography shapes the inner lives of characters and influences the moral structure of narrative itself.

In Valmiki's Ramayana, the forest becomes a transformative space where human identity is redefined. Rama's exile is not simply political punishment; it is also an ecological journey. The movement from Ayodhya into the wilderness symbolizes a departure from royal authority toward a deeper encounter with nature and spiritual truth. The contrast between the ordered space of Ayodhya and the fluid ecology of the forest structures exile as an ethical

reorientation, where authority is gradually replaced by ecological interdependence. The forest is alive with rivers, flowering trees, birds, animals, and ascetic communities. Valmiki's descriptive passages create what Lawrence Buell calls an "environmental imagination" in which the nonhuman world possesses narrative agency (Buell 7).

The Dandaka forest particularly represents an ecological and spiritual landscape. Sages residing there coexist with natural rhythms rather than dominating them. Violence within this environment signals moral disorder. Ravana's abduction of Sita disrupts not only familial ethics but the cosmic equilibrium connecting humans and nature. The ecological and ethical worlds overlap continuously.

Here, landscape and ethics remain closely connected. The forest evokes balance, while acts of violence unsettle the fragile relations that sustain both human and ecological life. Sacred geography becomes a medium through which ecological consciousness emerges.

Similarly, the Mahabharata presents forests as spaces of introspection and moral education. The Pandavas' exile removes them temporarily from political ambition and places them within a landscape conducive to philosophical reflection. Nature becomes a teacher. Silence, rivers, and wilderness create conditions for self-realization unavailable within royal courts and battlefields.

Rivers in Indian literature also embody sacred continuity. The Ganga functions simultaneously as a physical river, divine mother, and spiritual purifier. Its sanctity reflects a civilizational recognition that human survival depends upon ecological sustenance.

Contemporary ecological crises involving river pollution make such literary representations especially significant today.

Mountains too occupy sacred dimensions. The Himalayas symbolize endurance, transcendence, and humility before cosmic vastness. Unlike modern industrial narratives that frequently approach mountains as exploitable resources, Indian epics cultivate reverence toward them. This reverential attitude contributes to ecological ethics by encouraging restraint rather than domination.

Scholars such as Ramachandra Guha have argued that Indian environmental traditions historically emerged through lived interaction with forests, rivers, and agrarian cultures rather than abstract environmental theory alone (Guha 74). Indian epics preserve traces of this ecological memory

through sacred landscape imagery deeply embedded within narrative structures. These landscapes do more than symbolize ecological values; they organize the imaginative frameworks through which humans understand responsibility, coexistence, and their place within a larger ecological order.

Sacred Landscapes, Ecological Ethics, and Environmental Imagination

One of the most compelling ecological dimensions of Indian epics lies in their treatment of landscape as spiritually animate and ethically responsive. Nature in these texts is not presented as a passive backdrop to human action. Forest, rivers, and mountains function as ethically charged and symbolically resonant spaces within the narrative imagination.The natural world frequently participates in moral drama, shaping the consciousness of characters and reflecting the ethical state of society itself.

In Valmiki's Ramayana, the movement from Ayodhya to the forest marks far more than geographical displacement. Rama's exile initiates a gradual transformation from royal identity toward ecological and spiritual awareness. The forest does not merely shelter the exiled trio; it becomes a space of testing, discipline, and introspection. Valmiki repeatedly pauses the narrative to describe flowering trees, riverbanks, birds, and changing seasons with remarkable sensitivity. These descriptions are not ornamental excess. They create emotional intimacy between humans and the nonhuman world.

When Rama enters the forest, he does not behave like a conqueror of wilderness. Instead, he adapts himself to its rhythms. At Panchavati, the landscape acquires almost sacred stillness. Lakshmana builds a modest dwelling surrounded by forests and rivers rather than imposing royal structures upon nature. The simplicity of this life contrasts sharply with the material excess of courtly existence. The epic quietly suggests that ethical clarity becomes possible only after distancing oneself from political ambition and artificial luxury.

The Aranya Kanda especially reveals how ecological spaces in the epic possess moral consciousness. Violence disrupts the equilibrium of the forest. Ravana's abduction of Sita is not presented merely as personal tragedy but as cosmic disturbance. The natural world reacts emotionally to the event. Valmiki writes:

"The river stopped flowing, the wind ceased to blow, and the forest fell silent in grief" (Valmiki 412).

The silence of the forest symbolizes rupture within cosmic harmony itself. Such moments reveal a worldview in which human conduct directly affects ecological balance.

The Mahabharata similarly portrays forests as sites of ethical and philosophical awakening. During exile, the Pandavas encounter sages, rivers, and ascetic communities that reshape their understanding of suffering and responsibility. Wilderness becomes pedagogical. The court represents political ambition, while the forest offers perspective.

One particularly important episode is the Yaksha Prashna in the Vana Parva. Yudhishthira arrives at a lake after his brothers collapse because they ignored the Yaksha's warning. Water here is not passive matter available for immediate consumption. It is guarded, sacred, and ethically conditioned. Before drinking, Yudhishthira must answer philosophical questions concerning morality, wisdom, and human existence. The scene subtly critiques possessive attitudes toward

natural resources. Survival depends not upon domination but upon humility and ethical awareness. A close reading of the episode reveals that access to natural resources is framed through ethical accountability, implying that ecological use cannot be separated from moral responsibility.

The Yaksha asks:

"What is the greatest wonder?" Yudhishthira replies: Time and again countless creatures go to the abode of death, yet those who remain believe themselves immortal" (Vyasa 589).

Although philosophical in tone, the statement also reflects ecological humility. Human beings are transient participants within larger cycles of existence. Such recognition opposes modern anthropocentrism, which often assumes limitless entitlement over nature.

The Ganga is never represented merely as water flowing through geography. She appears as mother, purifier, memory, and divine continuity. The reverence attached to rivers in Indian traditions reflects an environmental consciousness rooted in dependence and gratitude.

Polluting sacred rivers today therefore represents not only ecological crisis but also cultural and spiritual contradiction.

The Bhagavad Gita further deepens this interconnected vision through its cosmology of reciprocity. Krishna explains that all existence remains bound together through cycles of nourishment, sacrifice, and responsibility:

The Bhagavad Gita presents human life, sustenance, and natural processes as part of an interconnected order, emphasizing the dependence of human well-being on ecological balance (Bhagavad Gita 3.14).

This verse reveals a remarkably ecological understanding of interdependence. Human survival depends upon natural processes that cannot be controlled indefinitely through greed or exploitation. The Gita repeatedly warns against excessive attachment and uncontrolled desire because imbalance within the self eventually produces imbalance in the world.

Modern environmental crises make these insights newly urgent. Climate instability, river pollution, and ecological exhaustion reveal the consequences of separating human ambition from ethical restraint. Indian epics repeatedly caution against such separation. Ravana's arrogance, Duryodhana's greed, and the destructive violence of war all emerge from the refusal to recognize limits.

Ascetic figures within these texts offer an alternative mode of existence grounded in restraint and coexistence. Hermitages located within forests function through minimal consumption and attentiveness to natural rhythms. The sages do not romanticize suffering, yet they reject accumulation as the basis of meaningful life. Their ecological sensitivity emerges from simplicity itself.

This is where Indian spiritual literature becomes particularly relevant for contemporary ecocritical discourse. The texts do not advocate modern environmental activism in a direct political sense. Yet they cultivate something equally important: an ethical imagination capable of perceiving nature as sacred presence rather than exploitable object.

Recent ecocritical scholars such as Graham Huggan and Helen Tiffin argue that non-Western literary traditions challenge the human-centered assumptions of industrial modernity (14). Indian

epics contribute significantly to this conversation because they consistently portray humans as participants within a larger moral and ecological order.

At the same time, these traditions should not be idealized uncritically. Ancient societies were neither environmentally perfect nor socially egalitarian. However, the ethical emphasis on balance, restraint, and reverence remains intellectually valuable in an age increasingly defined by ecological anxiety. What ultimately emerges from Indian epics and spiritual literature is not simply admiration for nature but a profound recognition of relational existence. Human beings survive not through domination of the earth but through responsible coexistence with it. The forest in these texts is never empty land awaiting control. It is presence, memory, discipline, and sometimes even conscience. Such representations cultivate an environmental imagination grounded in reciprocity rather than possession. Dharmic Ethics and Environmental Responsibility Ecological consciousness in Indian epics is deeply rooted in the concept of dharma. More than a code of duty, dharma functions as a principle of responsibility that links human conduct to a broader moral and ecological order. Actions are rarely treated as isolated choices; they carry consequences that extend beyond the individual. The Bhagavad Gita repeatedly warns against greed, excess, and attachment. Its vision of reciprocity connects human behavior with larger cycles of sustenance and well-being, suggesting that imbalance in human conduct can produce wider forms of disorder (Bhagavad Gita 62). Read ecocritically, this framework offers an ethics of restraint rather than accumulation. A close reading of the epics reveals a recurring pattern. Moral transgression is often accompanied by disruption, while figures associated with self-discipline and simplicity remain closely attuned to the natural world. Ecological balance therefore appears not merely as a material condition but as an ethical one. The principle of ahimsa extends this vision by challenging human-centered notions of value. As Vandana Shiva observes, Indian ecological thought emphasizes coexistence rather than domination (39). Bhakti traditions reinforce this sensibility by presenting rivers, forests, and seasonal rhythms as integral to spiritual experience.

Together, these traditions articulate an environmental ethic grounded in restraint, reciprocity, and care, where responsibility toward nature forms an essential part of ethical life.

Asceticism, Simplicity, and Ecological Consciousness

Indian spiritual literature frequently links ecological awareness with restraint rather than possession. Asceticism, in this context, is not simply a withdrawal from worldly life. It represents a critique of excess and a disciplined reorientation of human desire. The forest hermitages depicted in the epics offer a distinct model of living. Their inhabitants rely on the resources around them without seeking mastery over the environment. Simplicity is not presented as deprivation but as a way of sustaining balance between human needs and the natural world. A close reading of these spaces suggests that ecological consciousness emerges through attentiveness, moderation, and respect for natural limits. This ethical orientation resonates with Arne Naess's concept of deep ecology, which calls for a movement beyond narrowly self-centered perspectives toward recognition of broader ecological interconnectedness (99). Indian ascetic traditions similarly emphasize self- discipline and a diminished attachment to material accumulation, encouraging a more relational understanding of existence. These ideas continued to influence modern environmental thought. Gandhi's advocacy of restraint and ethical consumption

drew upon spiritual traditions that questioned the equation of well-being with unlimited acquisition. As he observed, the earth can satisfy human need but not human greed (Gandhi 92). Although these traditions should not be romanticized uncritically, their emphasis on moderation, responsibility, and limits remains significant. In an era marked by ecological degradation and resource exhaustion, they offer an alternative ethical framework for rethinking humanity's relationship with the natural world. The forest hermitages foreground moderation over accumulation, linking ethical self-discipline with attentiveness to the natural world. Ecological awareness emerges here through everyday practices of restraint rather than explicit environmental doctrine.

Contemporary Ecocritical Relevance

The ecological wisdom embedded within Indian epics and spiritual literature remains highly relevant today. Environmental crises are not only scientific or technological problems; they are also crises of imagination, ethics, and culture. Modern societies often approach nature through utilitarian frameworks that encourage extraction and commodification. Indian literary traditions provide an alternative imagination rooted in reverence, interdependence, and moral accountability. Sacred landscapes cultivate emotional attachment to ecological spaces, while dharmic ethics frame environmental care as ethical necessity rather than optional activism. Contemporary ecocriticism increasingly acknowledges the importance of indigenous and non-Western knowledge systems. Graham Huggan and Helen Tiffin argue that postcolonial ecocriticism must recover marginalized ecological perspectives suppressed by colonial and industrial modernity (13). Indian epics contribute meaningfully to this broader conversation because they challenge anthropocentric assumptions and foreground relational existence. However, ancient ecological insights alone cannot solve contemporary environmental crises. Modern ecological problems involve capitalism, industrialization, global inequality, and political conflict. Nevertheless, literature remains important because it shapes emotional and ethical responses to the environment. Ecological transformation requires cultural imagination alongside scientific innovation. Indian epics continue to matter because they imagine a world where human beings remain accountable to larger cosmic and ecological realities. They remind readers that environmental destruction ultimately reflects deeper ethical fragmentation and spiritual alienation.

Conclusion

Indian epics and spiritual literature articulate a rich ecological imagination grounded in sacred geography, dharmic ethics, and spiritual interconnectedness. Forests, rivers, mountains, and wilderness spaces function not as passive backgrounds but as living presences shaping moral consciousness and human destiny. Ecological balance and ethical responsibility remain deeply interconnected throughout these texts. Through ecocritical analysis, this paper has demonstrated that Indian literary traditions anticipate many concerns central to contemporary environmental thought. Sacred landscapes encourage reverence toward nature, while dharmic philosophy emphasizes restraint, reciprocity, and moral accountability. The study also identifies important gaps within existing scholarship. Ecological dimensions of Indian epics are frequently discussed superficially or fragmented across disciplines. By integrating ecocritical theory with literary and spiritual analysis, this paper argues that Indian texts offer a coherent environmental philosophy

capable of contributing meaningfully to contemporary ecological discourse. In an age defined by environmental uncertainty and ecological crisis, revisiting Indian epics becomes intellectually and ethically significant. Their enduring relevance lies not merely in mythological grandeur or religious symbolism but in their ability to imagine coexistence as a sacred responsibility. The ecological wisdom embedded within these traditions continues to challenge humanity to rethink its relationship with nature, desire, ethics, and the future of collective survival.

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Effects of Digital Diet Tracking and High-Intensity Functional Training on Body Composition, Cardiorespiratory Fitness, and Weight Maintenance in Sedentary

CORPORATE PROFESSIONALS IN CHENNAI: A RANDOMIZED CONTROLLED TRIAL

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Abstract

Rapid urbanization, sedentary occupations, and unhealthy dietary behaviors have contributed to increasing rates of overweight, obesity, and metabolic syndrome among young corporate professionals in India. To evaluate the effects of digital dietary self-monitoring alone and in combination with High-Intensity Functional Training (HIFT) on body composition, cardiorespiratory fitness, and weight-loss maintenance among sedentary adults in Chennai. In this three-arm randomized controlled trial, 84 sedentary corporate professionals aged 25–30 years with overweight/obesity were randomly assigned to a control group (n = 28), a digital diet-tracking group using the free version of HealthifyMe (n = 28), or a combined intervention group receiving HealthifyMe tracking plus supervised HIFT three times weekly (n = 28) for 10 weeks. Primary outcomes included body mass, body fat percentage, and waist circumference, while secondary outcomes included 6-Minute Walk Test (6MWT) distance and daily step count. Measurements were obtained at baseline, Week 5, Week 10, and Week 22. Data were analyzed using Linear Mixed-Effects Models. Significant Group × Time interactions were observed for all primary outcomes ($p < .001$). At Week 10, the combined intervention group demonstrated greater reductions in body mass (-6.7 kg vs. -3.8 kg), waist circumference (-7.4 cm vs. -3.8 cm), and body fat percentage (-4.6 vs. -2.0 percentage points) compared with the diet-tracking group ($p < .001$). Cardiorespiratory fitness improved significantly in the combined group, with a mean increase of 83 m in 6MWT distance. At Week 22, the combined group maintained most of its weight loss, whereas the diet-tracking group showed partial weight regain. Combining free digital dietary self-monitoring with structured HIFT produces superior and more sustainable improvements in body composition and fitness than dietary tracking alone, offering a scalable and cost-effective corporate wellness strategy for urban Indian populations.

Keywords: Digital health, HealthifyMe, High-Intensity Functional Training, Obesity, Corporate wellness, Weight management, Metabolic syndrome.

1. Introduction

The prevalence of overweight, obesity, and metabolic syndrome has increased substantially over the past decade, becoming a major public health challenge worldwide. In India, rapid urbanization, technological advancement, and changing occupational demands have contributed to increasingly sedentary lifestyles, particularly among young corporate professionals. Employees working in information technology, banking, and business sectors often spend prolonged periods sitting, engage in minimal physical activity, and consume energy-dense diets that promote excess weight gain and metabolic dysfunction. Recent reports indicate that overweight and obesity rates among urban Indian adults continue to rise, increasing the risk of cardiovascular disease, type 2 diabetes, hypertension, and other chronic health conditions (World

Health Organization, 2024; Anjana et al., 2023).

Dietary behavior plays a critical role in the development and management of obesity. In South India, dietary patterns are frequently characterized by high consumption of refined carbohydrates through staple foods such as rice, idli, dosa, and other cereal-based products. Although these foods form an important component of traditional diets, excessive carbohydrate intake combined with inadequate protein consumption and physical inactivity may contribute to positive energy balance and increased adiposity. Consequently, interventions that promote nutritional awareness and self-regulation are increasingly recognized as essential components of weight management programs (Raber et al., 2021).

The widespread availability of smartphones has accelerated the adoption of digital health technologies for lifestyle modification. Mobile applications such as HealthifyMe provide users with convenient tools to monitor calorie intake, track macronutrient consumption, record body weight, and receive feedback on dietary habits. Previous research has demonstrated that dietary self-monitoring through digital platforms can improve adherence to nutritional recommendations and facilitate moderate weight loss among adults with overweight and obesity (Patel et al., 2021; Berry et al., 2021). However, evidence also suggests that the effectiveness of digital tracking alone may diminish over time because user engagement frequently declines once the novelty of the intervention decreases, resulting in behavioral fatigue and partial weight regain (Raber et al., 2021).

In addition to nutritional interventions, regular physical activity remains one of the most effective strategies for improving body composition and metabolic health. High-Intensity Functional Training (HIFT) has gained popularity as a time-efficient exercise approach that combines aerobic, resistance, and functional movement exercises performed at relatively high intensities. HIFT programs have been associated with significant improvements in body fat reduction, cardiovascular fitness, muscular endurance, and exercise adherence across diverse populations (Feito et al., 2022; Tsuji et al., 2023). Despite these benefits, limited evidence exists regarding the combined effects of digital dietary self-monitoring and HIFT among sedentary corporate employees in the Indian context.

Furthermore, many contemporary health applications increasingly rely on premium artificial intelligence (AI)-based coaching features. While these services may enhance user engagement, their additional value beyond basic self-monitoring remains unclear. Understanding whether meaningful health improvements can be achieved through free digital tracking tools combined with structured exercise is important for developing accessible and cost-effective workplace wellness strategies.

Therefore, the purpose of this randomized controlled trial was to examine the effectiveness of digital diet tracking using the free version of HealthifyMe, both independently and in combination with a structured High-Intensity Functional Training program, among overweight sedentary corporate professionals in Chennai. The study aimed to determine the effects of these interventions on body mass, body fat percentage, waist circumference, cardiorespiratory fitness, and long-term weight maintenance while evaluating a scalable model for corporate wellness programs targeting metabolic syndrome in urban India

.2. Methods

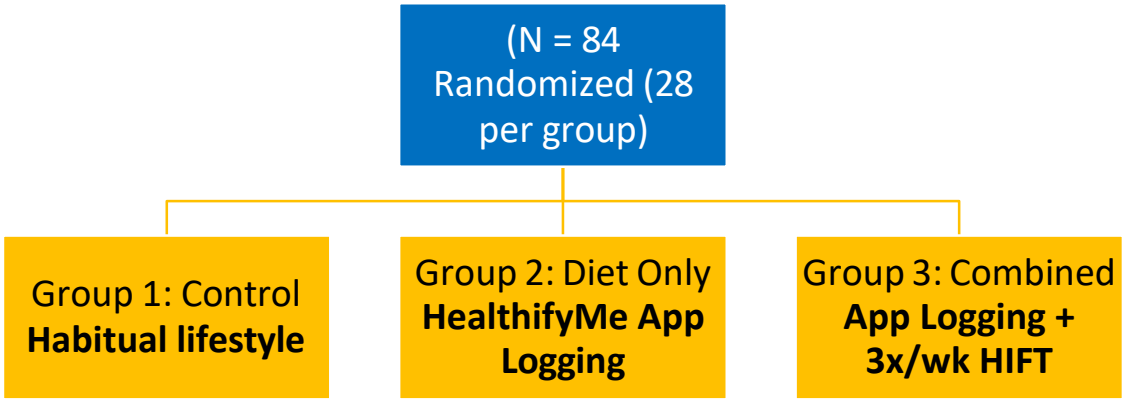
2.1 Study Design & Recruitment

This three-arm, parallel-group randomized controlled trial (RCT) evaluated a 10-week lifestyle intervention with a 12-week observational follow-up (Week 22). Sedentary corporate professionals aged 25–30 were recruited from Chennai's primary IT corridors (OMR, Guindy) and business hubs (T. Nagar) via social media and corporate human resource networks. Eligible participants presented a BMI ≥ 25 kg/m^2 and abdominal obesity (waist circumference > 90 cm} for men, > 80 cm for women). Exclusion criteria comprised metabolic disorders, structured exercise history (≥2 sessions/week), weight-loss medications, or pregnancy.

A sample size calculation in GPower (v3.1.9.7) indicated that N = 66 participants (22/group) provided sufficient power (1- β = 0.80, \alpha = 0.05) to detect a medium effect size (Cohen's d = 0.40). Target recruitment was set at N = 84 (28/group) to protect against a 20% attrition rate.

2.2 Randomization & Blinding

Following baseline screening, participants were allocated (1:1:1) to an experimental arm via a web-based block randomizer (Randomizer.org) managed by an uncoupled investigator. Allocation concealment used sequentially numbered, opaque, sealed envelopes. Anthropometric data collectors and biostatisticians were fully blinded; participants could not be blindeddue to the behavioral interventions.



2.3 Intervention Protocols

Group 1 (Control Group): Maintained baseline habitual diet and sedentary routines.

Group 2 (Digital Diet Tracking Only): Logged all meals, water, and weekly weights using the free tier of the HealthifyMe smartphone application. To ensure no AI coaching occurred, premium modules (automated macro planning, image recognition, and "Ria AI") were strictly locked out. To isolate nutritional effects, participants were explicitly instructed to maintain baseline sedentary habits, treating the app's automatic pedometer as a passive observational matrix rather than an active step target. Adherence required logging ≥ 5 days/week for ≥ 8 weeks.

Group 3 (Combined Intervention): Executed the identical Group 2 dietary tracking protocol alongside a structured, group-based High-Intensity Functional Training (HIFT) regimen executed three times per week on alternating days (Monday, Wednesday, Friday) for 10 consecutive weeks. Held at a central partner fitness facility and led by a certified trainer, each 45-to-55-minute

session followed a strict triphasic structure: a 10-minute dynamic warm-up of mobility drills and muscle activation, a 30-to-35-minute high-intensity circuit, and a 5-to-10-minute static cool-down focused on parasympathetic recovery. To balance structural loading
and minimize localized muscular fatigue, the training focus was systematically varied each week, targeting the lower body and cardio on Mondays (e.g., air squats, walking lunges, plyometric box jumps, rowing intervals), the upper body and core on Wednesdays (e.g., standard/assisted push-ups, planks, mountain climbers, heavy battle ropes), and full-body metabolic conditioning on Fridays (e.g., kettlebell swings, barbell thrusters, medicine ball slams, short-distance sprints). Cardiovascular and muscular loading intensity progressively advanced across the 10-week period by tightening the active interval windows and increasing the targeted rating of perceived exertion (RPE) on the Borg CR-10 scale, stepping up from 20 seconds of work and 40 seconds of rest (RPE 5–6) during weeks 1–2, to 30 seconds of work and rest (RPE 6–7) in weeks 3–4, 35 seconds of work and 25 seconds of rest (RPE 7–8) in weeks 5–8, and culminating in a challenging 45 seconds of work paired with just 15 seconds of rest (RPE 8–9) by weeks 9–10. Satisfactory exercise adherence was defined as physical attendance and completion of at least 80% of the program (≥24 out of the 30 scheduled sessions).

2.4 Outcome Measures

Primary outcomes (body mass via Withings Body+ Wi-Fi scales; body fat percentage via Omron HBF-701 hand-to-foot BIA plates; waist/hip circumferences via Gulick tape) were collected at Weeks 0, 5, 10, and 22 under fasting, morning conditions. Secondary outcomes included app-extracted nutrition profiles (calories, macronutrients), continuous passive daily steps, cardiorespiratory capacity (6-Minute Walk Test distance), resting blood pressure, and psychological eating behaviors via the Three-Factor Eating Questionnaire (TFEQ-R18). A single blinded assessor conducted all physical tracking to maintain high intra-rater reliability (\text{ICC} > 0.95).

2.5 Statistical Analysis

Analysis was executed on an Intention-to-Treat (ITT) base using SPSS 26.0. Missing dropout observations were preserved without inflating variance errors by utilizing Linear Mixed-Effects Models (LMM) via maximum likelihood estimation, completely bypassing rigid, biased imputations like Last Observation Carried Forward (LOCF). The primary mixed model analyzed fixed effects of Group, Time, and Group \times Time interactions. To isolate independent tracking effects, longitudinal daily step variations were embedded as a continuous fixed covariate (ANCOVA). Pairwise post-hoc tests were adjusted using a strict Bonferroni correction (\alpha = 0.017). Primary significance was set at $p < 0.05$.

3. RESULTS

3.1 Participant Flow and Baseline Characteristics

A total of 84 participants were successfully randomized into the three study arms (n = 28 per group). The comprehensive demographic, occupational, and clinical profiles of the cohort at baseline are presented in Table 1. The cohort reflected a young, highly sedentary urban professional demographic, with a major concentration (64.3\%) of participants employed within the major Information Technology (IT) hubs along the Rajiv Gandhi Salai (OMR) and Guindy

corridors.

Statistical evaluation via one-way ANOVA and Chi-Square tests confirmed that there were no statistically significant differences among the three parallel groups at baseline regarding age ($p = 0.642$), sex distribution ($p = 0.945$), occupational sectors ($p = 0.884$), body mass ($p = 0.912$), Body Mass Index ($p = 0.843$), or initial baseline physical activity levels ($p = 0.831$).

Table 1: Baseline Demographics and Clinical Characteristics of Participants (N=84)

Characteristic	Group 1: Control (n=28)	Group 2: Diet Only (n=28)	Group 3: Combined (n=28)	p-value
Age (years)	27.4±1.6	27.1±1.8	27.5±1.5	**0.642**
Sex, Female [n(%)]	15(53.6%)	14(50.0%)	15(53.6%)	**0.945**
Occupational Sector [n(%)]				**0.884**
IT / Software (OMR/Guindy)	18(64.3%)	19(67.9%)	17(60.7%)	
Banking / Corporate Financial	6(21.4%)	5(17.9%)	7(25.0%)	
Business / Marketing Management	4(14.3%)	4(14.3%)	4(14.3%)	
Family Type [n(%)]				**0.761**
Nuclear Family / Independent	20(71.4%)	22(78.6%)	21(75.0%)	
Joint Family System	8(28.6%)	6(21.4%)	7(25.0%)	
Body Mass (kg)	78.4±6.2	79.1±5.8	78.8±6.1	**0.912**
BMI (kg/m2)	28.2±1.9	28.5±1.7	28.4±2.1	**0.843**
Waist Circumference (cm)				
Male (n=40)	96.4±4.1	97.2±3.8	96.8±4.3	**0.814**
Female (n=44)	86.8±3.9	87.1±4.2	86.5±3.7	**0.89**
Body Fat Percentage (%)	33.4±4.5	34.1±4.1	33.8±4.8	**0.875**
Systolic BP (mmHg)	124±8	126±9	125±7	**0.684**
Baseline Daily Steps	**4,120±840**	**4,250±790**	**4,180±910**	**0.831**

3.2 Baseline Dietary Profiles

Initial dietary intake data compiled via the HealthifyMe application and the regional Food

Frequency Questionnaire (FFQ) verified a high-carbohydrate, low-protein baseline across the global sample (Table 2). Carbohydrates accounted for over 56\% of the total daily energy intake (2,240 to 2,285 kcal/day), heavily driven by the habitual consumption of regional staples, including Ponni rice during principal meals (mean ≥ 12 times/week) and traditional fermented rice-and-lentil breakfast items like idlis and dosas (mean ≥ 5.8 times/week). Baseline protein intake was uniformly low, contributing to less than 9\% of total daily energy distribution.

Table 2: Table 2: Baseline Dietary Metrics and South Indian Macro Breakdown

Nutritional Parameter	**Group 1: Control (n=28)**	**Group 2: Diet Only (n=28)**	**Group 3: Combined (n=28)**
Energy Intake (kcal/day)	2,240 ± 210	2,285 ± 195	2,260 ± 230
Carbohydrates (g/day)	315 ± 35	322 ± 28	318 ± 41
% of Total Energy	56.20%	56.40%	56.30%
Protein (g/day)	48 ± 8	51 ± 7	49 ± 9
% of Total Energy	8.60%	8.90%	8.70%
Fats (g/day)	87 ± 12	89 ± 11	88 ± 14
% of Total Energy	35.00%	35.10%	35.00%
Frequent Regional Items [Mean times/week]			
Rice/Ponni Rice (Lunch/Dinner)	12.4 ± 2.1	12.1 ± 1.9	12.5 ± 2.2
Idli / Dosa / Utthapam (Breakfast)	5.8 ± 1.2	6.1 ± 1.1	5.9 ± 1.4
Deep-fried snacks (Vada, Murukku)	3.2 ± 1.1	2.9 ± 0.8	3.1 ± 1.0
South Indian Filter Coffee / Tea	11.4 ± 2.8	11.8 ± 2.5	11.2 ± 3.1

3.3 Primary and Secondary Intervention Outcomes

The Linear Mixed-Effects Model (LMM) revealed highly significant Group \times Time interactions across all primary anthropometric variables and functional markers ($p < 0.001$, Table

3).

Table 3: Longitudinal Primary Anthropometric and Secondary Functional Changes

Outcome Dimension & Timepoint	Group 1: Control (n=28)	Group 2: Diet Only (n=28)	Group 3: Combined (n=28)	Group × Time Interaction (p-value)
Body Mass (kg)				**<0.001**
Post-Intervention (Week 10)	78.4 ± 6.1	75.1 ± 5.1†	72.8 ± 5.2†‡	
Follow-Up (Week 22)	79.2 ± 6.4	76.8 ± 5.5†	72.8 ± 5.4†‡	
Waist Circumference (cm)				**<0.001**
Baseline (Week 0)	91.4 ± 5.2	92.0 ± 5.0	91.5 ± 5.4	
Mid-point (Week 5)	91.5 ± 5.1	90.1 ± 4.8	88.2 ± 4.9	
Post-Intervention (Week 10)	91.8 ± 5.3	88.2 ± 4.5†	84.1 ± 4.6†‡	
Follow-Up (Week 22)	92.1 ± 5.6	89.4 ± 4.9†	84.9 ± 4.8†‡	
Body Fat Percentage (%)				**<0.001**
Baseline (Week 0)	33.4 ± 4.5	34.1 ± 4.1	33.8 ± 4.8	
Post-Intervention (Week 10)	33.6 ± 4.3	32.1 ± 3.9†	29.2 ± 4.0†‡	
Follow-Up (Week 22)	33.9 ±	32.9 ±	29.8 ±	

6-Minute Walk Test (meters)				
Baseline (Week 0)				
Post-Intervention (Week 10)				
Baseline (Week 0)				
Mid-point (Week 5)	78. 6 ± 6.0	77. 2 ± 5.4	75.4 ± 5.6	

†Significantly different from baseline ($p < 0.017$, Bonferroni corrected).

‡Significantly different from Group 2 at the same timepoint ($p < 0.017$, Bonferroni corrected).

3.3.1 Body Mass Variations

Post-hoc pairwise tracking with Bonferroni adjustments ($\alpha = 0.017$) showed that both active intervention groups achieved significant body mass reductions from baseline to Week 10 ($p < 0.001$). However, Group 3 (Combined) demonstrated significantly greater weight reduction compared to Group 2 (Diet Only), reaching an absolute mean reduction of -6.7 kg versus -3.8 kg ($p < 0.001$). During the unmonitored observational phase (Weeks 11–22), Group 3 exhibited significantly higher weight maintenance security, preserving a weight reduction of -6.0 kg below baseline values at Week 22 compared to Group 2, which showed minor weight regain (+1.5 kg from Week 10 to Week 22).

3.3.2 Tissue and Structural Changes

Waist circumference reductions were optimized within the combined intervention cohort, dropping significantly from 91.5 ± 5.4 cm at baseline to 84.1 ± 4.6 cm at Week 10 ($p < 0.001$), establishing superior abdominal reduction over Group 2 (88.2 ± 4.5 cm, $p < 0.017$). Similarly, absolute body fat percentage declined by 4.6\% within Group 3 at Week 10 ($p < 0.001$), outperforming the isolated diet tracking arm (2.0\% reduction). Cardiorespiratory assessment via the 6MWT demonstrated isolated functional improvements in Group 3, with distance increasing significantly by +83 meters at Week 10 ($p < 0.001$).

3.4 Behavioral Adherence and Control Verification

Fidelity analytics exported from the tracking infrastructure indicated parallel dietary compliance between the two active groups (Table 4), with Group 2 logging data on 84.2% of total available days and Group 3 logging on 81.6% ($p = 0.274$). Group 3 participants displayed high exercise compliance, attending a mean of 86.4% of the 30 scheduled functional conditioning classes.

Adherence Metric	**Group 2: Diet Only (n=28)**	**Group 3: Combined (n=28)**	**p-value**
App Logging Consistency (% of total days)	84.2% ± 8.5%	81.6% ± 9.1%	0.274
Met Adherence Definition for Diet n (%)	24 (85.7%)	23 (82.1%)	0.712
HIFT Class Attendance (% of 30 sessions)	—	86.4% ± 7.2%	—
Mean Daily Steps (Weeks 1–2 Baseline)	4,250 ± 790	4,180 ± 910	0.762
Mean Daily Steps (Weeks 9–10 Post-test)	4,410 ± 810	8,850 ± 1,120	<0.001

Crucially, the passive step logging analysis confirmed that Group 2 followed the behavioral instructions to remain sedentary, exhibiting no significant change in daily steps from baseline to the post-test block (+160 steps/day, $p = 0.412$). Conversely, Group 3 values more than doubled to 8,850 ± 1,120 steps/day ($p < 0.001$), reflecting the structured metabolic load of the functional workouts rather than external confounding activities.

4. Discussion

The primary finding of this study is that while isolated digital diet tracking via HealthifyMe yields modest weight loss (-3.8 kg), integrating High-Intensity Functional Training (HIFT) significantly accelerates body mass reductions (-6.7 kg) and promotes superior metabolic sustainability at Week 22. This finding supports previous evidence that digital dietary self-monitoring can facilitate weight loss, while the addition of structured high-intensity exercise produces greater improvements in body composition and metabolic health (Patel et al., 2021; Berry et al., 2021). This synergy is particularly relevant for Chennai's urban corporate population, whose baseline profile revealed a low-protein, high-carbohydrate dietary pattern combined with prolonged sedentary behavior, both of which are recognized risk factors for obesity and metabolic syndrome (Raber et al., 2021).

By disabling premium AI features, the present framework isolates the effectiveness of self-directed digital tracking. While Group 2 achieved initial success through increased calorie awareness, the minor weight regain (+1.5 kg) observed during follow-up reflects a common limitation of digital logging interventions. Previous studies have shown that user engagement and adherence to self-monitoring applications often decline over time, resulting in reduced

maintenance of weight-loss outcomes once active monitoring ceases (Patel et al., 2021; Raber et al., 2021).

In contrast, Group 3's progressive HIFT program acted as a behavioral anchor. Beyond increasing energy expenditure, the intervention produced favorable body composition changes (4.6% reduction in body fat) and improvements in cardiorespiratory fitness (+83 m in the 6MWT). Similar physiological benefits of HIFT and other high-intensity exercise modalities have been reported in recent systematic reviews and meta-analyses (Feito et al., 2022; Tsuji et al., 2023). Importantly, the step-count control confirmed that participants remained otherwise sedentary, indicating that the superior outcomes were primarily attributable to the structured training stimulus rather than incidental physical activity.

Ultimately, these findings suggest that expensive AI subscriptions are not essential for meaningful lifestyle modification. Combining free digital self-monitoring with structured, community-based physical conditioning offers a scalable and cost-effective approach for addressing metabolic syndrome among urban corporate employees, consistent with recommendations for integrated lifestyle interventions in weight-management programs (Berry et al., 2021; Hadzidedic et al., 2026).

5. Conclusion

This 10-week randomized controlled trial demonstrates that while isolated digital diet tracking via the free tier of HealthifyMe provides an accessible entry point for weight loss (-3.8 kg), integrating High-Intensity Functional Training (HIFT) is essential for achieving greater metabolic benefits (-6.7 kg), consistent with previous findings on combined diet and exercise interventions (Patel et al., 2021; Berry et al., 2021). For Chennai's sedentary corporate professionals, dietary self-monitoring alone appears vulnerable to behavioral fatigue, contributing to post-intervention weight regain (Raber et al., 2021). In contrast, the combined intervention resulted in superior fat loss, improved cardiorespiratory fitness (+83 m in the 6MWT), and sustained weight maintenance, supporting evidence on the effectiveness of HIFT
for enhancing body composition and aerobic capacity (Feito et al., 2022; Tsuji et al., 2023). These findings suggest that meaningful and sustainable health improvements can be achieved without premium AI coaching, highlighting a scalable and cost-effective framework for corporate wellness programs targeting metabolic syndrome across urban India (Hadzidedic et al., 2026).

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STRETCHING LIMITS: IMPROVING FULL-DRAW ENDURANCE IN ADOLESCENT ARCHERS

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Abstract

This research examines the impact of shoulder mobility training on the full-draw endurance of adolescent recurve archers. As an important component of archery performance, full-draw endurance allows athletes to maintain necessary stability, accuracy and control during the aiming and execution phases. The study evaluated whether a structured 60-day shoulder mobility stretching regimen could significantly extend the duration an archer maintains the full-draw position. Fourteen male recurve archers (ages 14–16) participated in this intervention, which focused on enhancing shoulder joint mobility, flexibility and range of motion attributes essential for the repetitive drawing movements inherent in archery. Exercises were systematically administered to ensure consistent adherence. Efficacy was determined through pre- and post-test assessments measuring the duration each archer could sustain the full-draw position. Findings demonstrated a significant performance improvement, with mean full-draw endurance increasing from 17.92 seconds to 25.85 seconds ($p < 0.05$). These results underscore the importance of shoulder mobility training in enhancing full-draw endurance among adolescent recurve archers.

Keywords: recurve archery, full draw endurance, performance improvement, shoulder mobility, flexibility

Introduction:

In recurve archery, precision and control dwells on the archer's ability to maintain proper form and consistency while at full draw. Full-draw endurance is an inevitable component of this discipline, enabling archers to maintain stability while aiming and shooting. For adolescent archers, who are still in a critical phase of physical development, training that targets flexibility and mobility can be a game-changer. Mobility training in archery refers to the systematic implementation of exercises, such as dynamic-progressive stretching and myofascial release, designed to optimize the range of motion and functional movement patterns required for consistent bow draw-release mechanics (Humaid et al. 34). Establishing the 'gun barrel' position, a state of precise linear alignment between the archer's shoulders, bow arm and drawing arms are biomechanically vital for optimizing force transmission and postural stability (Ahmad et al. 763). By forming this rigid skeletal framework, the archer minimizes detrimental lateral deviations, which ensures consistent energy transfer and enhances accuracy throughout the drawing and release cycle (Liu). Beyond structural alignment, specific mobility interventions targeting the glenohumeral joint and scapular stabilizers are essential to mitigate the common constraints of limited shoulder flexibility, which frequently impede drawing stability and degrade overall shooting precision (Rukmana & Arti 6). Moreover, integrating proprioceptive neromuscular facilitation can further enhance neuromuscular response and joint range of motion, (Yamanarda & Demirci 912) which is critical for sustaining the load during the aiming phase. Beyond

structural optimization, improving lower-body stability through targeted mobility routines is equally imperative, as a stable foundation minimizes postural fluctuations (Humaid et al. 34) that occur while the archer adjusts the bow's elevation. Consequently, the systematic integration of these conditioning protocols addresses the complex biomechanical demands of archery, ultimately facilitating the postural stability required for consistent high-level execution. Shoulder mobility plays a pivotal role in enhancing both range of motion and muscular endurance, which are essential for sustaining a prolonged draw. However, little research has focused on how dedicated mobility training can impact the specific demands of archery. This study seeks to bridge that gap by investigating the effect of a 60-day shoulder mobility regimen on full-draw endurance in adolescent recurve archers. The aim is to provide evidence-based recommendations that could revolutionize training methods for young athletes.

Objectives:

1. This study aims to assess how effectively a structured shoulder mobility program improves full-draw endurance among adolescent archers.
2. We sought to measure the change in full-draw holding duration before and after the training intervention.

Data Collection: 14 male recurve archers of age 14-16 are chosen for this study. All the participants were selected based on their own personal willingness to participate in the study and none of the archers had any earlier shoulder injuries. The full draw endurance was measured in seconds. To do this, the stop watch should be started as soon as the archer reaches full draw position and stopped as soon as the archer cannot hold the form anymore to obtain the elapsed total duration that the archer held at full draw. Pre-test was done before the intervention and post-test after a period of 60 days of intervention.

Procedure: Pre-Test: The archers were instructed to draw their bowstring and maintain full draw for as long as they could before their form failed. The mean value of full draw endurance was 17.92 seconds during the pre-test trials. Training Intervention: In the 60-day intervention the participants were asked to follow a structured mobility protocol which includes the correct static and dynamic stretching and strengthening exercises for the muscles necessary for bow holding at full draw. Post-test: Following the 60 days of mobility training, the same full draw endurance assessment was done. The mean holding time at full draw was increased to 25.85 seconds, showing a statistically significant increase in full-draw endurance based on the completion of the post-test.

Data Analysis: The paired t-test statistic was performed on the pre and post test results to evaluate if the full draw endurance was statistically significant and following the 60-day mobility program the mean duration of full-draw endurance increased from17.92 to 25.85 seconds with the p value < 0.05.

Statistical Treatment: A paired t-test was utilized to evaluate the significance of the changes in full-draw endurance. Pre-Test Mean Score: 17.9286 Post-Test Mean Score: 25.8571 p-value: < 0.05

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Test	17.9286	14	1.94004	.51850
	Post_Test	25.8571	14	1.95555	.52264

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	Pre_Test - Post_Test	-7.92857	1.77436	.47422	-8.95306	-6.90409	-16.719	13	.000

Findings: Statistical analysis revealed a significant improvement in average full-draw time, which increased from 17.92 seconds during pre-testing to 25.85 seconds post-testing ($p < 0.05$). The results showed that an appropriate shoulder mobility training program can positively impact on archer's ability to enhance the full draw endurance and may even have positive impact upon their performances.

Conclusion: This study confirms that the structured shoulder mobility program has favourable outcomes on the full draw endurance of adolescent recurve archers. Our 60-day shoulder mobility program resulted in a meaningful increase in full draw endurance by improving the proper alignment through increased mobility. Therefore, incorporating the mobility routines in regular archery training is inevitable for holistic development of archers by improving performance and mitigating injuries.

Recommendations: Archery coaches may find it helpful to introduce shoulder mobility routine to their archers as these data suggest that the intervention may improve full draw endurance, overall performance and decrease the incidence of shoulder injuries. Further studies are necessary to validate these results and future researchers should investigate the long-term effects of the shoulder mobility program on full draw endurance and its effects on diverse populations.

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ASSOCIATION OF HABITUAL WHEY PROTEIN CONSUMPTION WITH DELAYED ONSET MUSCLE SORENESS AND COUNTERMOVEMENT JUMP RECOVERY IN COMPETITIVE MALE BADMINTON PLAYERS

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Abstract

In the high-velocity and precision-oriented environment of competitive badminton, repetitive explosive actions induce severe exercise-induced muscle damage (EIMD) and functional drop-offs. This study examined the association of habitual post-exercise whey protein consumption with delayed onset muscle soreness (DOMS) and countermovement jump (CMJ) recovery kinetics following an acute physiological strain. A prospective cohort design with a repeated-measures approach was employed. Thirty male district-level badminton players (15 Protein Group, 15 Control Group; Mean age = 20.5 years) from Chennai, Tamil Nadu, completed a standardized 30-minute badminton-specific high-intensity "shock" circuit. Functional recovery (CMJ height via My Jump 2) and subjective pain (DOMS via a 0–10 Visual Analog Scale) were monitored at baseline, 24 hours, and 48 hours post-exercise. Data were analyzed using a Two-Way Mixed ANOVA via SPSS (Version 26.0). The analysis revealed a highly significant Time x Group interaction effect for both CMJ recovery ($F(2, 56) = 757.35$, $p < .001$, $\eta^2p = 0.96$) and DOMS attenuation ($F(2, 56) = 39.05$, $p < .001$, $\eta^2p = 0.58$). While both groups experienced substantial performance drops at 24 hours, post-hoc Bonferroni comparisons showed that by 48 hours, the Protein group achieved near-complete restoration of explosive power (Mean Diff = -0.65 cm, $p < .001$) and rapid pain resolution (1.07 ± 0.70). Conversely, the unsupplemented control group exhibited persistent functional deficits (Mean Diff = -3.55 cm, $p < .001$) and elevated soreness (3.73 ± 1.03) at 48 hours. These findings demonstrate that targeted post-exercise protein consumption effectively accelerates functional recovery kinetics. Competitive sports programs should integrate structured nutrient timing protocols to optimize athletic readiness during dense tournament schedules.

Keywords: *Whey Protein, Nutrient Timing, Badminton, Countermovement Jump, DOMS, Recovery Kinetics, Sports Nutrition.*

1. Introduction

Badminton is an exceptionally demanding, multi-directional racquet sport characterized by repetitive, explosive bouts of maximum-intensity exertion, such as high-velocity jumps, rapid court lunges, and sudden directional changes (Poulios et al., 2019). Modern competitive match play imposes extreme physiological and mechanical strain on the lower-body neuromuscular system, heavily taxing both anaerobic and aerobic metabolic pathways during prolonged rallies (Phomsoupha & Laffaye, 2015). Due to the dense structure of contemporary tournament schedules, where athletes frequently contend with multiple high-intensity matches within a single day, the temporal pattern of athletic recovery serves as a

primary determinant of persistent performance capacity and overall tournament success (Kritikos et al., 2021). Consequently, identifying practical, field-ready strategies that accelerate recovery kinetics and support consistent athletic readiness remains a core objective within sports science and racquet sport coaching frameworks.

The severe physical strain experienced during badminton-specific training frequently precipitates exercise-induced muscle damage (EIMD) and delayed onset muscle soreness (DOMS) (Davies et al., 2018). This phenomenon is driven by repetitive eccentric loading, particularly during deep forward lunging maneuvers, high-impact smash landings, and explosive deceleration phases on the court floor (Ramos-Campo et al., 2021). These intense eccentric muscular contractions induce structural micro-tearing within muscle sarcomeres and Z-disk disruptions, initiating a localized inflammatory response, extracellular matrix degradation, and intra-muscular swelling (Owen et al., 2012). Phenotypically, this structural damage manifests as a significant transient decline in lower-body explosive power, reduced joint range of motion, and localized mechanical pain that typically peaks between 24 and 48 hours post-exercise (Tidball, 2017). For badminton players, this persistent functional impairment directly hinders the countermovement jump (CMJ) capacity required for overhead smashes and dampens rapid court agility.

To counteract EIMD and optimize the timeline of muscle recovery, sports nutrition research has focused heavily on nutrient timing and targeted macronutrient supplementation (Cintineo et al., 2018). Among available strategies, post-exercise whey protein intake is widely recognized for its high bioavailability and dense concentration of essential amino acids, particularly leucine (Jäger et al., 2017). Mechanistically, the immediate post-workout ingestion of whey protein exploits heightened muscle blood flow and elevated cellular sensitivity, directly activating the mechanistic target of rapamycin complex 1 (mTORC1) signaling pathway (Carbone et al., 2012). This molecular activation upregulates myofibrillar protein synthesis, mitigating negative nitrogen balance, blunting the secondary inflammatory cascade, and accelerating the structural repair of damaged myofibrils (Castro et al., 2022).

Despite substantial evidence supporting the efficacy of protein supplementation in team sports and resistance-trained cohorts, empirical research evaluating recovery kinetics within racquet sports—specifically among regional competitive populations—remains limited (Poulios et al., 2019). Traditional dietary habits among competitive South Asian athletes frequently present distinct macronutrient distributions that may influence baseline recovery profiles, creating a clear gap in localized sports nutrition literature (Kritikos et al., 2021). Furthermore, many existing studies utilize generic weight-lifting protocols or isolated laboratory exercise modalities to induce muscle damage rather than simulating the specific, high-intensity functional strain unique to competitive badminton play (Ramos-Campo et al., 2021).

Therefore, this study aimed to investigate the influence of habitual post-exercise whey protein supplementation on functional recovery and muscle soreness in district-level badminton players following a standardized, high-intensity badminton-specific "shock" training circuit. It was hypothesized that athletes who consistently consumed a targeted dose of whey protein post-exercise would exhibit significantly faster restoration of lower-body explosive power (measured via CMJ height) and an accelerated attenuation of

subjective muscle soreness (DOMS) over a 48-hour recovery window compared to unsupplemented controls (Jäger et al., 2017). By monitoring functional field tests and subjective pain scales simultaneously, this prospective cohort study seeks to provide practical, evidence-based recovery guidelines tailored to competitive racquet sport athletes managing dense performance schedules (Castro et al., 2022).

2. METHODOLOGY

Methodology Research Design

The present study adopted a prospective cohort design with a repeated-measures approach to investigate the influence of habitual post-exercise whey protein supplementation on recovery following a high-intensity badminton-specific training session. Recovery was assessed through measures of muscle soreness and explosive lower-body performance at three time points: baseline (pre-exercise), 24 hours post-exercise, and 48 hours post-exercise. The study focused on the acute recovery response following a standardized exercise protocol designed to induce delayed onset muscle soreness (DOMS).

Participants

Thirty male badminton players aged between 18 and 25 years were recruited from badminton training academies and sports clubs in Chennai, Tamil Nadu, India. Participants were required to have a minimum of two years of competitive playing experience and be actively involved in training at least four days per week.

The inclusion criteria were: (a) male badminton players aged 18–25 years, (b) minimum two years of competitive badminton experience, (c) regular participation in training sessions, and (d) absence of any injury that could affect performance during the study period.

Participants were excluded if they had experienced a musculoskeletal injury within the previous three months, had any diagnosed metabolic, renal, or hepatic disorders, were consuming anti-inflammatory medications, or were using ergogenic supplements other than whey protein.

Based on their regular nutritional practices, participants were categorized into two groups:

- Protein Group (n = 15): Players who regularly consumed whey protein supplements containing at least 25 g of protein within two hours after training sessions, at least three times per week.
- Control Group (n = 15): Players who did not consume whey protein supplements and relied solely on their habitual dietary intake.

Experimental Procedure

Participants attended the testing venue after refraining from strenuous physical activity for 48 hours. Baseline measurements were collected before the exercise protocol.

The testing sequence consisted of:

Baseline Assessment → Standardized Warm-Up → Badminton-Specific High-Intensity Training Session → Recovery Monitoring at 24 h and 48 h

A standardized dynamic warm-up lasting five minutes was performed prior to the exercise session. The warm-up included jogging, dynamic stretching, lunges, and badminton-specific movement drills.

Badminton-Specific High-Intensity Exercise Protocol

To induce exercise-related fatigue and muscle soreness, all participants completed a standardized badminton-specific "shock" training session lasting approximately 30 minutes.

The protocol included:

a. Five minutes of dynamic warm-up

b. Twelve repetitions of 15-second maximal multi-directional court shadow sprints interspersed with 15 seconds of active recovery.

c. Ten minutes of continuous high-intensity badminton movement drills involving explosive lunges, rapid changes of direction, and smash-defense footwork patterns.

The exercise protocol was designed to replicate the physical demands of competitive badminton and create sufficient muscular stress to elicit delayed onset muscle soreness.

Outcome Measures Countermovement Jump (CMJ)

Explosive lower-body performance was assessed using the Countermovement Jump (CMJ) test. Jump height was measured using the My Jump 2 mobile application. Participants performed three maximal jump trials, and the highest value recorded was used for analysis. Measurements were expressed in centimeters (cm).

Delayed Onset Muscle Soreness (DOMS)

Perceived muscle soreness was assessed using a 10-point Visual Analog Scale (VAS), where 0 represented "no soreness" and 10 represented "extreme soreness." Participants rated soreness experienced during the performance of a standardized bodyweight squat.

Monitoring Variables

To reduce the influence of potential confounding factors, additional variables were monitored throughout the study.

Rating of Perceived Exertion (RPE)

Immediately after the exercise protocol, participants reported their level of exertion using the Modified Borg CR-10 Scale.

Sleep Quality

Participants reported sleep quality using a self-rated scale ranging from 0 (very poor) to 10 (excellent) at both 24-hour and 48-hour follow-up assessments.

Hydration Status

Hydration status was evaluated using a standardized urine color chart ranging from 1 to 8, with lower values indicating better hydration.

Data Collection Schedule

Measurements were collected at three time points:

- Baseline (Pre-Exercise)
- 24 Hours Post-Exercise
- 48 Hours Post-Exercise

At each assessment point, CMJ performance and muscle soreness scores were recorded.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 26.0. Descriptive statistics, including mean and standard deviation, were calculated for all variables. Normality of data distribution was assessed using the Shapiro–Wilk test. To examine differences between the Protein and Control groups across the three assessment

periods, a Two-Way Mixed Analysis of Variance (Mixed ANOVA) was employed. The between-subjects factor was Group (Protein vs. Control), while the within-subjects factor was Time (Baseline, 24 h, and 48 h).

The primary outcome of interest was the Group × Time interaction effect, indicating whether recovery patterns differed between the two groups. Where significant effects were identified, Bonferroni-adjusted post hoc analyses were performed. Statistical significance was established at $p < 0.05$. Effect sizes were reported using Partial Eta Squared (η^2p).

2. RESULTS

Participant Characteristics and Protocol Standardization

A total of 30 district-level badminton players successfully completed the experimental protocol. A preliminary independent-samples t-test confirmed that the Protein Group (n = 15) and the Control Group (n = 15) were homogenous at baseline with no significant differences in age (20.60 ± 2.67 vs. 20.47 ± 2.64 years, p = .894), weight (65.87 ± 7.55 vs. 65.27 ± 7.15

kg, p = .826), or baseline lower-body explosive power (42.47 ± 3.99 vs. 41.81 ± 3.58 cm, p =

.635).

Furthermore, the Rating of Perceived Exertion (RPE) recorded immediately following the badminton-specific "shock" circuit demonstrated no significant variance between the Protein (8.53 ± 0.52) and Control (8.47 ± 0.52) cohorts (p = .748), confirming a highly standardized training load and exercise intensity across all participants. The descriptive trends across the three testing intervals are detailed below in Table 1.

Table 1 - Descriptive Statistics of Performance and Soreness Metrics (Mean ± SD)

Outcome	Group	Baseline	24h	48h
CMJ (cm)	Protein	42.47±3.99	38.47±4.05	41.82±4.08
	Control	41.81±3.58	36.39±3.59	38.25±3.60
DOMS (0–10)	Protein	0.00±0.00	4.27±0.96	1.07±0.70
	Control	0.00±0.00	5.33±0.98	3.73±1.03

Inferential Main and Interaction Effects

To evaluate the primary hypotheses, a Two-Way Mixed ANOVA was executed for both functional and subjective recovery parameters. The full breakdown of Sum of Squares (SS), egrees of freedom (df), F-statistics, and corresponding effect sizes (η2p) is presented in Table-2.

Table 2: Two-Way Mixed ANOVA Results

Outcome	Source	SS	df	MS	F	p	η^2p
	Time	33	2	16	8031.	<0	0.

CMJ		4.52		7.26	45	.001	99
	Group	99.65	1	99.65	2.28	0.143	0.08
	Time × Group	31.54	2	15.777	757.35	<0.001	0.96
	Error (Within)	1.17	56	0.02			
DOMS	Time	345.6	2	172.8	499.38	<0.001	0.95
	Group	34.84	1	34.84	33.93	<0.001	0.55
	Time × Group	27.02	2	13.51	39.05	<0.001	0.58
	Error (Within)	19.38	56	0.35			

Countermovement Jump (CMJ) Performance Recovery

For lower-body explosive power, the mixed ANOVA revealed a highly significant main effect for Time ($p < .001$, $\eta 2p = 0.99$), indicating that the acute shock session successfully induced severe neuromuscular fatigue across the entire sample. The main effect for Group was not

statistically significant ($p = .143$, $\eta 2p = 0.08$).

Crucially, a highly significant Time \times Group Interaction Effect was observed ($F(2, 56) = 757.35$, $p < .001$, $\eta 2p = 0.96$). This interaction indicates that the trajectory of functional performance recovery over the 48-hour window differed fundamentally between the two groups.

To isolate where these specific variations occurred, Bonferroni-adjusted post-hoc pairwise comparisons were conducted, as summarized in Table 3. At 24 hours post-exercise, both groups experienced severe performance drops. However, by 48 hours, the Protein group demonstrated robust, near-complete recovery, remaining only marginally below baseline values (Mean Diff} = -0.65 cm). In contrast, the Control group exhibited a severe, persistent performance deficit from their baseline mark (Mean Diff = -3.55 cm), failing to recover explosive capacity.

Table 3: Key Post-hoc Comparisons (Bonferroni)

Outcome	**Comparison**	**Mean Diff**	**p**	**Interpretation**
CMJ	Protein: Baseline vs. 48h	-0.65	< 0.001	Near-complete recovery
CMJ	Control: Baseline vs. 48h	-3.55	< 0.001	Severe persistent deficit
DOMS	Protein vs. Control at 48h	-2.67	< 0.001	Significantly lower soreness in Protein

Delayed Onset Muscle Soreness (DOMS) Attenuation

Analysis of subjective muscle soreness revealed significant main effects for both Time ($p < .001$, $\eta 2p = 0.95$) and Group ($p < .001$, $\eta 2p = 0.55$). Furthermore, the analysis yielded a highly significant Time \times Group Interaction Effect ($F(2, 56) = 39.05$, $p < .001$, $\eta 2p = 0.58$), illustrating that post-training protein supplementation effectively modulated the perception of muscle pain over time.

While both cohorts reported a substantial surge in muscle soreness at 24 hours (Protein: 4.27 ± 0.96; Control: 5.33 ± 0.98), their recovery paths diverged sharply by 48 hours. Post-hoc analysis (Table 3) confirmed that at the 48-hour mark, the Protein group experienced an accelerated resolution of symptoms, dropping to a minimal soreness score of 1.07 ± 0.70. Conversely, the Control group maintained elevated physical distress with a mean DOMS score of 3.73 ± 1.03. The absolute between-group difference at 48 hours was highly significant (Mean Diff = -2.67, $p < .001$), demonstrating a substantial reduction in prolonged muscle soreness in favour of the protein-supplemented athletes.

DISCUSSION

The primary finding of this study demonstrates that targeted post-exercise protein intake significantly accelerates the recovery kinetics of explosive lower-body power and mitigates delayed onset muscle soreness (DOMS) in competitive badminton players. The

sharp reduction in Countermovement Jump (CMJ) performance observed at 24 hours across both groups highlights the severe mechanical and metabolic fatigue induced by intense, sport-specific court drills (Poulios et al., 2019). This functional drop-off aligns with classic sports science literature establishing that high-intensity interval training (HIIT) causes acute structural micro-tearing within muscle sarcomeres, which transiently impairs force-generation capacity and vertical jump efficiency (Davies et al., 2018).

However, the rapid return of the protein-supplemented group toward baseline performance at 48 hours highlights the physiological value of strategic nutrient timing (Cintineo et al., 2018). Immediate post-workout protein delivery supplies an abundant pool of essential amino acids, particularly leucine, which rapidly activates the muscle protein synthesis signaling cascade required to mend damaged myofibrils (Carbone et al., 2012). Without this timely nutritional support, the control group exhibited a prolonged performance deficit (-3.55 cm) at 48 hours, demonstrating how an unsupplemented state prolongs cellular recovery windows and extends structural muscle impairment (Castro et al., 2022).

Furthermore, the significant attenuation of DOMS scores at 48 hours in the protein cohort underscores its role in accelerating structural tissue repair (Kritikos et al., 2021). Intense badminton movements demand rapid, repetitive eccentric lunging and explosive deceleration, which heavily increases localized inflammation, structural tissue soreness, and secondary biochemical damage (Ramos-Campo et al., 2021). Providing high-quality protein within the post-exercise window helps blunt this inflammatory cascade and speeds up the structural rebuilding of damaged extracellular matrices (Jäger et al., 2017). Consequently, these findings suggest that for regional tournament players managing dense training schedules, immediate post-training protein supplementation serves as an effective field-based strategy to maintain explosive capacities and minimize persistent muscular pain.

Conclusion

In conclusion, this study demonstrates that targeted post-exercise protein supplementation significantly accelerates recovery kinetics and attenuates muscle soreness in competitive, district-level badminton players following intensive training (Poulios et al., 2019; Kritikos et al., 2021). The application of a high-intensity sport-specific shock circuit induced severe acute muscle damage and mechanical fatigue, characterized by a substantial drop in vertical jump capacity and elevated muscle pain across all participants at 24 hours post-exercise. However, the subsequent 48-hour recovery trajectories revealed a profound divergence between the experimental groups. Athletes who timed their commercial protein intake within the immediate two-hour post-workout window achieved near-complete restoration of lower-limb explosive power and experienced a rapid mitigation of physical discomfort (Jäger et al., 2017). Conversely, the unsupplemented control group exhibited severe, prolonged neuromuscular deficits and persistent mechanical pain at 48 hours (Davies et al., 2018). These findings underscore the critical role of nutrient timing in activating muscle protein synthesis and facilitating rapid myofibrillar remodeling after fatiguing athletic strain. Ultimately, for regional tournament players managing dense, multi-session training schedules, immediate post-training protein delivery provides a highly effective, field-ready strategy to maximize explosive performance retention, speed up tissue repair, and support consistent athletic readiness (Cintineo et al., 2018; Castro et al., 2022).

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COMPARATIVE EFFECTS OF ADVENTURE-BASED THERAPEUTIC GAMES AND FUNCTIONAL FITNESS TRAINING ON CRAVING, SELF-EFFICACY, AND TREATMENT ADHERENCE AMONG INDIVIDUALS WITH SUBSTANCE USE DISORDER

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Abstract

Background: Substance Use Disorder (SUD) remains a major public health challenge, with high relapse rates and poor treatment adherence often limiting rehabilitation outcomes. Physical activity has been recognized as an effective complementary intervention; however, limited evidence exists comparing the effectiveness of different exercise-based rehabilitation approaches.
Purpose: This study aimed to compare the effects of Adventure-Based Therapeutic Games (ABTG) and Functional Fitness Training (FFT) on craving, recovery self-efficacy, and treatment adherence among males undergoing rehabilitation for Substance Use Disorder in Ambur, TamilNadu.
Methods: A randomized controlled experimental design was employed involving 60 male participants (18–40 years) diagnosed with Substance Use Disorder. Participants were randomly assigned to an Adventure-Based Therapeutic Games group (n = 20), a Functional Fitness Training group (n = 20), or a Control Group (n = 20). Both intervention groups participated in supervised 60-minute sessions, three times per week, for 12 weeks, while the Control Group received standard rehabilitation care only. Craving was assessed using the Drug Craving Questionnaire, recovery self-efficacy was measured using the General Self-Efficacy Scale, and treatment adherence was determined from attendance records. Data were analyzed using Analysis of Covariance (ANCOVA) and Scheffé post hoc tests. Results: Significant group differences were observed for craving, $F(2,56) = 42.32$, $p < .001$, $\eta p^2 = .602$, and recovery self-efficacy, $F(2,56) = 28.14$, $p < .001$, $\eta p^2 = .501$. The ABTG group demonstrated lower adjusted craving scores (46.90 ± 1.45), higher recovery self-efficacy (31.10 ± 0.95), and greater treatment adherence ($89.50 \pm 5.40\%$) than both the FFT and Control groups. Conclusion: Adventure-Based Therapeutic Games produced superior improvements in craving reduction, recovery self-efficacy, and treatment adherence compared with Functional Fitness Training and standard rehabilitation care. The findings suggest that integrating cognitively engaging and socially interactive physical activities into addiction rehabilitation programs may enhance recovery outcomes.

Keywords: Substance Use Disorder, Adventure-Based Therapeutic Games, Functional Fitness Training, Craving, Recovery Self-Efficacy, Treatment Adherence, Rehabilitation, Physical Activity.

Introduction

Substance Use Disorder (SUD) is a chronic and relapsing condition characterized by the compulsive use of psychoactive substances despite harmful physical, psychological,

and social consequences. It remains a major public health concern worldwide, contributing to increased morbidity, mortality, reduced quality of life, and significant socioeconomic burden. Although pharmacological and psychosocial interventions remain central to addiction treatment, relapse rates continue to be high, highlighting the need for complementary rehabilitation approaches that can strengthen recovery outcomes and improve treatment engagement (Zschucke et al., 2012).

Physical activity has emerged as a promising adjunctive intervention in addiction rehabilitation. Research has demonstrated that regular exercise can reduce substance cravings, improve mood, alleviate symptoms of anxiety and depression, and enhance overall psychological well-being among individuals recovering from substance dependence (Montón-Martínez et al., 2025). Exercise is believed to influence neurobiological pathways associated with addiction by promoting the release of neurotransmitters such as dopamine, serotonin, and endorphins, thereby helping to regulate reward mechanisms and reduce craving-related symptoms (Zheng et al., 2024).

Among the various psychological factors influencing recovery, substance craving is one of the strongest predictors of relapse. Persistent cravings often interfere with treatment progress and increase the likelihood of returning to substance use. Evidence suggests that exercise-based interventions can effectively reduce craving intensity by providing cognitive distraction, stress reduction, and emotional regulation benefits (Ding et al., 2024). However, the effectiveness of physical activity may depend not only on exercise intensity but also on the structure and engagement level of the intervention.

Recovery self-efficacy is another critical determinant of successful rehabilitation outcomes. Self-efficacy refers to an individual's confidence in their ability to resist substance use and cope with high-risk situations. Higher levels of recovery self-efficacy have been consistently associated with improved treatment outcomes and reduced relapse rates. Physical activity interventions may enhance self-efficacy through mastery experiences, goal achievement, and positive social interactions, thereby strengthening confidence in maintaining recovery (Hill, 2007). Treatment adherence is equally important within rehabilitation settings. Many individuals discontinue treatment prematurely due to low motivation, boredom, or lack of engagement. Consequently, rehabilitation programs that are enjoyable, interactive, and socially supportive may improve attendance and participation rates, thereby enhancing overall treatment effectiveness

(Ryan & Deci, 2000).

Functional Fitness Training (FFT) is commonly used in rehabilitation settings to improve physical fitness and overall health. However, its repetitive nature may limit long-term engagement among some participants. In contrast, Adventure-Based Therapeutic Games (ABTG) combine physical activity with cooperative problem-solving, communication, teamwork, and experiential learning. Such activities require participants to engage cognitively, emotionally, and socially while performing physical tasks, potentially offering broader therapeutic benefits than conventional exercise programs (Gassmann & Grawe, 2006).

Despite growing interest in exercise-based rehabilitation, limited research has directly

compared the effects of Adventure-Based Therapeutic Games and Functional Fitness Training on craving, recovery self-efficacy, and treatment adherence among individuals with Substance Use Disorder. Therefore, the present study aimed to compare the effectiveness of a 12-week ABTG program, FFT, and standard care among males undergoing rehabilitation for SUD in Ambur, Tamil Nadu. It was hypothesized that participants in the ABTG group would demonstrate greater reductions in craving, higher recovery self-efficacy, and superior treatment adherence compared with those receiving FFT and standard rehabilitation care.

2. Methodology

2.1 Research Design

This study employed a randomized controlled experimental design to investigate the comparative effects of Adventure-Based Therapeutic Games (ABTG) and Functional Fitness Training (FFT) on craving, recovery self-efficacy, and treatment adherence among individuals with Substance Use Disorder (SUD). The intervention was conducted over a 12-week period in selected drug rehabilitation centers. The study was designed to evaluate whether participation in structured adventure-based activities could provide greater psychological and behavioral benefits than conventional fitness training within a rehabilitation setting.

2.2 Participants and Selection Criteria

A total of 60 male participants diagnosed with Substance Use Disorder were recruited through purposive sampling from registered rehabilitation centers. The sample included individuals undergoing residential treatment for alcohol dependence, drug addiction (including opioids, cannabis, or stimulants), or polysubstance use. Participants were aged between 18 and 40 years and had been enrolled in the rehabilitation program for a minimum of one month prior to participation to ensure baseline clinical stabilization and completion of initial medical detoxification.

Individuals with severe psychiatric disorders, neurological impairments, cardiovascular contraindications, or musculoskeletal conditions that could limit safe participation in physical activity were excluded from the study. To minimize confounding variables, participants were stratified according to their primary dependency type (alcohol versus drugs) during the allocation process to ensure balanced baseline representation across study groups. Written informed consent was obtained from all participants before data collection, and the study adhered to established ethical guidelines for research involving human participants.

2.3 Randomization and Group Assignment

Participants were randomly assigned using a computer-generated randomization sequence into three parallel groups comprising 20 participants each:

- Adventure-Based Therapeutic Games Group (ABTG)
- Functional Fitness Training Group (FFT)
- Control Group (CG)

Baseline measurements of craving and recovery self-efficacy were obtained before the commencement of the intervention.

2.4 Intervention Protocols

2.4.1 Adventure-Based Therapeutic Games (ABTG)

Participants in the ABTG group completed three supervised sessions per week for 12 weeks, with each session lasting approximately 60 minutes. Activities included team obstacle challenges, cooperative relay races, navigation games, trust-building exercises, problem-solving missions, treasure-hunt activities, and group adventure challenges. The difficulty and complexity of activities were progressively increased throughout the intervention to maintain engagement and encourage continuous adaptation.

2.4.2 Functional Fitness Training (FFT)

Participants assigned to the FFT group completed three supervised sessions per week for 12 weeks, with each session lasting 60 minutes. The training program consisted of bodyweight and circuit-based exercises such as squats, lunges, push-ups, planks, step-ups, agility drills, and functional movement circuits. Training intensity was progressively increased through manipulation of repetitions, duration, and circuit complexity.

2.4.3 Control Group (CG)

Participants in the Control Group continued to receive standard rehabilitation services, including counseling, educational programs, and routine therapeutic activities. No structured physical activity intervention was provided during the study period.

2.5 Outcome Measures

The following dependent variables were assessed:

1. Craving: Measured using the Drug Craving Questionnaire, which assessed the intensity and frequency of substance-related urges.
2. Recovery Self-Efficacy: Assessed using the General Self-Efficacy Scale, evaluating confidence in coping with challenges and maintaining behavioral change.
3. Treatment Adherence: Determined through attendance records, participation rates, and session completion data maintained by rehabilitation center staff.

2.6 Testing Procedures

Pre-test assessments were conducted one week before the intervention, while post-test assessments were completed immediately following the 12-week intervention period. All assessments were administered under standardized conditions by trained researchers.

2.7 Statistical Analysis

Descriptive statistics, including means and standard deviations, were calculated for all variables. The assumptions of normality, homogeneity of variances, linearity, and homogeneity of regression slopes were examined before inferential analysis. Analysis of Covariance (ANCOVA) was employed using post-test scores as dependent variables and corresponding pre-test scores as covariates. When significant group effects were observed, Scheffé post hoc comparisons were performed. Statistical significance was established at the 0.05 level.

3. Results

The present study examined the effectiveness of a 12-week Adventure-Based Therapeutic Games (ABTG) intervention and Functional Fitness Training (FFT)

compared with a Control Group (CG) on substance craving, recovery self-efficacy, and treatment adherence among individuals undergoing rehabilitation.

Table 1 - Baseline Characteristics, Raw Scores, and Adjusted Post-Test Means for All Study Groups (N = 60)

Variable	Outcome Measure	ABTG (n=20)	FFT (n=20)	Control (n=20)
Demographic	Age (years)	29.95± 4.21	29.90 ±4.25	29.20± 4.09
Craving Score	Pre-test	78.35± 5.82	78.40 ±5.75	78.40± 5.75
	Post-test	46.40± 6.27	54.35 ±6.49	74.25± 7.25
	Adjusted Post-test Mean (EMM)	46.90± 1.45	53.80 ±1.45	73.50± 1.45
Recovery Self-Efficacy	Pre-test	17.40± 2.87	17.35 ±2.91	17.35± 2.91
	Post-test	31.45± 4.14	26.10 ±4.28	18.55± 4.19
	Adjusted Post-test Mean (EMM)	31.10± 0.95	26.40 ±0.95	18.60± 0.95
Treatment Adherence (%)	Session Completion Rate	89.50± 5.40	82.00 ±6.20	—

The baseline characteristics indicated that the three groups were comparable in age and pre-test measurements, suggesting initial equivalence prior to the intervention period.

2.1 Effect of Intervention on Substance Craving

Prior to conducting ANCOVA, the assumptions of normality, homogeneity of variances, linearity, and homogeneity of regression slopes were examined and found satisfactory.

Table 2 - ANCOVA for Post-Test Substance Craving Scores

Source	SS	df	MS	F	p	Partial ηp2
Pre-Test Craving (Cov.)	1205.6	1	1205.6	27.22	<0.001	0.327
Group Effect	3748.2	2	1874.1	42.32	<0.001	0.602
Error	2 4 8 0. 1	5 6	4 4. 2 9	—	—	—
Corrected Total	7 4 3 3. 9	5 9	—	—	—	—

After controlling for baseline differences, a significant group effect was observed, $F(2,56) = 42.32$, $p < .001$, $\eta p^2 = .602$. The adjusted post-test means indicated that the ABTG group achieved the lowest craving score (46.90 ± 1.45), followed by the FFT group (53.80 ± 1.45), while the Control Group recorded the highest adjusted score (73.50 ± 1.45).

Table 3 - Scheffé Post Hoc Comparisons for Craving Scores

Comparison	Mean Difference	95% CI	p
ABTG vs FFT	-6.90	[-11.20, -2.60]	< .001
ABTG vs Control	-26.60	[-30.90, -22.30]	< .001
FFT vs Control	-19.70	[-24.00, -15.40]	< .001

All pairwise comparisons were statistically significant, indicating that ABTG was the most effective intervention for reducing substance craving.

2.1 Effect of Intervention on Recovery Self-Efficacy

Table 4 - ANCOVA for Post-Test Recovery Self-Efficacy Scores

Source	SS	df	MS	F	p	Partial η^2
Pre-Test Self-Efficacy	408.50	1	408.50	22.71	< .001	.289

Group	1012.30	2	506.15	28.14	< .001	.501
Error	1007.20	56	17.99	—	—	—
Corrected Total	2428.00	59	—	—	—	—

A significant group effect was observed after adjustment for baseline scores, $F(2,56) = 28.14$, $p < .001$, $\eta p^2 = .501$.

Table 5- Scheffé Post Hoc Comparisons for Recovery Self-Efficacy

Comparison	**Mean Difference**	**95% CI**	**p**
ABTG vs FFT	4.70	[1.90, 7.50]	< .001
ABTG vs Control	12.50	[9.70, 15.30]	< .001
FFT vs Control	7.80	[5.00, 10.60]	< .001

The ABTG group achieved significantly higher recovery self-efficacy than both the FFT and Control groups.

2.2 Treatment Adherence

Table 6 - Comparison of Treatment Adherence between Intervention Groups

Variable	**ABTG (n = 20)**	**FFT (n = 20)**	**Mean Difference**	**t**	**p**	**Cohen's d**
Treatment Adherence (%)	89.50 ± 5.40	82.00 ± 6.20	7.50	4.08	< .001	1.29

The ABTG group demonstrated significantly higher adherence than the FFT group, t(38)

= 4.08, $p < .001$, with a large effect size ($d = 1.29$).

3. Discussion

The present study investigated the comparative effects of Adventure-Based Therapeutic Games (ABTG) and Functional Fitness Training (FFT) on craving, recovery self-efficacy, and treatment adherence among males with Substance Use Disorder (SUD). The findings indicate that both interventions were effective in improving recovery-related outcomes; however, ABTG demonstrated consistently superior effects across all variables.

The significant reduction in craving observed in both intervention groups is consistent with recent evidence suggesting that exercise-based interventions are effective adjunctive strategies in substance use rehabilitation. Systematic reviews and meta-analyses have reported that physical activity can reduce craving and substance use behaviors by influencing reward-related neurobiological mechanisms and stress regulation pathways (Carlson et al., 2025; Chen et al., 2025). In the present study, the ABTG group showed greater reductions than FFT, indicating that cognitively engaging and socially interactive physical activity may enhance attentional control and reduce cue-induced craving more effectively than repetitive exercise alone.

Recovery self-efficacy was also significantly higher in the ABTG group. This finding aligns with contemporary research emphasizing that mastery experiences, social reinforcement, and problem-solving tasks are key contributors to self-efficacy development in addiction recovery (Acord-Vira et al., 2025). Adventure-based activities provide structured challenges that require teamwork, decision-making, and adaptation, which likely strengthened participants' belief in their ability to manage recovery-related challenges.

The significantly higher treatment adherence in the ABTG group is consistent with Self-Determination Theory, which highlights autonomy, competence, and relatedness as essential drivers of intrinsic motivation (Ryan & Deci, 2020). Recent research in exercise-based addiction interventions has also emphasized that enjoyment, novelty, and social engagement are critical for sustaining participation in rehabilitation programs (Montón-Martínez et al., 2025). The gamified structure of ABTG likely enhanced engagement, thereby reducing dropout rates compared to traditional fitness training.

Overall, the findings support emerging evidence that multimodal physical activity interventions combining cognitive, emotional, and social components may produce stronger therapeutic effects than conventional exercise alone in SUD rehabilitation settings (Patterson et al., 2022).

4. Conclusion

The present study demonstrated that a 12-week Adventure-Based Therapeutic Games (ABTG) intervention is more effective than Functional Fitness Training (FFT) and standard rehabilitation care in improving psychological and behavioral outcomes among individuals with Substance Use Disorder.

First, ABTG produced significantly greater reductions in substance craving compared with FFT. This supports recent evidence indicating that structured physical

activity can reduce craving intensity through neurobiological regulation and cognitive distraction mechanisms (Chen et al., 2025; Carlson et al., 2025).

Second, ABTG significantly improved recovery self-efficacy compared to FFT and control conditions. This suggests that experiential learning, teamwork, and problem-solving tasks enhance confidence in managing high-risk situations, consistent with current findings on exercise-based rehabilitation interventions (Acord-Vira et al., 2025). Third, ABTG achieved higher treatment adherence than FFT, indicating that gamified and socially interactive interventions may improve intrinsic motivation and sustained participation in rehabilitation programs. This aligns with contemporary evidence that engagement-driven exercise interventions are more effective in maintaining long-term adherence in clinical populations (Monton-Martinez et al., 2025). In conclusion, Adventure-Based Therapeutic Games represent a promising adjunctive rehabilitation strategy for Substance Use Disorder by integrating physical activity with cognitive engagement and social interaction. However, future research should include larger randomized controlled trials, multi-site samples, and long-term follow-up assessments to examine sustainability and relapse prevention outcomes (Carlson et al., 2025).

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MIND-BODY HARMONY: YOGA AS A LIFESTYLE MANAGEMENT STRATEGY FOR HOLISTIC HEALTH AND WELL-BEING

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Abstract

Modern lifestyle -- characterised by sedentariness, poor dietary habits, inadequate sleep due to psychological stress and excessive digital dependence – has resulted in the increasing prevalence of lifestyle disorders and diminished quality of life. Contemporary health challenges such as obesity, hypertension, diabetes, cardiovascular diseases, anxiety, and stress-related disorders highlight the urgent need for holistic and sustainable approaches to health promotion and lifestyle management. In this context, Yoga, one of the major schools of Indian philosophy, has emerged as a scientifically relevant and globally recognised wellness practice promoting integrated physical, mental, and emotional health.

Yoga has been increasingly popular as a lifestyle management strategy in recent decades. Its potential to promote holistic health and well-being is a much-studied area in Physical Education and Health Sciences. This paper explores the impact of yogic practices such as asanas, pranayama, meditation, relaxation techniques, and mindful behaviour in enhancing physical fitness, emotional stability, mental well-being, sleep quality, stress regulation, and overall quality of life. The discussion further highlights the preventive and therapeutic significance of yoga in the management of lifestyle-related diseases such as obesity, hypertension, Type-2 diabetes, anxiety, and stress-induced disorders.

Drawing from contemporary scientific literature and holistic health approaches, the paper emphasises the integration of yoga into daily lifestyle routines, educational settings, and community wellness programmes as a cost-effective and sustainable health promotion strategy. The paper concludes that yoga provides a comprehensive framework for holistic well-being by integrating traditional wisdom with modern lifestyle management and preventive healthcare practices.

Keywords: *Yoga, Lifestyle Management, Holistic Health, Well-being, Health Promotion, Yogic Practices*

Introduction

The contemporary world has witnessed a rapid transformation in lifestyle patterns driven by urbanisation, technological advancement, industrialisation, and increasing digital dependence. While these developments have enhanced convenience

and productivity, they have been instrumental in the prevalence of unhealthy behavioural patterns such as sedentary living, irregular sleep, unhealthy dietary habits, psychological stress, and reduced social interaction in real time. These lifestyle changes have been responsible for the steady decline in quality of life and rising instances of non-communicable diseases across all age groups.

Lifestyle-related disorders such as obesity, hypertension, cardiovascular diseases, type 2 diabetes, anxiety, depression, and stress-related conditions have become serious public health concerns globally (1,2). According to contemporary health research, many of these conditions are closely associated with modifiable behavioural risk factors rather than infectious causes. Consequently, modern healthcare systems have increasingly shifted their focus from curative approaches to preventive and lifestyle-based interventions that promote long-term health and well-being.

In this context, lifestyle management has gained considerable importance as a multidisciplinary approach aimed at improving health outcomes through positive behavioural modifications. It encompasses various dimensions from regular physical activity, balanced nutrition, adequate rest and sleep to stress management, emotional regulation, and healthy social practices. However, the growing complexity of modern life has created challenges in maintaining balanced and sustainable lifestyle behaviours, thereby necessitating holistic and integrative approaches to health promotion.

Yoga, one of the most significant contributions of Indian Knowledge Systems (IKS), has emerged as a globally recognised practice for promoting holistic health and well-being (3). Traditionally rooted in ancient Indian philosophy, yoga extends beyond physical exercise and represents a comprehensive system integrating physical, mental, emotional, and behavioural disciplines. Yogic practices such as asanas, pranayama, meditation, relaxation techniques, and
mindful living practices are increasingly being acknowledged for their positive influence on physical fitness, stress reduction, mental health, emotional stability, and quality of life.

From a Physical Education and Health Science perspective, yoga offers a scientifically relevant and cost-effective strategy for lifestyle modification and preventive healthcare. Unlike many conventional fitness approaches that primarily focus on physical conditioning, yoga promotes an integrated model of wellness addressing both physiological and psychological dimensions of health. Recent scientific literature has highlighted the effectiveness of yoga-based interventions in improving flexibility, muscular endurance, cardiovascular efficiency, sleep quality, stress tolerance, and management of lifestyle-related diseases (4,5). Furthermore, yoga has demonstrated significant therapeutic potential in reducing anxiety, depression, hypertension, obesity, and metabolic disorders.

The increasing incorporation of yoga into educational institutions, community wellness programmes, workplace health initiatives, and rehabilitation settings reflects its growing acceptance as a sustainable health promotion strategy. In the context of rising mental health challenges, sedentary lifestyles, and chronic diseases, yoga provides a holistic framework for restoring balance between body and mind while encouraging

healthy behavioural practices.

Therefore, the present paper attempts to examine yoga as a lifestyle management strategy for holistic health and well-being. It analyses the role of yogic practices in promoting physical, mental, and emotional wellness, preventing lifestyle-related disorders, and enhancing quality of life through sustainable and holistic lifestyle interventions.

Lifestyle Management

Modern life is characterised by fast pace, gadget dependency, and considerable lack of physical activity, all of which affect well-being in the long run. The downside of a more convenient and comfortable lifestyle is the gradual, sometimes unconscious loss of certain healthy practices, further resulting in 'lifestyle disease'. This has led to the increasing focus on lifestyle management, or, adoption of habits or practices that ensure overall well-being and quality of life. In fact, lifestyle management is now a crucial aspect of preventive medicine.

Lifestyle is merely individual as it is deeply impacted by several external factors. Rapid urbanization, aggravated pollution and air quality issues, increased reliability on fast food and access to quick deliveries, demanding and stressful occupations – all of these contribute to reduction in general quality of life and well-being. While a heavily tech-reliant life has made everything faster and smoother, it has also led to a condition where an individual spends more time working and eating while compromising healthy practices such as playing sports or doing regular exercise, in which little time is invested. Such changes in lifestyle are the chief causes of obesity, hypertension, cardiovascular issues, diabetes and depression. This has made lifestyle management strategies imperative.

Lifestyle management is an intervention strategy to identify, assess and rectify or improve conditions and/or risk factors that are unhealthy and detrimental to general well-being

(6). It is a comprehensive approach that goes beyond disease prevention to include total enhancement of health and vitality, productivity, resilience, stability and fitness. It integrates physical, psychological, emotional and social aspects of health.

Dietary regulations and nutrition form a crucial part of lifestyle management. The trend of moving away from home-cooked meals to junk food and fad diets has been a rising concern in recent times. The over-reliance on processed food, high intake of sugar and irregular eating habits aggravate the chances of chronic illness and metabolic disorders.

Yet another significant facet of lifestyle management is sufficient rest and sleep. Both work and leisure nowadays observe irregular timings which compromise proper rest. Sleep disorders are found across age groups, even among young children, chiefly due to increased screen time. Sleep deprivation can affect hormonal balance, immunity and general health.

Equally concerning is the rise in stress disorders across all age groups. The prevalence of hustle culture, and the pressure to perform and achieve in all walks of life have put contemporary generations under immense stress to reach expectations and to sustain self-worth. This leads to both physiological and psychological issues that further drain

the essential quality of life. Another recurring culprit behind modern lifestyle diseases is, without doubt, an alarming decline in physical activity. Easy transport mobility, mostly deskbound jobs, media bingeing and general tiredness on account of improper diet push regular exercise or activity down the priority list.

Thus, it can be seen that lifestyle management must address multiple concerns to improve the quality of life. One of the major aspects of lifestyle intervention is regular exercise

(7). Consistent physical activity helps to improve muscular strength, cardiovascular fitness, immunity and better functional capacity. It is here that Yoga becomes significant as it is a holistic lifestyle management strategy backed by science.

Yoga and Holistic Health Yoga or Yog is one of the major schools of Indian philosophy. It is a holistic system that caters to physical, mental, ethical and social well-being. Often seen as another system of exercise, Yoga is much more than physical work out as it comprises an entire philosophy of life. In other words, physical fitness is just another component of total health and well-being. Systematic integration of yogic philosophy can ensure a wholesome life experience. The discipline it incorporates also helps in keeping illness at bay. The word 'yoga' itself signifies harmony or union of mind and body. The physical aspect of Yoga primarily deals with pranayama and asanas which help in disciplining body and mind. In this way Yoga becomes a holistic health practice that address the various dimensions of well-being.

Asanas and Physical Health

Asanas refer to specific physical postures designed to improve strength, flexibility, balance, posture, neuromuscular coordination, and body awareness. In modern health science, yogic postures are recognised as effective low-impact physical activities that enhance musculoskeletal efficiency and functional capacity. Regular practice of asanas improves joint mobility, muscular endurance, spinal flexibility, circulation, and postural alignment while reducing physical stiffness and fatigue (8).

Yoga postures focus on control rather than intensity. Assuming a yoga asana involves the conscious control of body and breath. More than an exercise, an asana is a method of disciplining the body. Yoga postures also activate internal organs and assist in optimising blood circulation. Consistent and systematic yoga practice can thus ensure good health and immunity, and can also help in dealing with obesity, hypertension and associated diseases. Unlike other exercise options, yoga can be adapted according to varying levels of health and fitness of individuals.

Respiratory Regulation through Pranayama

Pranayama is a core component of yogic practice. It refers to controlled, measured breathing to optimise respiratory efficiency and stimulate parasympathetic nervous system. Breath is equal to life and pranayama helps in regulating it to sustain a healthy life. Pranayama involves various methods of deep breathing, a practice usually recommended for alleviating stress, reducing anxiety and acquiring mental calm. Scientific evidence suggests that controlled breathing practices positively influence cardiovascular function, respiratory endurance, stress

tolerance, and emotional regulation (9). Regular practice of pranayama can ensure improved concentration, better sleep and mental relaxation.

Meditation for Mental Health

Contemporary life is characterised by over-stimulation of all senses or sensory overload that adversely impacts mental health and psychological stability. Meditation, yet another core aspect of Yoga, chiefly serves in sustaining or restoring mental resilience, emotional health and inner awareness. In a time where attention span and ability to concentrate seem to be declining, meditative practices can help significantly in better cognitive functioning as well as self-awareness (10). Research has shown that regular yoga practice contributes to reduced anxiety, improved mood, greater emotional resilience, enhanced self-control, and better stress management (11,12).

Sleep Hygiene, Relaxation Techniques and Recovery

Yoga also helps to improve sleep quality since adequate sleep is essential for holistic health. In fact, insomnia and other sleep disorders are on the rise which has a negative impact on hormonal balance and other health aspects. Yoga Nidra is a type of guided relaxation that helps in calming down physical, psychological and nervous systems thereby restoring the balance between activity and recovery. Thus, yoga helps improve sleep through stress reduction, nervous system relaxation, breathing regulation, and mental calmness (13).

Discipline and Mindful Living

As mentioned earlier, Yoga is not just a physical activity. Beyond the postures and breathing methods, Yoga also contains ethical philosophy that helps in maintain a well-disciplined life. The ethical aspects of Yoga can be found in yama (restraint) and niyama (discipline) which relate to good conduct of life as well as self-maintenance. There are also advanced yogic phases such as pratyahara (withdrawal of senses) and dharana (concentration) which contribute towards mindfulness and increase awareness.

From this it can be seen that, Yoga is an effective lifestyle intervention strategy as it has impact on almost all aspects of life. In today's busy world, yogic approaches are indeed imperative if good health and well-being are to be sustained. Yoga is a sure shot solution towards holistic health if implemented systematically into daily routine.

Quality of Life and Holistic Wellness

The primary aim of lifestyle management is to enhance the quality of life and wellness. As can be seen from above analysis, yoga has a cumulative influence on all levels of health. Holistic wellness is a state of being when body and mind are in harmony, and Yoga aims to create and sustain this harmony. It should also be noted that Yoga is suitable for all age groups The earlier an individual starts a yogic routine, the better will be their lifestyle in the long run. Holistic well-being is also a product of discipline, which is crucial in disease prevention as well.

Yoga in Lifestyle Disease Prevention and Management

As mentioned above, many of the contemporary health issues are due to lifestyle changes. It would not be wrong in saying that many of modern habits are not health-friendly. Lack of adequate nutrition, exercise and rest causes immunity to decline thereby making the body susceptible to illnesses. Yoga can help in disease prevention

by improving immunity, and so is a popular approach in preventive health care. It can help in managing conditions like obesity and hypertension, and by extension tackle other related disorders through systematic lifestyle management. Yogic approach to disease management is not just curing the symptoms but is characterised by long-term behavioural regulation. Yoga has demonstrated positive effects on autonomic nervous system regulation, stress reduction, vascular relaxation, and emotional stability. Practices such as pranayama, meditation, and relaxation techniques help reduce sympathetic nervous system overactivity and promote parasympathetic dominance, thereby contributing to blood pressure regulation (14). Yoga has gained considerable attention as a complementary approach for the prevention and management of common mental health disorders. Through the combined practice of asanas, pranayama, meditation, and relaxation techniques, yoga helps regulate stress responses, improve emotional regulation, and reduce psychological distress. Research has demonstrated that regular yoga practice may contribute to reductions in anxiety symptoms, perceived stress, and depressive tendencies while enhancing coping ability and psychological resilience (15,16).

Integrating Yoga into Daily Lifestyle for Health Promotion

It should be noted that Yoga is not a temporary mode of treatment. It has to be integrated into daily life in a systematic, disciplined manner, and should be practised on a regular basis. As mentioned earlier, Yoga is a flexible, adaptable intervention across gender and age. While inclusion of Yoga into routine cold be an individual choice, integrating it on a larger scale could be effective especially in the light of rising lifestyle diseases. Educational institutions play a crucial role in shaping lifelong health behaviours. Since learning is heavily digital these days, a lot of changes has happened in contemporary educational structure, especially in the focus given to physical training and sports. Making Yoga a part of school and higher education can reap immense benefits as it can help develop a healthy lifestyle at a very young age itself. In Physical Education, Yoga helps to complement traditional sports and fitness programmes. Similarly, work culture has undergone drastic changes in recent times. The prevalence of long hours, night shifts, work pressure and other challenges directly contribute to lifestyle disorders among adult population. Integration of Yoga into workplace through regular sessions on physical activity and relaxation can help with stress management and promote workplace wellness. In order to promote public health, Yoga can also be made part of community programmes through residence associations, public health centre initiatives etc.

Challenges and Limitations in Integrating Yoga into Lifestyle Management

While Yoga is now acknowledged as an effective lifestyle management strategy, its full and sustained adoption into daily life still faces a lot of challenges. Individual motivation, time constraints, prioritisation are some of the hindrances in making Yoga part of the routine. The effectiveness and benefits of Yoga are dependent on consistency and long-term practice. Busy schedules, heavy workload and other responsibilities of modern life make long term adherence difficult. Also, unrealistic expectations for instant results become a demotivating factor preventing people from

sustaining consistent practice. Another barrier to integrating yoga into daily life is lack of awareness or limited understanding. Yoga is often misunderstood as an exercise regimen while its psycho-social benefits are overlooked. Yoga is also seen as complex physical activity unsuitable for certain groups. Again, there are misconceptions regarding the cultural associations around Yoga which discourage participation. Therefore, awareness on Yoga's health benefits supplemented by evidence is very essential. Yet another challenge is accessibility to quality instructors, structured programmes and suitable practice environments. Proper training is a crucial factor in Yoga because inadequate coaching and improper supervision may affect the benefits and lead to other difficulties. Closely related to this aspect is the widespread commercialization of Yoga. Many commercial yoga programmes tend to alter the core practices to suit fitness trends and profit-driven objectives. While these may gain traction with the public, they may overshadow the holistic principles of Yoga. Also, there are considerable variation in teaching methods, programme design, duration, and practice intensity. This lack of standardisation can make it difficult to evaluate outcomes consistently and compare findings across studies. Greater efforts toward evidence-based practice and professional standards may enhance the credibility and effectiveness of yoga-based interventions. In order to fully understand and reap the benefits of Yoga it is imperative to maintain a balance between traditional yogic principles and modern health applications. Effective lifestyle management calls for an integrated approach that takes into consideration the philosophical, scientific and health dimensions of Yoga. Despite these challenges, Yoga is the need of the hour in preventive healthcare. Future efforts should focus on increasing public awareness, strengthening yoga education, improving accessibility, promoting evidence-based practice, and integrating yoga into educational institutions, workplaces, and community health programmes. Collaboration among health professionals, physical educators, researchers, policymakers, and yoga practitioners can facilitate the development of comprehensive lifestyle management initiatives that maximise the benefits of yoga for diverse populations. Addressing these challenges effectively will further strengthen the role of yoga as a sustainable strategy for holistic health promotion and well-being.

Conclusion

Yoga is, without doubt, a much desirable regimen for health and wellness promotion. Unlike other physical and fitness activities, Yoga is a comprehensive system that addresses the physical, psychological, social aspects of health and wellness. It's adaptable nature and suitability across age groups makes it a preferred option for overall fitness. Lifestyle management is of immense importance in contemporary times. The increased pace of life, pressures of different kinds, sedentary habits all lead to rise in stress, anxiety and other related disorders. Systematic practice of Yoga can address all of these issues and help change lifestyle to a healthier one. While it is highly recommended to make Yoga a part of daily life, importance must be given to proper training and sustained practice.

This paper has attempted to underscore the significance of Yoga in improving physical fitness, mental health and overall well-being by regulating lifestyle. Inclusion of yoga

into routine is of utmost significance especially in the scenario where drugs such as Ozempic are gaining momentum in 'curing' obesity albeit with dire side effects. While drugs are useful in certain cases, looking for easy solutions without changes in lifestyle pattern will not bring desired results. Yoga is a cost-effective method that can be easily made a regular practice with discipline and the determination to prioritise health. It is, without doubt, a comprehensive approach to a better life and holistic well-being with long lasting impact on the quality of life at all levels.

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THE ROLE OF LMNT NEUROPATHY IN DIGITAL AGE STRESS

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Abstact

The rapid expansion of digital technologies has transformed modern lifestyles by improving communication, education, and productivity. However, excessive dependence on smartphones, computers, social media platforms, and digital communication systems has contributed to a growing health concern known as digital age stress or technostress.

Continuous exposure to digital devices often results in mental fatigue, anxiety, sleep disturbances, emotional exhaustion, reduced attention span, and various physical complaints. The present paper explores the potential role of LMNT Neurotherapy in addressing the adverse effects of digital age stress within the broader framework of Indian Knowledge Systems (IKS).

The study adopts a conceptual and literature-based approach by reviewing existing research on digital stress and examining the theoretical foundations of LMNT Neurotherapy. The paper discusses how stimulation of neuro-reflex points may support nervous system regulation, relaxation, and overall physiological balance. It further highlights the integration of neurotherapy with healthy lifestyle practices such as yoga, meditation, pranayama, mindful technology use, and adequate rest.

The findings suggest that LMNT Neurotherapy may serve as a complementary wellness approach for managing symptoms associated with digital stress.When combined with preventive lifestyle interventions, it may contribute to improved mental well-being, stress resilience, and digital wellness. The paper emphasizes the need for future empirical research to scientifically evaluate the effectiveness of LMNT Neurotherapy in digital-age health challenges.

Keywords: Digital Age Stress, Technostress, LMNT Neurotherapy, Mental Well-Being, Digital Wellness, Indian Knowledge Systems, Stress Management, Nervous System Balance.

Introduction

The twenty-first century has witnessed an unprecedented digital revolution. Smartphones, computers, social media platforms, artificial intelligence, and instant communication technologies have transformed the way people work, learn, socialize, and access information. While these innovations have undoubtedly improved convenience and productivity, they have also created new challenges for human health. One of the most significant concerns emerging from this technological transformation is Digital Age Stress, commonly referred to as Techno Stress.

Digital age stress is a state of mental, emotional, and physical strain resulting from excessive exposure to digital technologies and the constant demand for connectivity.
The continuous influx of information, frequent notifications, prolonged screen time, online work pressure, and social media engagement place a substantial burden on the nervous system. As a result, individuals increasingly experience fatigue, anxiety, sleep disturbances, reduced concentration, and emotional exhaustion. In this context, LMNT Neurotherapy, developed by the and institutionalized through the under the leadership of offers a holistic and drug-free approach for managing the adverse effects of digital stress.

Understanding Digital Age Stress

Digital age stress develops when the human mind and body struggle to adapt to the demands of modern technology. Unlike traditional forms of stress, digital stress often remains unnoticed because digital devices have become an inseparable part of daily life.

1. Excessive screen time.
2. Continuous exposure to social media.
3. Information overload.
4. Work-from-home and remote work pressures.
5. Constant notifications and interruptions.
6. Fear of Missing Out (FOMO).
7. Digital multitasking.
8. Reduced physical activity.
9. Poor sleep due to late-night device usage.
10. Dependence on technology for daily activities.

Symptoms of Digital Age Stress

Physical Symptoms	Psychological symptom	Behavioral symptoms
• Headache and migraines	• Anxiety and Nervousness	• Social withdrawal
• Eye strain and dry leye	• Irritability and Mood swing	• Excessive device dependency
• Neck, Shoulder and Back pain	• Difficulty concentrating	• Reduced physical activity
• Fatigue and lower energy	• Mental fatigue	• Disturbed work - life balance
• Sleep disturbance	• Reduced productivity	• Poor interpersonal communication
• Increased muscle tension	• Emotional exhaustion	

IMPACT ON NERVOUS SYSTEM

Continuous exposure to digital stimuli can overstimulate the nervous system. The brain remains in a heightened state of alertness due to constant notifications, messages, and

information processing demands.

This prolonged activation may result in:

- Increased sympathetic nervous system activity
- Elevated stress hormone levels
- Reduced parasympathetic relaxation response
- Mental fatigue
- Sleep disturbances
- Reduced cognitive efficiency
- Over time, this imbalance can negatively affect physical health, emotional well-being, and overall quality of life.

LMNT Neurotherapy: An Overview

LMNT Neurotherapy is a natural, non-invasive, and drugless healing system based on the principle that proper functioning of the nervous system plays a crucial role in maintaining health.

The therapy involves stimulation of specific neuro-reflex points corresponding to various organs and physiological systems.

Through systematic pressure applications, LMNT Neurotherapy aims to enhance circulation, improve nerve communication, support organ function, and encourage the body's innate healing mechanisms.

The therapy emphasizes:

- Natural healing
- Nervous system regulation
- Improved circulation
- Stress reduction
- Holistic wellness
- Preventive healthcare

Role of LMNT Neurotherapy in Managing Digital Age Stress

1. Relaxation of nervous system

Digital stress frequently causes nervous system overstimulation. Neurotherapy interventions help promote relaxation and support autonomic nervous system balance, allowing the body to shift from a stress-dominant state toward recovery and restoration.

2. Reduction of Mental Fatigue

Continuous digital engagement can exhaust cognitive resources. Neurotherapy may help improve blood circulation and nervous system efficiency, thereby reducing mental fatigue and enhancing mental clarity.

3. Improvement of Sleep Quality

Sleep disturbances are among the most common consequences of excessive screen exposure. Neurotherapy relaxation techniques may help calm the mind and support healthier sleep patterns.

4. Relief from Physical Discomfort

Prolonged use of digital devices often leads to neck stiffness, shoulder tension, headaches, and musculoskeletal discomfort. Neurotherapy can assist in reducing muscular tension and improving physical comfort.

5. Emotional Stability

Stress, anxiety, and emotional exhaustion are common manifestations of digital overload. Regular neurotherapy sessions may contribute to emotional balance and improved psychological well-being.

6. Enhanced Concentration and Productivity

By reducing stress and improving nervous system functioning, neurotherapy may help improve attention span, focus, and work efficiency.

Integration with Indian Knowledge Systems (IKS)

Indian Knowledge Systems have long emphasized harmony between mind, body, and environment. The principles of LMNT Neurotherapy align closely with these traditional concepts of holistic health.

Yogic Practices

Combining neurotherapy with yoga can provide additional benefits:

- Improved flexibility
- Better posture
- Reduced muscular tension
- Enhanced mental calmness

Pranayama

Breathing exercises such as:

- Anulom Vilom
- Bhramari
- Nadi Shodhana

can help regulate stress responses and improve nervous system balance.

Meditation

Meditation supports:

- Mental clarity
- Emotional resilience
- Reduced anxiety
- Enhanced concentration

Mindful Technology Use

Indian wisdom encourages moderation and self-regulation. Practical measures include:

- Scheduled screen breaks
- Digital detox periods
- Limiting social media usage
- Conscious technology engagement

Lifestyle Recommendations for Digital Wellness

To effectively manage digital age stress, the following lifestyle strategies are recommended:

Digital Habits

- Follow the 20-20-20 rule for eye health.
- Reduce unnecessary screen exposure.
- Turn off non-essential notifications.
- Schedule technology-free periods.

Physical Health

- Engage in regular exercise.
- Maintain proper posture.
- Stay hydrated.
- Ensure adequate sleep.

Mental Health

- Practice mindfulness.
- Develop healthy social interactions.
- Spend time in nature.
- Engage in recreational activities.

Neurotherapy Support

- Regular LMNT Neurotherapy sessions.
- Stress management protocols.
- Nervous system balancing techniques.
- Preventive wellness practices.

Future Perspectives

As technology continues to evolve, digital age stress is likely to become an increasingly significant public health concern. Integrative approaches that combine traditional wisdom with modern health practices will play an important role in addressing these challenges.

LMNT Neurotherapy represents a promising complementary approach for supporting mental wellness, reducing stress-related symptoms, and enhancing nervous system balance. Further clinical research and evidence-based studies can help establish its effectiveness in managing digital stress and related health concerns.

Conclusion

Digital technology has transformed modern society, offering unprecedented opportunities for communication, learning, and productivity. However, excessive dependence on digital devices has also contributed to rising levels of stress, mental fatigue, and lifestyle-related health challenges. LMNT Neurotherapy offers a holistic, natural, and drug-free approach to addressing the physical and psychological effects of digital age stress. By promoting nervous system balance, improving circulation,

reducing mental fatigue, and supporting emotional well-being, it can serve as a valuable complementary intervention in the modern digital era. When combined with the principles of Indian Knowledge Systems, including yoga, pranayama, meditation, and mindful technology use, LMNT Neurotherapy provides a comprehensive framework for achieving digital wellness and maintaining optimal health in an increasingly connected world.

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SOCIO-CULTURAL AND SPIRITUAL SIGNIFICANCE OF POUMAI NAGA WRESTLING PRACTICES

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Abstract

Traditional wrestling among the Poumai Nagas of Manipur represents an important component of indigenous sporting culture and serves as a significant expression of socio-cultural identity, spirituality, and community values. Beyond its function as a physical contest, wrestling is deeply embedded in the social and ritual life of the community and is closely associated with agricultural festivals, customary practices, and inter-village interactions. The present study aims to explore the socio-cultural and spiritual significance of traditional wrestling among the Poumai Nagas and to document its role in preserving indigenous knowledge and cultural heritage. The study employed an exploratory and ethnographic approach based on field observations, oral narratives, interviews with community elders, wrestlers, and local residents, supplemented by relevant secondary sources. The findings reveal that wrestling functions as a symbol of cultural identity, social cohesion, and communal solidarity. It serves as a medium for transmitting traditional values such as discipline, respect, courage, and perseverance among younger generations. The practice is also closely linked with ritual beliefs and festival celebrations, reflecting the spiritual worldview of the community. Furthermore, the study documents several indigenous wrestling techniques that demonstrate the richness of traditional sporting knowledge. Despite the challenges posed by modernization and changing lifestyles, traditional wrestling continues to play a vital role in strengthening ethnic identity and preserving cultural continuity among the Poumai Nagas. The study highlights the importance of systematic documentation and community-based preservation efforts to safeguard this valuable element of indigenous cultural heritage.

Keywords: Poumai Naga, traditional wrestling, indigenous sports, cultural identity, spirituality, cultural heritage, Manipur.

Introduction

The Poumais are the descendants of grand old man “POU” one of the great leaders of the Naga who migrated to Khyafii commonly known as Makhel.Poumai Naga is one of the major tribes mainly settling in Senapati District Manipur India. By the artificial boundary some of the Poumais are settled in the Chakhesang area in Phek District, Nagaland. In geographical terms, the Poumais have four sub-communities inhabiting four major areas viz: Poamata, Lepaona, Chilivai, and PoumaiChakhesang in

Razeba Range's Nagaland. After the end of headhunting the wrestling started in the Poumai area and 'Poyu' is an official dialect of wrestling. Among all the traditional games wrestling is one of the most popular games played by mans. However, traditional wrestling had different seasons of playing the game varies from village to village. During festivals different villages' organized traditional wrestling were conducted in the form of inter-village friendly competitions. The people of Paomata organize the game during the 'Laonii' festival that falls in the month of 'Lao khou' (July) while the people of Lepaona region conduct the 'Poyu' competition during the paddy transplanting festival known as 'Paoki' that falls in the month of 'Khanakhou' (May). The people of the Chilivai region organize the game 'Poyu' during the 'Daonii' festival which falls in the month of 'RoupaKhou' or 'KhoniihKhou' last week of March and the first week of April. The people of Poumai Naga follow the "LUNAR" calendar for its customs and traditions. Wrestling is one of the most growing and popular games in the Poumai Naga tribe, in these ritual game women are strictly prohibited and they are not allowed to participate in the events.

Wrestling is a game that enthralls the crowd by displaying the men's physique, tricks, skills, tactics, and strength. (Khalo, 2020) Wrestling plays a vital role in bringing togetherness and harmony among the Poumais where there are no haters against any particular individuals or any villages; it brings good relationships between two neighboring villages or more. The categories of the wrestlers may be between the same age group and a similar weight. (Jadhav, 2024)

The people of Paomata organized the traditional wrestling in the ritual festival called 'Laonii' which is one of the sacred festivals celebrated on the completion of the paddy plantation that falls in the month of 'Lao Khou' (July). Before the festivals all the paddy works have to be done or completed, if any field is not planted before the festivals is to be extremely wicked for the year as it is believed that the paddy transplanting after the festivals does not yield crops. Laonii festival is a twelve-long day celebration during this festival all the villages are strictly prohibited from going and working in paddy fields. During this 12-long festival celebration, the youths are allowed to organize traditional wrestling.

Paonii is also known as Paoki and it is one the biggest and most lavishly celebrated festivals of the Poumai. The celebration takes place every year in the month of 'KhanaKhou' (May) to mark the first paddy transplanting day of the year. In the olden days, this festival was celebrated by a few villages which are situated in the middle part of the Poumai region namely; Onaeme (Oinam), Purul, Koide, Maiba, Phuba, Chaonamai (ThingbaKhullen) and Shomai (ThingbaKhunou), etc. (Ngupani, 2010)Paonii/Paoki festivals are the best for the people of Lepaona, a sub-community of Poumai. Paoki is a four-day long celebrated festival by the people of Lepaona, which starts with 'Ranai', on this day the paddy field is kept ready for planting, and apart from

planting the foodstuff is also kept ready for the guests as well. On the second day 'Thaopai' is reserved for seedlings from jhum land during the day time and in the evening of the second day the guests and relatives were invited for the festive to the respective house with the traditional foods with rice-beer, pork, fish, beef etc. On the night of the second day, it marks the most memorable moment for the boys who participated in the wrestling competition where conducted between the host villagers and the challengers from the other villages or neighboring villages, thus sometimes wrestling continue till the dawn of the next day. On the next day the third day 'Khanai' is the main day of the Paonii/Paoki festivals, paddy plantation starts in the early morning with the ritual performed by the housewife by offering a slice of meat along with drops of wine to God and the paddy field deity asking for fertility and healthy growth of paddy to be transplanted. During the day boys pay a visit to the girls who they are interested in or admire and help them in planting and enjoying delicious foods and wine which is served by girls. On the last day of the festival 'Khanaithai' on this day boys usually visit the fields and extend their hands to the families who had not completed their plantation works.(Taishya& Prasad Das, 2024)

The people of the Chilivai (Proumai) region organized wrestling during the festivals of Daonii which falls in the month of 'RoupaKhou' or 'KhoniihKhou' last week of March and the first week of April. While the other villages which fall under Chilivai celebrate the festivals as marunii. Daonii / marunii is an indigenous festival for Proumai and Raimai, it is the festival of seed sowing and cultivation of crops by tradition. This festival is observed for four days and it's restricted to villagers to work in the field. On the first day, animals were butchered in preparation for the celebration. Daughters who are married to other villages would be invited along with their husbands and clan members on the next day when they returned to their husband's villages the daughter's families would be given meat as a traditional token of love and share with the in-laws. On the second day, 'Chidzii', a ritual prayer and offering to the house deity would be performed. On this second day, the wine is poured into each cup and offered to the deity with the words 'Ra Paipaoh, nehaizaopraivesohlou-o' which means 'come and be served your cup of wine'. In the evening young men would gather and prepare to wrestle and prove their strength and defend their village from the challengers that come from other villages or neighboring villages and the winner of the wrestling competition would be named as the strongest man of the year and he would be awarded.(Punii&Meyieho, 2020b).

Although studies have documented Naga festivals and indigenous sports, limited scholarly attention has been given to the socio-cultural and spiritual dimensions of Poumai Naga wrestling. Therefore, the present study seeks to fill this gap by examining wrestling as a cultural institution, ritual practice, and marker of ethnic identity.

Objective of the study:

1) To examine the socio-cultural significance of traditional wrestling among the Poumai Nagas.
2) To evaluate the role of youth to instilling cultural pride among the generation
3) To document the indigenous techniques and rules of Poumai wrestling.

Methodology:

The methodology used in this research is exploratory, historical, and analytical in design since so far no in-depth research has been undertaken by any other scholar or writer about the Poumai Naga tribe. The study is mainly based on the primary source to be used in the fieldwork conducted and the other sources collected during the fieldwork with the help of individual as well as group interviews, exploration of oral traditions, old documents, and also adopted to the socio-religious and cultural activities, in addition, extensive use of the availability of secondary source in order to get more information in the research.

Regulations of Poumai Naga Traditional Wrestling

1) WRESTLING ARENA:

a) The length and breadth of the wrestling ring/ arena will be 40 sqft in diameter.
b) The wrestling arena will be encircled with strong ropes.
c) For the safety of the wrestlers, enough space will be provided, for which a minimum space of 5 feet should be there in between the ring and the rope.

2) WAIST BINDER:

a) The organizers or host villages will provide the waist binder to both wrestlers.
b) The waist binder will be 1 meter in breadth and 2 or 2 ½ or 3 meters in length, which should be cotton cloth.
c) The waist binder will be tied in 2 rounds around the waist on the navel.
d) The wrestlers will check their opponent's waist binder before the first bout and will not complain whatsoever before the completion of that bout. In the second and third bouts also the same rule will apply with that of the first bout.
e) In the process of wrestling if the waist binder breaks or loosens incapacitating further wrestling, then the referee will stop the bout and tighten the binder properly and the opponent will not complain after that.
f) The waist binder will be tied binder in a traditional reef knot.
g) For each bout, the waist binder can be re-tied.
h) Once the wrestling starts, no wrestlers will complain about the belt before the completion of the bout of two minutes.
i) Both the wrestlers will stand in the proper position so that each one can hold their opponent's waist binder with both hands. Kneeling, moving away to escape his opponent from holding the binder before the start is not allowed.

j) The tournament officials will tie the waist binder of the wrestlers from outside the arena to save time.

3) TIME:

a) Two minutes will be given in each bout. If it ends in a draw, two minutes will be given for the third bout to decide the winner.

b) In the first bout, if both the wrestlers waste the allotted time, they will be made to stand straight, their toes and stomach touching each other and facing each other face to face and start the bout allowing each other to apply the tactics. If the wrestlers return to the same passive position, within 5 seconds the referee will ask the wrestlers to re-start the standing position till one is victorious. The same will be applied in the second and third bouts to decide the winner.

4) FALL:

a) If the chest, back, shoulder, buttock, or thigh touches the ground, it is a fall.

b) The elbow, knew and head touching the ground is not considered a fall.

c) If a wrestler had applied the tactics from within the ring and if the opponent fell on the line or outside the arena, it was a fall.

d) The wrestlers may still be applying tactics but if they have gone out of the arena. The referee can stop the match and bring them back to the center of the arena to restart the match with the remaining time.

e) In the process of wrestling if both wrestlers have parted and not holding each other, then the referee will call them back to the center of the ring and re-start the match with the remaining time.

f) Wrestlers will not be allowed to go out of the wrestling arena without informing the referee. If anyone does so the referee will declare the opponent as the winner.

g) In the process of wrestling, if anyone puts down his opponent to a kneeling position but cannot apply further tactics, then the referee can ask both to stand up and restart the match. But if the wrestlers continue to apply tactics, the match will not be stopped.

5) TIME OUT:

a) Only in the case of injury, time out or rest time of 2 minutes can be availed. In about wrestler can be availed only for once for an injury time out, but on the advice of the physician another 2 minutes may be added to the injury time. If the injured cannot restart the match after a lapse of injury time out, then his opponent will be declared the winner.

b) There is no rest time or time out given to any player other than injury.

6) RESTRICTION:

a) If wrestlers, with ill intentions, intentionally apply tricks which is dangerous to their opponent then the referee will give a warning to the guilty, but if the warning is not

heeded, then his opponent will be declared the winner while the guilty will be barred/expelled from the tournament.

b) In the process of wrestling pushing their opponent's thigh or pulling their ribs/chests will not be allowed.
c) No wrestler will hackle each other with ill intentions but will wrestle in a friendly way.
d) If any player removes/untied his waist binder before the completion of the bout then the referee will tie the waist binder accordingly as a punishment.
e) Wrestlers will not apply oil on their bodies or use other substances that are banned by the organizers.
f) Wrestlers will not be allowed to participate with long nails (fingers and toes).
g) Wrestlers will not be allowed to pull/push the thighs/legs of their opponents. Such actions call for a warning from the Referee.
h) During the bouts, no wrestlers are allowed to have eatables while still in the Arena.

7) JUDES AND REFEREES:

a) There will be three judges to manage the match and the result will be decided by the majority opinion. In case there is no clear verdict to decide the winner, the bout will resume with the remaining time allotted for the bout.
b) For all the bouts, and its interval the referee will start and stop.
c) Before the start of any tournament – Referees /judges' oath and clinic taking will be held for the smooth conduct of the tourney. If any officials fail to attend this then they will not be allowed to officiate in the tournament.
d) Referees/Judges were highly aspect intoxicants during the tournament, if anyone was found guilty then his official registration shall immediately be suspended or canceled without any further notice from the association.

Results and Discussion

1. Wrestling as a Symbol of Cultural Identity

The findings reveal that traditional wrestling occupies a central position in the cultural life of the Poumai Naga community. Wrestling is not merely a competitive sport but serves as an important marker of ethnic identity and collective memory. The practice is deeply embedded within major agricultural festivals such as Laonii, Paonii (Paoki), and Daonii, where participation reflects adherence to traditional customs and community values.

Among the Poumai Nagas, wrestling provides a platform for the younger generation to connect with ancestral traditions and reaffirm their cultural belonging. The organization of wrestling competitions during festivals demonstrates the continued importance of indigenous sports as a medium for preserving cultural heritage. The community regards successful wrestlers as representatives of village pride and cultural strength, thereby reinforcing a sense of collective identity.

This finding supports previous studies on indigenous sports which suggest that traditional games function as cultural symbols that preserve historical traditions and strengthen ethnic consciousness. Traditional wrestling among the Poumais therefore acts as a living expression of cultural continuity amidst social change.

2. Wrestling and Social Cohesion

The study found that wrestling contributes significantly to social cohesion and inter-village relationships. Competitions are commonly organized between neighboring villages during festival celebrations, attracting participants and spectators from different communities.

Unlike modern competitive sports that emphasize individual achievement, Poumai wrestling promotes communal participation and mutual respect. The wrestling arena becomes a social space where relationships are strengthened, disputes are minimized, and collective celebrations are encouraged. Villagers gather not only to witness physical contests but also to participate in communal feasting, cultural performances, and social interaction.

The role of wrestling in fostering social solidarity reflects the broader function of indigenous sports as mechanisms for maintaining social order and strengthening community bonds. Through these events, individuals develop a stronger sense of belonging and responsibility toward their community.

3. Wrestling as a Rite of Passage and Construction of Masculinity

The findings indicate that wrestling serves as an important mechanism for the socialization of young men. Participation in wrestling allows young males to demonstrate physical strength, courage, endurance, discipline, and self-control. Success in wrestling often enhances an individual's social prestige and reputation within the village.

Traditionally, wrestling was considered an avenue through which young men proved their readiness to assume adult responsibilities. Competitions provided opportunities to display qualities that were valued in traditional society, including bravery, determination, and leadership. Consequently, wrestling contributed to the construction of masculine identity among the Poumai Nagas.

The association between wrestling and masculinity is consistent with observations from other indigenous societies where physical contests function as symbolic demonstrations of manhood and social maturity. Thus, wrestling serves not only as a sport but also as an educational institution that transmits culturally approved gender roles.

4. Spiritual Significance of Wrestling Practices

One of the most significant findings of the study is the spiritual dimension associated with traditional wrestling. Wrestling competitions are closely connected with ritual observances, indigenous beliefs, and customary norms. Prior to competitions, participants often observe specific taboos and traditional practices believed to bring

success, protection, and blessings.

The timing of wrestling competitions during agricultural festivals further illustrates the relationship between sport and spirituality. Ritual offerings, prayers to deities, and ceremonial activities performed during festivals demonstrate that wrestling is integrated into broader religious and cosmological beliefs. The wrestling arena is therefore viewed not only as a place of competition but also as a sacred cultural space where spiritual and social values intersect.

These observations highlight the inseparable relationship between religion, ritual, and sport within indigenous communities. Wrestling functions as a symbolic expression of respect for ancestral traditions and spiritual forces that are believed to influence human well-being and agricultural prosperity.

5. Indigenous Knowledge and Transmission of Traditional Values

The study reveals that traditional wrestling serves as a vehicle for transmitting indigenous knowledge and moral values from one generation to another. Through participation and observation, younger members of the community learn important cultural principles such as respect for elders, discipline, honesty, cooperation, and perseverance.

The rules governing wrestling competitions reflect the ethical foundations of the Poumai community. Wrestlers are expected to compete fairly, demonstrate self-control, and respect opponents and officials. Such practices reinforce moral education and contribute to character development among youth.

Traditional wrestling therefore functions as an informal educational institution through which cultural knowledge, social norms, and community values are preserved and transmitted across generations.

6. Technical Skills and Indigenous Sporting Knowledge

The documentation of various wrestling techniques such as Lei Pfiiyu, Pohyu, Kou Daoyu Nya, Khou Khe Yu, Va Dao, Kou Pfiiyu, Khou Teayu, Liikhea, Siikha Nya, and Phi Daoyu demonstrates the richness of indigenous sporting knowledge within the Poumai community.

These techniques require not only physical strength but also balance, coordination, timing, tactical awareness, and technical expertise. The diversity of techniques reflects generations of accumulated experience and adaptation within the local cultural context.

The preservation of these techniques is important because they represent unique forms of indigenous knowledge that may gradually disappear under the influence of modernization and the increasing popularity of global sports.

7. Challenges of Modernization and Cultural Preservation

The findings suggest that traditional wrestling continues to remain popular despite increasing exposure to modernization, urbanization, and global sporting practices. However, concerns were expressed regarding declining participation among younger

generations, changing lifestyles, and reduced familiarity with traditional customs.

The expansion of formal education, migration, digital entertainment, and modern sports may contribute to a gradual weakening of indigenous sporting traditions. Nevertheless, community-based wrestling competitions continue to play a significant role in preserving cultural identity and promoting cultural pride among the Poumai Nagas.

To ensure the long-term survival of this cultural practice, systematic documentation, cultural education programs, and community support are necessary. Traditional wrestling should be recognized not only as a sport but also as an important component of the intangible cultural heritage of the Poumai Naga community.

Traditional Wrestling Techniques of the Poumai Nagas

The field investigation documented several indigenous wrestling techniques practiced by the Poumai Nagas. These techniques reflect generations of accumulated knowledge, physical skill, and tactical understanding. While the socio-cultural significance of wrestling constitutes the primary focus of this study, the documentation of these techniques contributes to the preservation of indigenous sporting knowledge and provides insight into the technical dimensions of Poumai wrestling traditions.

Skillsof Poumai Naga Wrestling



Figure 1: Lei Pfiiyu This technique to takedown relying on strength, and timing to unbalance and defeat the opponent



Figure 2: Pohyu This technique demonstrates raw strength, control and tactical position making an effective takedown to the opponent



Figure 3: Kou Daoyu Nya Right This technique the wrestler maintains body contact and positioning to ensure he dictates the direction of the opponents fall.



Figure 4: Khou Khe Yu The wrestler gripped his opponent waist and gaining advantages position in the process of controlling his lower body and making it easier to takedown



Figure 5: Natya/ Nearai Right The wrestler has tightly gripped his opponents' waist and lifting him off the ground by using his hips and lower back to generate power for a high-impact throw



Figure 6: nearai The attacking wrestler has wrapped both arms tightly around his opponent body and applying strong pressure to control the movement and takedown with minimal effort



Figure 7: Va Dao The wrestler used his right leg to trap his opponent's left leg causing him imbalance and by pushing his opponents upper body backward for easier takedown



Figure 8: Kou Pfiiyu This technique the wrestler lifted one leg of the opponent from the ground and use of a hip or thigh block to disrupt balance



Figure 9: Khou Teayu This technique the wrestler has secured a tight hold which is essential for controlling the opponent's movement and his hip positioned should lower than the opponent's to takedown



Figure 10: Liikhea Right This technique is a combination of body control and leg positioning makes its highly effective for throwing the opponent's off balance



Figure 11: Siikha Nya This is a powerful takedown technique where the wrestler in blue ribbon has secured a body lock around the opponent's waits and attempt to lift and off-balance their opponents. It relies on body control to execute a clean takedown



Figure 13: Phi Daoyu The wrestler with the purple sash has secured a strong grip around the opponent's waist and lifting them off the ground, this type of throw is commonly used to off-balance and pin the opponent effectively



Figure 14: khou khe veiyu The wrestler are engaged in by the collar and elbow tie-up with a body lock grip, it is a common stance in traditional wrestling style, the positioning may setting for a takedown or throw



Figure 15: Liikhea right This is a technique where the attacker lifts the opponent from behind and either throws them backward or takedown. This move is common in indigenous wrestling styles that focus on body lock and throws

Conclusion

The present study demonstrates that traditional wrestling among the Poumai Nagas is far more than a physical sport; it is a multifaceted cultural institution deeply embedded in the social, spiritual, and communal life of the people. The practice is closely associated with major agricultural festivals and serves as an important medium through which cultural identity, collective memory, and indigenous values are preserved and transmitted across generations.

The findings reveal that wrestling plays a significant role in promoting social cohesion,

strengthening inter-village relationships, and fostering a sense of belonging among community members. The sport also reflects the spiritual worldview of the Poumai Nagas through its association with customary rituals, traditional beliefs, and festival observances. Furthermore, the documentation of indigenous wrestling techniques highlights the richness of local sporting knowledge and demonstrates the community's unique contribution to the cultural heritage of Northeast India.

Despite the growing influence of modernization and changing lifestyles, traditional wrestling continues to remain an important symbol of ethnic identity and cultural resilience among the Poumai Nagas. The survival of this indigenous practice depends on sustained community participation, systematic documentation, and greater academic attention. Therefore, efforts should be made to preserve, promote, and transmit this valuable cultural tradition to future generations as an integral component of the intangible cultural heritage of the Poumai Naga communit

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HARMONY WITHIN: THE ROLE OF YOGA IN WOMEN'S HEALTH

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Abstract

Women's health is influenced by biological, hormonal, psychological, and lifestyle-related factors that vary across different stages of life. Increasing stress, sedentary lifestyles, and reproductive health challenges have highlighted the need for holistic healthcare approaches. Yoga, an ancient mind–body practice integrating asanas, pranayama, meditation, and relaxation, has gained recognition as a complementary strategy for promoting women's health. This review examines the role of yoga in enhancing physical, mental, emotional, and reproductive health by synthesizing evidence from classical yoga literature and contemporary scientific studies. The evidence indicates that regular yoga practice improves flexibility, muscular strength, stress management, sleep quality, and emotional resilience while supporting reproductive and endocrine health. Yoga has also been shown to alleviate menstrual discomfort, pregnancy-related stress, menopausal symptoms, anxiety, depression, and lifestyle-related disorders. As a safe, low-cost, and non-pharmacological intervention, yoga complements conventional healthcare by promoting healthy ageing and improving women's overall quality of life. Further high-quality longitudinal and randomized controlled studies are needed to establish standardized yoga protocols for specific women's health conditions.

Keywords: Yoga, women's health, asanas, pranayama, reproductive health, mental health, holistic health.

Introduction

Women's health is a global public health priority due to the increasing prevalence of lifestyle-related disorders, reproductive health problems, and psychological stress. According to the World Health Organization (WHO, 2022), health is a state of complete physical, mental, and social well-being rather than merely the absence of disease. Throughout the life span, women experience major physiological and hormonal transitions, including menstruation, pregnancy, childbirth, and menopause, which influence their physical and psychological well-being. Contemporary lifestyle factors such as physical inactivity, unhealthy dietary habits, occupational stress, and urbanization have further increased the incidence of obesity, hypertension, diabetes, polycystic ovary syndrome (PCOS), anxiety, depression, and menopausal disorders. These conditions often impair reproductive health and overall quality

of life (Telles et al., 2012). In response to these challenges, yoga has emerged as a holistic and evidence-based approach to women's health. Originating in ancient India, yoga integrates physical postures (asanas), breathing techniques (pranayama), meditation, and relaxation practices to promote harmony between the body and mind (Iyengar, 2005). Unlike conventional exercise, yoga addresses physical, psychological, and emotional well-being simultaneously. Research demonstrates that regular yoga practice improves autonomic regulation, emotional resilience, and overall health, making it a safe, cost-effective, and sustainable strategy for enhancing women's well-being (Nagendra, 2008; Woodyard, 2011).

Meaning and Concept of Yoga

The term yoga is derived from the Sanskrit root Yuj, meaning "to unite" or "to integrate," signifying the union of body, mind, and spirit. Patanjali defined yoga as Yoga Chitta Vritti Nirodhah, referring to the control of mental fluctuations (Saraswati, 2013). Beyond a form of physical exercise, yoga is a comprehensive system comprising asanas, pranayama, meditation, relaxation techniques, and ethical practices that collectively promote holistic health. Scientific evidence indicates that regular yoga practice improves autonomic balance, endocrine function, cognitive performance, and emotional regulation, thereby enhancing overall quality of life (Nagendra, 2008; Woodyard, 2011).

Women's Health: A Holistic Perspective

Women's health extends beyond the absence of disease and encompasses physical, mental, emotional, reproductive, and social well-being. Hormonal and physiological changes across adolescence, the reproductive years, pregnancy, menopause, and ageing predispose women to conditions such as menstrual disorders, obesity, osteoporosis, cardiovascular diseases, anxiety, depression, sleep disturbances, and menopausal symptoms. Consequently, modern healthcare increasingly advocates a preventive and holistic approach that addresses both physical and psychological dimensions of health. Within this framework, yoga has gained recognition as an effective complementary practice that promotes overall well-being while supporting long-term health (WHO, 2022; Woodyard, 2011).

Role of Yoga in Women's Health

Yoga plays a vital role in promoting women's health by integrating physical activity, breath regulation, and mindfulness. Regular practice enhances flexibility, muscular strength, posture, balance, and circulation while supporting endocrine function and hormonal regulation. It also reduces stress-related physiological responses by modulating autonomic nervous system activity, thereby improving emotional regulation and psychological well-being (Telles et al., 2012). In addition, yoga improves pelvic circulation, supports reproductive health, and helps alleviate menstrual discomfort. Its positive effects on metabolism and cardiovascular health further contribute to the prevention and management of lifestyle-related disorders such as obesity, hypertension, diabetes, and cardiovascular disease (Woodyard, 2011).

Benefits of Yoga for Physical Health

Regular yoga practice enhances muscular strength, flexibility, joint mobility, posture, and physical endurance while improving circulation, digestion, and metabolic function. For women, it is particularly beneficial in supporting reproductive health by improving pelvic circulation and relieving menstrual discomfort through practices such as Bhujangasana, Baddha Konasana, and Shavasana (Devi, 2002; Iyengar, 2005). Prenatal yoga improves maternal well-being by enhancing breathing, flexibility, and stress regulation, whereas postnatal yoga facilitates physical recovery after childbirth. Recent evidence also indicates that yoga improves heart rate variability during pregnancy (Mayer et al., 2025) and effectively reduces menopausal symptoms, anxiety, sleep disturbances, and blood pressure (Wang et al., 2025). Furthermore, regular practice lowers the risk of obesity, hypertension, arthritis, and other chronic lifestyle-related disorders.

Benefits of Yoga for Mental and Emotional Health

Yoga has well-documented benefits for psychological health. By combining controlled breathing, meditation, and relaxation, it reduces stress, anxiety, and emotional distress while enhancing emotional resilience, concentration, and cognitive function (Telles et al., 2012; Goyal et al., 2014). Regular practice promotes mindfulness, improves sleep quality, strengthens self-awareness and self-confidence, and helps women cope more effectively with occupational, social, and hormonal challenges. These psychological benefits complement its physical effects, making yoga a comprehensive approach to women's overall well-being.

Important Yoga Practices for Women

Selected yoga practices, including asanas, pranayama, meditation, and Surya Namaskar, contribute significantly to women's physical, mental, and reproductive health (Nagendra, 2008). Among these, asanas improve strength, flexibility, balance, posture, and the functioning of the musculoskeletal, endocrine, circulatory, and nervous systems. Regular practice also enhances pelvic health, promotes hormonal balance, and supports emotional well-being, making yoga an effective complementary strategy for women's holistic health (Iyengar, 2005; Saraswati, 2013).

Important Asanas and Their Benefits

Bhujangasana (Cobra Pose): Bhujangasana strengthens the spine and back muscles, improves spinal flexibility, and stimulates the abdominal and pelvic organs. In women, it enhances pelvic circulation, supports reproductive health, improves posture, and helps relieve lower back pain and menstrual discomfort (Devi, 2002; Iyengar, 2005). Women with spinal injuries, hernia, recent abdominal surgery, or severe back pain should avoid this posture. It is not recommended during pregnancy unless practiced under qualified prenatal supervision.

Baddha Konasana (Butterfly Pose): Baddha Konasana stretches the hips, inner thighs, and pelvic muscles while enhancing the flexibility of the pelvic region. It supports reproductive health, improves pelvic mobility, and may help alleviate menstrual discomfort

(Iyengar, 2005; Saraswati, 2013). Women with hip, groin, or knee injuries should practice cautiously, avoiding excessive pressure on the knees.

Vajrasana (Thunderbolt Pose): Vajrasana is one of the few yoga postures that can be practiced after meals. It promotes digestion, calms the nervous system, enhances concentration, and reduces stress, thereby supporting emotional and hormonal well-being in women (Saraswati, 2013; Muktibodhananda, 2012). Women with severe knee or ankle disorders should practice with support or avoid prolonged sitting in this posture.

Setu Bandhasana (Bridge Pose): Setu Bandhasana strengthens the back, pelvic floor, and core muscles while stimulating the endocrine glands. It enhances pelvic stability, improves spinal mobility, and supports hormonal and musculoskeletal health in women (Iyengar, 2005; Saraswati, 2013). Women with neck injuries, severe spinal disorders, or uncontrolled hypertension should perform this posture only under expert supervision. It should be modified or avoided during advanced pregnancy.

Shavasana (Corpse Pose): Shavasana is a restorative posture that induces deep physical and mental relaxation. It reduces stress, anxiety, and fatigue while improving emotional regulation and the restorative effects of yoga practice (Telles et al., 2012; Saraswati, 2013). Although generally safe, women in late pregnancy are advised to lie on the left side instead of the supine position for greater comfort and safety.

Important Pranayama Practices

Anulom Vilom (Alternate Nostril Breathing): Anulom Vilom is a controlled breathing technique that regulates the flow of breath through alternate nostrils, promoting autonomic balance and respiratory efficiency. Regular practice enhances lung function, reduces stress, improves mental clarity, and supports emotional well-being in women (Nagendra, 2008; Brown & Gerbarg, 2005). It should be practiced in a comfortable seated posture with slow, relaxed breathing. Individuals with acute respiratory illness or severe nasal congestion should practice under professional guidance.

Nadi Shodhana (Alternate Nostril Purification): Nadi Shodhana balances the nervous system by regulating alternate nostril breathing, thereby enhancing oxygenation, concentration, and emotional control. It is particularly beneficial for reducing mental fatigue

and promoting relaxation (Saraswati, 2013; Brown & Gerbarg, 2005). Beginners should avoid prolonged breath retention and discontinue the practice if dizziness or discomfort occurs.

Bhramari Pranayama (Bee Breathing): Bhramari Pranayama involves gentle humming during exhalation, producing soothing vibrations that calm the nervous system. It effectively reduces anxiety, irritability, and mental tension while enhancing concentration and relaxation, making it particularly beneficial for women experiencing emotional fluctuations (Nagendra, 2008; Telles et al., 2012). The practice should be performed gently in a quiet environment and avoided during acute ear or sinus infections.

Meditation and Women's Health

Meditation is a mindfulness practice that cultivates self-awareness, mental clarity, and emotional resilience. Regular practice reduces stress, improves attention, enhances sleep quality, and supports psychological well-being by modulating stress-related physiological responses (Goyal et al., 2014; Nagendra, 2008). These benefits contribute to improved emotional regulation and overall quality of life in women. Meditation should be practiced in a quiet, comfortable setting, beginning with short sessions that may be gradually extended. Women with severe psychological disorders should undertake meditation under professional supervision.

Surya Namaskar (Sun Salutation)

Surya Namaskar (Sun Salutation) is a dynamic sequence of twelve yoga postures performed in synchrony with controlled breathing. It integrates physical movement, breath regulation, and mindfulness, making it one of the most comprehensive yogic practices for promoting overall health. Regular practice improves cardiovascular endurance, muscular strength, flexibility, balance, metabolism, and respiratory efficiency while enhancing circulation and neuromuscular coordination (Mody, 2011; Woodyard, 2011).

For women, Surya Namaskar is particularly beneficial as it strengthens the core and pelvic muscles, improves spinal flexibility, and promotes healthy functioning of the reproductive and endocrine systems. Regular practice supports hormonal regulation, assists in maintaining a healthy body weight, enhances stamina, and helps alleviate fatigue associated with daily physical and emotional demands. The synchronized breathing and mindful movements also reduce stress, improve emotional resilience, and promote psychological well-being, making Surya Namaskar an effective practice for women across different stages of life (Saraswati, 2013; Woodyard, 2011). However, it should be practiced on an empty stomach with proper technique. Women with severe spinal disorders, uncontrolled hypertension, recent abdominal surgery, or high-risk pregnancy should practice only under qualified supervision or after medical consultation.

Yoga supports women's health across the lifespan by addressing the physical, psychological, and hormonal changes associated with different life stages (Nagendra, 2008; Woodyard, 2011). During adolescence, regular practice improves posture, flexibility, concentration, self-esteem, and emotional regulation while helping manage menstrual discomfort and stress related to academic and social demands (Khalsa & Butzer, 2016).

During adulthood, yoga enhances physical fitness, metabolic health, and sleep quality while helping women cope with occupational and family-related stress. It also reduces anxiety, fatigue, and depressive symptoms, contributing to improved overall health (Woodyard, 2011; Cramer et al., 2013). During pregnancy, supervised prenatal yoga improves flexibility, breathing, circulation, and relaxation, helping reduce pregnancy-related discomfort and preparing women physically and mentally for childbirth. It has also been associated with

favourable maternal and neonatal outcomes (Field, 2012; Curtis et al., 2012). During menopause, yoga serves as an effective complementary therapy by alleviating hot flashes, sleep disturbances, mood changes, and anxiety while improving balance and adaptability to hormonal changes (Cramer et al., 2012). Among older women, yoga promotes healthy ageing by improving muscle strength, balance, flexibility, and mobility, thereby reducing the risk of falls and age-related conditions such as osteoporosis, arthritis, and hypertension. It also supports cognitive function and psychological well-being, fostering greater independence and quality of life (Woodyard, 2011; Roland et al., 2011).

Thus, yoga is a safe, holistic, and lifelong practice that promotes physical health, emotional resilience, and healthy ageing in women across all stages of life (Nagendra, 2008; Woodyard, 2011).

Conclusion : The evidence reviewed in this article indicates that yoga is a safe, holistic, and evidence-based approach to promoting women's health across different stages of life. Consistent with previous systematic reviews and clinical studies, regular yoga practice improves physical fitness, emotional resilience, reproductive health, and quality of life while reducing stress, anxiety, and symptoms associated with pregnancy and menopause (Telles et al., 2012; Woodyard, 2011; Cramer et al., 2017). Recent investigations further support these findings, demonstrating the beneficial effects of yoga on autonomic regulation, pregnancy outcomes, heart rate variability, menopausal symptoms, sleep quality, and psychological well-being (Mayer et al., 2025; Wang et al., 2025). Compared with conventional exercise programmes, yoga offers a unique integrative approach by combining physical postures, breathing techniques, meditation, and relaxation, thereby addressing both physiological and psychological aspects of health. Its non-invasive, low-cost, and adaptable nature makes it suitable for women across adolescence, adulthood, pregnancy, menopause, and older age. Although the current evidence strongly supports the therapeutic value of yoga, further large-scale, longitudinal, and well-designed randomized controlled trials are warranted to establish standardized yoga protocols for specific women's health conditions. Overall, incorporating yoga into daily life and community health programmes may serve as an effective complementary strategy for promoting preventive healthcare, healthy ageing, and long-term well-being among women.

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TRADITIONAL KNOWLEDGE SYSTEMS OF THE KORAGA COMMUNITY: AN ETHNOGRAPHIC STUDY OF ECOLOGICAL, MEDICINAL, AND CULTURAL PRACTICES

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Abstract

Tribal communities have developed extensive knowledge of medicinal plants, including their identification, preparation, and application for various health conditions. The Koraga community, a Particularly Vulnerable Tribal Group (PVTG) inhabiting in the forest- regions of Karnataka and northern Kerala had a rich treasure of traditional knowledge. Koraga traditional knowledge represents a biocultural heritage system with significant implications for biodiversity conservation, sustainable development, and indigenous rights discourse. The Koragas demonstrate ecological adaptation through seasonal resource use, forest-based livelihoods, and bamboo technology. Koraga ethnomedicine is closely aligned with Western Ghats biodiversity, while bamboo technologies demonstrate sustainable ecological adaptation. This system includes ethno botanical medicine, bamboo-based material culture, subsistence ecology, oral traditions, and ritual healing practices. The study examines the contributions of Koraga traditional knowledge. Their knowledge systems are threatened by socio-economic marginalization, forest access restrictions, and cultural assimilation. Oral traditions remain central to knowledge transmission but are rapidly weakening. The Koraga Indigenous Knowledge System is a resilient but endangered biocultural system. It integrates ethnobotany, bamboo technology, healing systems, and oral traditions into a unified ecological knowledge framework. A conceptual IKS–Ecology–Society model is proposed to explain interactions between ecological resources, cultural practices, and external pressures. The study highlights the need for participatory documentation and integration of indigenous knowledge into biodiversity conservation.

***Keywords**: Koraga, Indigenous Knowledge Systems, Ethnobotany, Cultural Ecology, PVTG, Biocultural diversity*

Introduction

India recognizes 705 tribal communities as Scheduled Tribes, distributed across various states and regions. These communities represent approximately 8.6% of India's total population. The tribal population is primarily concentrated in central India, the Eastern Ghats, the Western Ghats, and northeastern states. These communities possess distinct knowledge systems fundamentally different from mainstream approaches, encompassing healthcare, agriculture, ecological management, social organization, and cultural expression. Each community has developed unique knowledge systems adapted to their specific ecological contexts.

IKS

Indigenous Knowledge Systems (IKS) represent dynamic, adaptive knowledge frameworks developed through long-term interaction between human communities and their environments (Berkes, 2012; Agrawal, 1995). These systems integrate ecological understanding, medicinal practices, cultural values, and spiritual beliefs into holistic worldviews.

The Western Ghats is recognized as one of the world's biodiversity hotspots, hosting exceptional plant diversity and high levels of endemism (Reddy et al., 2011). Ethnobotanical research demonstrates that tribal communities in this region possess extensive knowledge of medicinal plants and sustainable resource use systems (Kumar et al., 2011; Hamilton et al., 2003).

Koragas

The Koraga people, recognized as a Particularly Vulnerable Tribal Group (PVTG) in South India, have a deep-rooted history in the Tulu Nadu region spanning across Karnataka and Kerala. As original inhabitants, their traditional knowledge encompasses rich biodiversity, unique indigenous crafts, and ancestral healing systems that have been passed down for generations. They inhabits Manjeshwar and Kasaragod taluks of Kasaragod district. Community is seen living in settlements are seen in Madhoor, Karadukka, Kuttikkol, Bedadukka, Delambadi, Paivalige, Puthige,Enmakaje, Badiyadukka,Kumbala, Belloor, Manjeswaram, Vorkkadi, Mangalpady areas of Kerala, and a major part of the community resides in adjoining parts of Dakshina Kannada district of Karnataka.

Koragas are a historically marginalized PVTG distributed across coastal Karnataka and northern Kerala. They are traditionally associated with forest-edge livelihoods, bamboo craftsmanship, and subsistence-based economies. Basketry is the main source of income, both men and women engage in this activity. Bamboo, cane and different creepers are the main raw materials used. Dholu and Voote (Drum and Flute) were two important musical instruments of the koragas. Traditional belief was that Koraga drum-beating had special supremacy and that the sound of drum-beating drives away evil spirits. Voote is a flute made out of bamboo. As per the 2011 census their total population is 1582, in which 778 were males and 804 females.As per Socio-Econmic Survey conducted by Scheduled Tribe Development Department the population of Koraga community is 1644, 802 males and 842 females and hence the Sex ratio is 1000:1050. (Kirtads)

Research Gap

Although Western Ghats ethno botany is well documented, Koraga-specific integrated studies linking ethnobotany, cultural ecology, and socio-economic transformation remain limited.

Objectives

1. To synthesize Koraga traditional ecological knowledge systems
2. To compare them with broader Western Ghats ethnobotanical patterns
3. To analyze knowledge transformation under socio-economic change

4. To propose an integrated conceptual model of IKS dynamics

Methods

This study is based on qualitative secondary data analysis. Sources include ethnographic monographs, peer-reviewed ethnobotanical studies, government tribal reports, and regional anthropological surveys.. A thematic analysis approach was used to categorize findings into ecological knowledge, material culture, medicinal practices, and oral traditions. The study synthesizes existing literature to construct an integrated understanding of Koraga knowledge systems.

Theoretical framework

Indigenous Knowledge Systems (IKS) Framework

The IKS framework conceptualizes indigenous knowledge as dynamic, locally situated, and transmitted through oral traditions and practice. It emphasizes holistic relationships between humans, nature, and spirituality. IKS are characterized by holistic, orally transmitted, and adaptive knowledge structures that integrate ecological, medicinal, and cultural dimensions (Berkes, 2012). Knowledge is integrated across ecological, medicinal, and cultural domains. For the Koragas, knowledge of plants, rituals, and resource use is not merely technical but embedded in social and spiritual life, reflecting a holistic epistemology.

Cultural Ecology

Cultural ecology theory explains how human societies adapt culturally to environmental constraints (Steward, 1955). The Koragas exemplify this through forest-based subsistence, bamboo craft, and seasonal resource use.

Traditional agricultural knowledge includes crop selection, planting techniques, soil management, and pest control methods that have been refined over generations.

Ecological Management and Forest Conservation

For centuries, Indian tribes have helped preserve natural habitats through sustainable practices, demonstrating that participatory management of forests is the key to sustainable development for people and forests. Tribal populations derive nearly half their annual income from forests and are especially affected by resource degradation, which has led to biodiversity loss, land degradation, and water scarcity. Communities with control over their resources are better equipped to manage and protect them, mitigating environmental risks.

Social Organization, Cultural Expression and Knowledge Transmission

Tribal knowledge is transmitted primarily through oral narratives, rituals, customs, and every day practices rather than formal written documentation. Knowledge Transmission passed from elders to younger generations through storytelling and direct instruction, Rituals and customs: Cultural practices that encode and transmit knowledge systematically, Daily practices: Everyday activities that reinforce and practice traditional knowledge, Community linkages: Social networks that sustain knowledge systems. This mode of transmission maintains cultural continuity while adapting to changing circumstances.

For tribal communities, the Commons (natural resources such as forests, pastures, and water bodies) are critical for withstanding climate shocks such as droughts and floods. Tribal lifestyles offer solutions to climate change through sustainable practices that protect the natural environment.

Review of Indigenous Knowledge Systems in India highlights their importance and role in biodiversity conservation. Tribal communities' contributions to forest preservation demonstrate their critical role in maintaining biodiversity, preservation of sanctified groves and therapeutic herbs through conservation techniques represents active biodiversity conservation.

Tribal communities possess enormous aggregate of indigenous knowledge with potential to provide sustainable solutions to falling agricultural productivity and soil quality concerns. Their traditional practices include sustainable farming methods that protect soil health and maintain biodiversity. These practices are particularly relevant for achieving Sustainable Development Goal 2 (Zero Hunger).

Results and Discussion

Historical and Socio-cultural Context

The Koragas are among the earliest known inhabitants of the Tulu Nadu region. Historical ethnographies describe them as forest-dependent communities engaged in basket weaving, seasonal labor, and subsistence gathering. Traditional settlements were located in forest fringes, with simple dwellings constructed from bamboo and leaves. Colonial and postcolonial caste hierarchies contributed to their marginalization, restricting them to low-status occupations. Despite this, the Koragas retained distinct cultural practices and ecological knowledge systems.

Ethnobotanical Knowledge System

Ethnobotanical research across the Western Ghats demonstrates high medicinal plant diversity among tribal communities (Phillips & Gentry, 1993; Heinrich et al., 1998). Koraga knowledge systems include approximately 40–45 medicinal plant species used for treating common ailments (Rajith & Mohanan, 2013). Koraga ethnobotanical knowledge is extensive and includes the identification, collection, and preparation of medicinal plants for treating common ailment such as fever, skin diseases, digestive disorders, and respiratory conditions.

Koraga knowledge is therefore a localized subset of a larger Western Ghats ethnobotanical continuum. For centuries, the Koragas have been master craftspeople heavily dependent on the surrounding forest resources. [1, 2, 3, 4, 5]

- Weaving Skills: They use bamboo, cane, and forest creepers to weave practical, everyday items. [1]
- Types of Crafts: Their indigenous techniques produce highly specialized traditional items, such as mannutha batty (heavy storage baskets), unputha batty (winnowing trays), shibla, and muttale (traditional headgear made from areca sheaths). [1, 2]

- Sustainable Living: This material culture historically allowed the tribe to live a self-sufficient, cost-effective, and sustainable lifestyle, though urbanization and synthetic alternatives have threatened these traditional practices. [1, 2]

Music, Rituals, and Folklore

The Koragas have a distinct and powerful cultural identity tied to their music, dance, and spiritual beliefs. [1, 2, 3, 4, 5]

- Drum Beating: Their drumming is an iconic cultural contribution. Traditionally, they played instruments like the Dholu (drums) and Voote (bamboo flutes). The community traditionally believed that the rhythms and sounds of these instruments had special powers to drive away evil spirits.

Key characteristics:

Their knowledge includes: Plant identification and taxonomy, Seasonal availability cycles, Sustainable harvesting practices, preparation methods (decoction, paste, infusion). This knowledge is transmitted orally through apprenticeship and daily practice. This knowledge is embedded in everyday ecological interaction rather than formal medicinal systems.

Table 1 Selected Ethnomedicinal Knowledge of the Koragas

Plant Category	Use	Preparation Method	Ailment Treated
Leaves (Fabaceae spp.)	Decoction	Boiled in water	Fever
Roots (Apocynaceae spp.)	Paste	Ground fresh	Skin diseases
Bark extracts	Infusion	Soaked in water	Digestive issues
Herbs (Acanthaceae spp.)	Juice	Crushed and extracted	Respiratory problems
Wild tubers	Food/medicine	Cooked or raw	Nutritional deficiency

(Based on synthesis of Rajith & Mohanan, 2013)

Forest-Based Subsistence Strategies

The Koragas historically relied on mixed subsistence strategies including basket making, bamboo skilled works, Collection of tubers, leaves, and wild fruits and collection of non-timber forest products, honey harvesting, wage labor in agricultural fields and other tool works and seasonal agricultural labor. These subsistence practices demonstrate ecological adaptation based on seasonal cycles and resource availability

Bamboo based Technology and Material Culture

Bamboo technology represents an ecologically sustainable livelihood system widely documented in Asian indigenous economies (Liese & Köhl, 2015; Sharma et al., 2015). Bamboo craft is most significant components of Koraga traditional knowledge. It is central to Koraga material culture and livelihood systems. Koragas traditionally produce baskets, mats, winnowing trays, and agricultural tools using bamboo.

Ecological significance:

renewable raw material

- low energy input

- biodegradable production cycle

However, modernization and plastic substitution have significantly reduced demand, leading to cultural and economic decline.

Ecological features:

- Use of locally available bamboo species
- Low-energy production methods
- Minimal environmental degradation
- Biodegradable material use
- Eco-friendly production techniques
- Functional design suited for agricultural and domestic use

Bamboo knowledge includes harvesting timing, curing methods, and structural design principles passed through apprenticeship. However, industrial substitution and market decline have reduced economic viability, threatening this knowledge system.

Traditional Healing Systems and Herbal medicine

Koraga healing systems integrate ethnobotanical medicine, herbal medicine with ritual practices and ecological spirituality reflecting a holistic health worldview. Such integrative systems are widely documented in indigenous medicine globally (Fabricant & Farnsworth, 2001; WHO, 2013). Illness is often conceptualized as both biological and spiritual imbalance. Healing rituals include drumming, chants, and symbolic purification practices. Plant-based treatments are used for fever, inflammation, digestive disorders, and skin diseases. Remedies involve decoctions, infusions, and topical applications.

Oral Traditions and Knowledge Transmission

Oral traditions are central to Koraga epistemology and include songs, myths, ritual and folk narratives, ritual songs, drumming traditions and mythological accounts. Knowledge transmission occurs through apprenticeship and participation rather than formal instruction (Berkes, 2012). Knowledge transmission occurs through songs, storytelling and ritual performance.(Berkes, 2012; Reyes-García et al., 2005) Koraga knowledge represents a biocultural adaptive system where ecological resources directly shape cultural practices (Maffi, 2005). Their ethnobotanical knowledge aligns with Western Ghats biodiversity richness (Reddy et al., 2011). Knowledge is transmitted through observation, participation, and oral storytelling rather than formal instruction. However, formal education systems, migration, and livelihood shifts have weakened oral transmission (Reyes-García et al., 2005).

Socio-economic Transformation and Knowledge Erosion

Koraga society has traditionally been organized through small kinship-based groups. Knowledge transmission occurs through apprenticeship in craft and healing, oral storytelling by elders and Participation in rituals and daily subsistence activities. However, recent studies show that intergenerational transmission is weakening due to migration, schooling, and economic changes (KIRTADS 28). Koraga communities face significant socio-economic

challenges, including poverty, malnutrition, and limited access to healthcare and education (KIRTADS, 2020). Restricted access to forest resources, occupational displacement, migration to urban labor markets, decline of bamboo craft economy and intergenerational discontinuity accelerated the erosion of traditional knowledge systems. Similar patterns are documented globally among indigenous communities (Turner & Clifton, 2009).

Discussion: Ecological Significance of Koraga Knowledge

Their ethno botanical knowledge contributes to biodiversity conservation through sustainable harvesting and plant classification systems. From an Indigenous Knowledge Systems perspective, Koraga traditions demonstrate holistic integration of ecology and health, strong place-based ecological memory, Resilience despite socio-economic marginalization. However, this system is undergoing rapid transformation due to external socio-economic pressures. Despite their knowledge systems, Koragas face severe marginalization, poverty, and declining cultural transmission due to modernization and displacement (Sabitha, 2019).

Language Loss

Majority of the traditional knowledge of Koraga community is preserved in Koraga language. But the language is facing serious thrat. Language loss is a critical threat to tribal knowledge transmission. Since knowledge is transmitted through oral narratives, the loss of tribal languages directly impacts knowledge preservation.

Insufficient institutional support hampers efforts to document, preserve, and integrate tribal knowledge systems. Here is the continuation of the research paper:

Tribal Women in Forest Management

Tribal Women demonstrates their vital contribution, as their life and economy are entirely connected with the forest, playing vital roles in socio-economic and cultural life. Secure land tenure provides legal recognition to women over resources, having fair access to land and other natural resources. Inclusive governance and management enhances women's status within communities, empowering them to participate actively in decision-making processes ensuring equitable access.

Integration with Modern Science

Meaningful integration of tribal wisdom with modern scientific approaches can contribute to sustainable and inclusive development in India. Through Integration approaches, combining traditional and scientific knowledge for enhanced outcomes, including tribal communities in research processes, Documentation with ethical frameworks, Preserving knowledge while maintaining community control and Incorporating traditional practices into national policies through policy framework are essential. The study emphasizes importance of ethical documentation, legal protection, and academic recognition of tribal knowledge. Documentation must respect community sovereignty over their knowledge systems.

Legal protection and Academic recognition

Legal protection through frameworks like the Forest Rights Act ensures tribal communities

maintain control over resources and knowledge. Strengthening implementation of existing laws is crucial. Academic recognition of tribal knowledge systems validates their importance and promotes integration into educational curricula and incorporating tribal knowledge into formal education systems.

Secure land tenure and decentralized governance protect livelihoods and environment. Community empowerment through inclusive governance enhances status within communities and ensures equitable resource access. Dedicated interventions improving income, women and child health, and education would directly have positive effects on national indicators. Strengthening institutional mechanisms for tribal welfare is essential.

Interpretation:

The study puts forth a conceptual model IKS–Ecology–Society Framework model shows that indigenous knowledge systems are emergent properties of ecological interaction and socio-cultural reinforcement, and are destabilized when external pressures disrupt ecological access or cultural transmission. The ecological layer focus on Western Ghats biodiversity (plants, bamboo, forests) , Knowledge Layer on ethnobotany, healing systems, oral traditions, craft, Societal Layer on livelihood, identity, cultural continuity and External Pressure Layer on modernization, deforestation, market shift.

Findings and Discussion

Koraga communities possess extensive knowledge of forest plants, seasonal cycles, and sustainable harvesting practices. Ethno botanical studies document the use of over 40 medicinal plant species used for treating fever, skin diseases, and digestive disorders. Bamboo craft forms a core component of Koraga livelihood. They produce baskets, mats, and agricultural tools using traditional weaving techniques that reflect ecological sustainability. Koraga Traditional Medicine systems combine herbal medicine and ritual practices. Plant-based remedies are used alongside spiritual healing practices that reflect a holistic understanding of health. Oral narratives, songs, and drumming traditions serve as key mechanisms for knowledge transmission and cultural continuity. Koraga traditional knowledge systems represent a significant but under-documented indigenous heritage. Preservation efforts are essential for both cultural survival and ecological sustainability.

The Koraga Indigenous Knowledge System represents a complex biocultural adaptive framework integrating ethnobotany, bamboo technology, healing systems, and oral traditions. This system reflects long-term ecological co-adaptation within the Western Ghats biodiversity hotspot.However, rapid socio-economic transformation is accelerating knowledge erosion. The study emphasizes that Koraga knowledge should be recognized not as archaic tradition but as a living ecological science system embedded in cultural practice.

Conclusion

The Koraga traditional knowledge system represents a complex and adaptive cultural-ecological framework encompassing ethnobotany, material culture, healing systems, and oral

traditions. Despite severe historical marginalization, the community has preserved significant ecological knowledge systems that contribute to biodiversity conservation and sustainable resource management.

However, these systems are increasingly threatened by socio-economic change, forest access restrictions, and cultural assimilation. Urgent documentation, revitalization, and policy integration are required to preserve Koraga biocultural heritage. Future research should emphasize participatory ethnography and community-led knowledge preservation initiatives.

Protecting Commons resources is critical for social justice, climate resilience, and sustainable development. Indigenous knowledge of communities residing in harmony with nature can provide immense impetus to national conservation strategies and help mitigate climate change impacts.

The research demonstrates that tribal traditional knowledge systems are not merely historical artifacts but living, adaptive systems with contemporary relevance for addressing global challenges. Their preservation and integration into mainstream development approaches represent crucial steps toward sustainable and equitable futures for India and the world.

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FINANCIAL LIBERALIZATION AND SUSTAINABLE DEVELOPMENT: INSIGHTS FROM THE ENVIRONMENTAL KUZNETS CURVE AND THE INDIAN KNOWLEDGE SYSTEM

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Abstract

Financial liberalization has become a dominant development strategy for promoting economic growth, particularly in developing economies, yet its environmental consequences remain ambiguous. This study integrates the Environmental Kuznets Curve (EKC) framework with principles from the Indian Knowledge System (IKS). While the Environmental Kuznets Curve contends that environmental degradation falls and environmental quality shall improve after a threshold level of economic growth, Indian Knowledge System emphasizes ecological harmony, ethical consumption, and sustainable resource management from the beginning. Integrating these insights provides a broader framework for examining the environmental consequences of financial liberalization and economic growth in developing countries. In the initial stages of development, liberalization tends to stimulate industrial expansion, energy use, and carbon emissions, thereby exacerbating environmental degradation. However, as income levels rise and financial systems mature, improved access to capital, technological innovation, and green finance instruments can reduce pollution and support sustainable growth. Empirical evidence across developed and developing economies indicates that the environmental impact of financial liberalization is highly conditional on institutional quality, regulatory effectiveness, and the integration of environmental objectives into financial policies. The paper argues that financial liberalization is neither inherently environmentally harmful nor beneficial. Its ultimate effect depends on governance structures, environmental regulations, and the availability of green financial mechanisms. The study concludes that a calibrated and sequenced approach to financial liberalization rooted in Indian Knowledge System, supported by strong institutions and sustainable finance policies, can reconcile economic growth objectives with long-term environmental sustainability.

Keywords: Financial liberalization, Environmental Sustainability, Indian Knowledge System Environmental Kuznets Curve

1. Introduction

Financial Liberalization is a complex, multifaceted phenomenon. It has implications on all aspects of the domestic economy –from giving acceleration to economic growth and environmental sustainability, providing an impetus to financial development, and opening the doors to foreign capital flows to triggering financial crises, to mention a few. Financial liberalization has emerged as a new global development order or mantra to achieve faster economic development for developing countries. The process of global financial integration is

intrinsic in financial liberalization. With this the environmental implications of financial liberalization have become a growing concern in the context of climate change and global sustainability goals (Hamdi et al., 2015).

Environmental sustainability means the sustainable use of natural resources and ecosystems in the long term (Khan et al., 2022). The relation between financial liberalization and environmental quality is not linear. On one hand, liberalization can lead to economic growth and industrialization, which might increase energy consumption and, therefore, pollution (the "scale effect"). Conversely, liberalization may lead to increased efficiency and innovation by allowing access to modern technology and finance to produce more environmentally friendly production (the "technique effect") (Li et al., 2021).

As a result, the main question of policy is whether financial liberalization can take place in the structure of promoting environmental sustainability rather than environmental degradation. This paper aims to examine the complex interplay between the environment and financial development and examines the measures that can help align financial reforms with sustainability goals.

2.Evolution of Financial Liberalization

The tracing of the historical evolution of financial globalization leads one to conclude that it is not a recent phenomenon. What is new is the depth and breadth of liberalization since the 1970s. From a historical perspective, Bordo et al. (1999) present a detailed account of the characteristics of liberalization before 1914. The theoretical support for capital account openness and financial liberalization before 1914 stemmed from the complementarities between trade and factor flows, as well as to the network externalities from monetary coordination (Esteves, 2012). The period from the First World War to the breakdown of the Bretton Woods System was characterized by a reversal of the globalization process where countries relied on capital controls and fixed exchange rates to retain monetary autonomy. Countries adopted the financial repression policies, which derived its support from the theories of Keynes (1936) and Tobin (1965) in an attempt to insulate the domestic economies from the global economic disorder and turmoil which prevailed during the period 1914 to 1973. The terminology "financially repressed" was introduced by Shaw (1973), and Mc Kinnon (1973). The optimal financial management in a repressed economy is found in Mc Kinnon et al., (1981).

3.Financial Liberalization and Endogenous Growth Models in the 1990s

The endogenous growth models of the 1990s, which positively link Financial Liberalization and Economic Growth, emphasized the reciprocal externalities between financial development and economic growth through an external effect on aggregate investment efficiency. King et al. (1993) stressed the role of innovation in financial development. According to this school of thought, financial systems perform the most important function of mobilizing and channelizing savings to their most productive uses and facilitates in

diversifying the risks associated with these activities. This increases the probability of successful innovation and the rate of technological progress. The argument of sustainability of increased growth rates and endogeneity of technological progress, which keeps marginal productivity of capital from falling, is fundamental to endogenous growth models. Levine (1997) summarizes the basic functions of financial systems as fostering capital accumulation and productivity growth, facilitating the trading, hedging, diversifying, pooling of risk, allocating resources, monitoring managers, exerting corporate control, mobilizing savings and facilitating the exchange of goods and services.

4.Financial Liberalization and Economic Growth

The theoretical base for the gains from financial liberalization is provided by the Neoclassical Economic Theory, which contends that when there is complete financial globalization, capital becomes perfectly mobile in and out of countries. Capital moves out of abundant countries where the cost of capital is less to capital-poor countries where the cost of capital is high, thus bringing about the equalization of domestic and global interest rates. The empirical studies on the net gains of liberalization analyses the effect of liberalization on output and economic growth.

The complexity of the nexus between financial development and economic development was analyzed by economists as early as 1911. Schumpeter (1911) stressed the productivity and growth-enhancing effects of financial development and put forward arguments in favour of the financial liberalization process. Since then, a considerable wealth of theoretical and empirical literature emerged from analyzing the association between finance and growth. The causality question dominated the theoretical debate on Financial Liberalisation, that is, whether financial development propelled economic growth or economic development preceded financial development. Robinson (1952) argued that there existed a causal relationship between economic development and financial development.

Andersen et al. (2003) evaluated the finance– growth relationship based on theory and empirical work in Less Developed Countries. Modern information economics provided valuable insights on the link between financial development and economic growth. The traditional theoretical models on finance growth nexus failed to pay adequate attention to this aspect. Markets with asymmetric information were not in general constrained pareto efficient or optimal. Increased banking sector competition, following financial liberalization, would not necessarily induce efficient financial intermediation. Increased competition was likely to erode franchise values, which could, in turn, generate an unstable banking environment where gambling behaviour on the part of the banks prevailed. Increased competition could also discourage relationship-banking, and it disturbed a constrained efficient mode of contracting in a dynamic setting characterized by asymmetric information. The study argued that these problems were further aggravated by the massive task of building an appropriate institutional and regulatory framework designed to curb imprudent bank behaviour effectively.

Information Asymmetry could trigger Banking crises. The study argued that the alleged first-order effect whereby financial development caused growth was not adequately supported by econometric work and empirical evidence. The empirical evidence on the finance–growth nexus did not yield any clear-cut picture. The study questioned whether financial development, in the sense of increased formal financial sector intermediation in a deregulated environment, could be expected to act as 'engine of growth' in the development process in the presence of Asymmetric Information.

Bekaert et al. (2005) addressed four significant questions connected with financial liberalization. The study analyzed the question of whether Financial Liberalisation spurred economic growth by introducing a financial liberalization variable into the standard growth regression model by the General Method of Moments Estimator Method. The relation between financial liberalization and an increase in economic growth was found to be statistically significant. The study concluded that Financial Liberalisation spurred economic growth, and equity market liberalization led to an average one percent rise in annual real economic growth over a five-year period. To analyze the effect of liberalization on growth, the study decomposed the rise in GDP to investment, consumption, government, and trade effects and found that GDP to Investment ratio increased post capital market liberalization. The study also examined the cross-country differences in liberalization effect and found that economies with developed institutional framework responded positively to Financial Liberalization and enhanced the liberalization effect. Finally, on the question of the rate of convergence of growth rates between poor and rich countries, the study estimated an increased convergence coefficient in the liberalization model. There was also a need for calibration of the Liberalization Process.

Prasad et al. (2005) analyzed three important questions connected with financial liberalization. Did financial globalization spur economic growth in developing countries? Did macroeconomic volatility increase with liberalization? What were the ways to reap the benefits of financial liberalization? These were the questions for which the study tried to provide answers. The study found evidence for the threshold effect for the relationship between financial liberalization and economic growth. The threshold effect meant that the positive and beneficial effects of financial globalization were more likely to be detected when the developing countries had a certain amount of absorptive capacity. The study pointed out that in addition to sound macroeconomic policies, improved governance and institutions had an important role in determining the nature of capital inflows to the country. They had a significant impact on a country's ability to attract less volatile capital inflows and on its vulnerability to crises. Developing countries were unable to derive the potential benefits of financial globalization in terms of the reduction of macroeconomic volatility. Globalization had heightened the risks of crises since cross-country financial linkages amplified the effects of various shocks and transmitted them more quickly across national borders.

Ranciere et al. (2006) developed an integrated empirical framework to synthesize, quantify, and contrast the dual effects, positive and negative effects of financial liberalization. The positive view on liberalization posited that financial liberalization led to higher long-run growth. In contrast, the negative belief argued that liberalization induced excessive risk-taking increased macro-economic volatility, and led to financial fragility and crises. The study developed a methodology to decompose the effects of financial liberalization into two that is Growth Channel and Fragility Channel and compared the expected growth benefits and growth costs arising from greater vulnerability to crises and concluded that financial liberalization led to faster average growth in the long run even though it made the economy vulnerable to occasional crises. The study concluded that in the long run, benefits of liberalization on growth, investment, and financial liberalization far outweighed the costs in terms of financial fragility and the incidence of crises.

Owusu et al. (2013) studied the relationship between Economic Growth and Financial Liberalisation of Nigeria employing the Auto Regressive Distributed Lag Bounds Approach. They created an index to represent the long run and Short-Run relationship between Economic Growth and Financial Liberalisation, adopting the Principal Component Analysis. The study found that both in the long run and short run Financial Liberalisation had a positive and significant impact on Economic Growth. They advocated a cautious approach to Liberalisation Process and warned of the dangers of Liberalisation in the form of Market Failures. The study was against Laissez-Faire Policy, of leaving everything to market in the liberalization approach.

5.Financial Liberalization and Environmental Sustainability

The relationship between financial liberalization and environment is complex and multidimensional. There are several channels through with financial liberalization affects environment. Financial liberalization can affect environmental outcomes through multiple channels which include investment expansion, technological upgrading, and changes in governance and financing structures. In countries with lax regulation, liberalization may lead to a situation where pollution level rises even though it contributes to growth and technological efficiency. But if there are proper and smart policies, green financial tools, and solid environmental governance, then financial liberalization can divert investment towards sustainable development. The role that institutional quality, regulatory frameworks, and disclosure mechanisms play in deciding whether financial liberalization is supportive or detrimental to environmental sustainability is very significant (Hamdi et al., 2015; Khan et al., 2022; Yardımcı & Oskay, 2025).

6.Empirical Evidence

Many cross-country studies show that financial development and liberalization can both harm and help the environment, depending on the prevailing policy context. Khan et al. (2022) found that green finance instruments are able to reduce emissions, but only where institutions

are enforcing environmental standards.

Li et al. (2021) found that in high-income economies, financial development was associated with reduced CO_2 emissions due to moving towards cleaner technologies, while in poorer economies, liberalization caused an increase in emissions through expansion of industries.

Bilgili (2025) carried out wavelet coherence analysis for emerging economies and the findings indicated that the effects of financial development on emissions would, at times, be positive, over time would turn negative as mature sustainable investment mechanisms are achieved.

Yardımcı and Oskay (2025) found that the combination of green finance and financial globalization could collectively improve sustainability; however, these benefits would depend on the degree of alignment of the respective regulatory and policy frameworks.

Hamdi et al. (2015) did an analysis on Tunisia through cointegration models (1971-2011) where it stated that financial liberalization had mixed environmental outcomes. Increased income led to more emissions but, in the long run, technology adoption helped mitigate pollution. For APEC countries,

Balli (2024) found that financial development initially increased CO_2 emissions because of its growth effects, but eventually reduced emissions as renewable energy investments accelerated.

The study of BRICS economies shows that liberalization fuels economic growth, but its environmental impacts depend on energy structure and institutional settings (Li et al., 2021). China provides an example on the fact that regional differences in environmental regulation may have considerable effect on the liberalization-emissions relationship (Khan et al. 2022).

7.Scale and Composition Effects of Economic Growth

As Financial liberalization progresses there will be increased access to credit and lowers the cost of capital which encourages industrialization and economic expansion. In economies reliant on fossil fuels, this expansion leads to higher greenhouse gas emissions (Hamdi et al., 2015).

Financial liberalization changes the structure of an economy with possible impact on environment. With the flow of capital and credit accompanying Financial Liberalization there will be shifts in production toward certain industries, sometimes cleaner, sometimes dirtier, depending on comparative advantages, foreign investment patterns, and regulatory strength (Grossman & Krueger, 1995).

For instance, financial liberalization may attract foreign direct investment (FDI) into capital-intensive manufacturing sectors, which are typically more pollution-intensive. This can worsen environmental quality if host countries have weak environmental enforcement, leading to what is known as the “pollution haven” hypothesis (Antweiler, Copeland, & Taylor, 2001). Conversely, liberalization can also cause a structural shift toward services or high-tech industries, which are generally less carbon-intensive, thereby improving

environmental outcomes (Li et al., 2021). Therefore, the composition effect operates through sectoral reallocation of resources. Its direction depends on the sectoral pattern of capital inflows, the strength of environmental regulation, and the technological level of foreign and domestic firms (Khan et al., 2022). Briefly, if liberalization encourages investment in cleaner sectors, the composition effect is environmentally positive; if it concentrates in polluting industries, it becomes negative.

8.Technique and Structural Effects of Financial Liberalization

Increased financial resources, access and competition encourage more investment in cleaner environmentally friendly green technologies. Green House Gas emissions can be reduced with the use of renewable energy resources. Developed financial markets can facilitate renewable energy projects, leading to reduced emission intensity (Li et al., 2021; Khan et al., 2022).

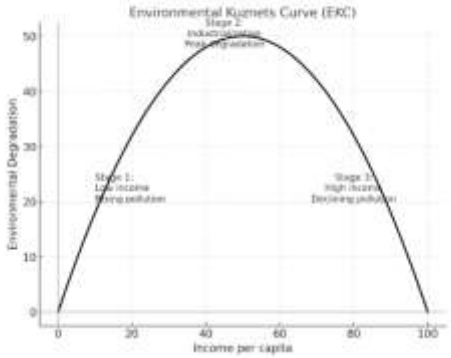
Liberalization often shifts economic structures toward industrial sectors that are more energy-intensive. However, Chinyanga, (2019) contends that financial openness may also attract foreign direct investment (FDI) to cleaner technologies, if environmental regulations are strong.

9.Financial Innovation

Liberalized financial markets encourage Financial Innovation in the form of new products like green bonds, sustainability-linked loans, and carbon trading instruments etc. With proper regulation these can support sustainable projects (Climate Policy Initiative, 2024), but weak regulation results in misuse (Associated Press, 2024).

10.Environmental Kuznets Curve Hypothesis

With Financial Globalization and increased Economic Growth pressures accompanied by industrialization, environmental degradation, greenhouse gas emissions and pollution increase in developing countries in the initial stages of economic growth. This was conceptualized as the Environmental Kuznets Curve Hypothesis. When the percapita income reaches a threshold limit, environmental degradation decreases as the countries focus on environmental quality can afford clean energy technologies, stricter environmental regulations and sustainability measures. Studies generally find the U-shaped or inverted U-shaped relationship—consistent with the Environmental Kuznets Curve (EKC)—suggests that environmental degradation first rises and later declines as financial systems mature and green finance expands (Khan et al., 2022; Li et al., 2021). This is illustrated in the diagram.



Source: Grossman and Krueger (1995)

11.Financial Liberalization, Green Growth and Environmental Sustainability

The growth-liberalization-environment debate continues. The empirical literature on growth environment nexus has neglected three important elements: (a) environmental innovation, (b) the international diffusion of environmental technologies, and (c) the economic benefits of a cleaner environment. It is high time that these aspects should be integrated in to future research. For the development of a sound, well-coordinated economic and environmental policies some action is needed in the area of the analyses of endogenous environmental innovation in response to environmental policy, the tradable nature of environmental technologies, the role of trade and foreign direct investment as channels of environmental-technology transfer to developing countries, the effects of local environmental policies in encouraging the adoption of such technologies in developing countries, and the economic benefits of a cleaner environment (Chua,1999).

Environmental innovations and patents are positively significant, ensuring that environment-related technologies are helpful in attaining green growth in the economies. The estimates of financial globalisation are significantly positive, suggesting that a rise in financial globalisation leads to an increase in green growth in the BRICS economies. Policymakers should focus on R&D activities that can encourage the development of green innovations (Chen et al 2023).

12. Sustainable Green Development: Insights from Indian Knowledge System

The relationship between financial liberalization, economic growth, and environmental sustainability can be enriched by insights from the Indian Knowledge System (IKS). While the Environmental Kuznets Curve hypothesizes that environmental degradation initially rises with economic growth before declining after a threshold income level, IKS emphasizes a balanced coexistence between economic development and nature. Concepts such as Dharma, Vasudhaiva Kutumbakam, and traditional resource-conservation practices advocate sustainable development from the outset rather than treating environmental protection as a later-stage outcome of growth. Therefore, IKS provides a normative framework that

complements and critiques the EKC by promoting environmentally responsible growth throughout the development process (Ministry of Education,2023).

While the Environmental Kuznets Curve (EKC) suggests that environmental degradation may increase before improving as income rises, the Indian Knowledge System emphasizes harmony between economic activities and nature from the very beginning. The Key IKS principles include the Sustainable use of natural resources rather than exploitation.

The concept of "Vasudhaiva Kutumbakam" (the world is one family), encourages responsibility toward the environment and future generations. It can be found that respect for nature found in the Vedas, Upanishads, and traditional agricultural practices advocates Environmental Sustainability. The idea of Dharma, stresses ethical and responsible economic behaviour. While the Environmental Kuznets Curve assumes that Economic Growth occurs first, Environmental damage later, Environmental improvement eventually.

Conversely, IKS is rooted on the Principles of Growth with environmental responsibility, Sustainable resource use and Long-term ecological balance. Thus, Indian Knowledge System offers an alternative perspective to the Environmental Kuznets Curve by suggesting that economic growth need not be accompanied by severe environmental depletion and degradation if guided by ethical and sustainable principles (Mahadevan, 2022).

13. Policy suggestions for Sustainable Green Development

Integration of Climate Risk in to Financial Regulation

Regulators should incorporate climate stress tests and mandatory climate-related disclosures, aligning with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). This ensures that liberalized financial systems account for environmental risks (Financial Times, 2025).

Strengthening Green Finance Standards

Green Finance Standards can be strengthened by developing credible taxonomies and certification systems for green bonds and sustainability-linked loans. The EU Green Bond Standard and similar initiatives can reduce greenwashing and improve accountability (The Guardian, 2024).

Public-Private Collaboration

Governments of Developing countries can rely on blended finance instruments which combine concessional public funds with private investment for mobilizing green capital (Climate Policy Initiative, 2024).

Sequenced Liberalization

Financial Liberalization process in countries should be calibrated and sequenced while strengthening environmental institutions and governance frameworks (Hamdi et al., 2015).

Global Coordination

International organizations such as the IMF, World Bank, and UN Environment Programme should support capacity building for green finance and integrate sustainability into financial

sector assessments (Li et al., 2021).

Conclusion

Financial liberalization is not fundamentally beneficial or harmful to the environment—it is situational. Financial liberalization's environmental impact depends critically on the quality of regulatory framework, financial supervision, and the synthesize of environmental goals into financial systems. Liberalization combined with green taxonomies, transparent disclosure, and carbon pricing can create synergies between finance and sustainability (Khan et al., 2022; Climate Policy Initiative, 2024).

In summary, Environmental effects of liberalization and growth depend on governance, transparency, and policy coherence. In countries with weak regulatory environments, financial liberalization can increase greenhouse gas emissions by financing environmentally harmful polluting industries. Conversely, in robust institutional settings with strong environmental governance and active green finance policies, liberalization can channel capital toward sustainable growth. It is imperative to introduce financial reforms that account for environmental risks, improve transparency norms, and promote low-carbon investment through incentives. Indian Knowledge System principles and practises can provide a framework in this process. Only through such coordinated efforts and adopting practises from Indian Knowledge System can financial liberalization become a tool for achieving high economic growth with environmental sustainability.

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SYZYGIUM ESSENTIAL OILS AND HOLISTIC WELLNESS: PHARMACOLOGICAL AND AROMATHERAPEUTIC PERSPECTIVES IN INDIAN HEALING TRADITIONS

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Abstract

The genus Syzygium Gaertn. (Myrtaceae) comprises numerous medicinally and aromatically important species widely distributed in tropical and subtropical regions, particularly in India. Several species including Syzygium aromaticum, S. cumini, S. jambos, and endemic Western Ghats taxa possess essential oils and phytochemicals with remarkable therapeutic value. Indian traditional healing systems such as Ayurveda, Siddha, folk medicine, and holistic wellness practices have extensively utilized these species for the management of diabetes, inflammation, infections, respiratory disorders, stress, and mental fatigue. Essential oils rich in eugenol, β-caryophyllene, linalool, limonene, and α-pinene exhibit antimicrobial, antioxidant, anti-inflammatory, anxiolytic, neuroprotective, and respiratory-supportive properties that strongly support their relevance in aromatherapy and integrative healthcare. Aromatic inhalation and essential oil-based therapies derived from Syzygium species may contribute to emotional balance, stress reduction, respiratory comfort, relaxation, and enhancement of psychological well-being, thereby complementing yoga and mind–body wellness practices. This review summarizes the botanical diversity, phytochemistry, essential oil composition, traditional medicinal uses, pharmacological properties, and aromatherapeutic applications of important Syzygium species, with special emphasis on their role in Indian healing systems, holistic wellness, yoga-associated therapies, and future prospects in integrative medicine and natural healthcare industries.

Keywords: Syzygium, Aromatherapy, Ayurveda, Essential oils, Indian healing system, Myrtaceae, Ethnomedicine, Phytochemistry

1. Introduction

Medicinal plants have served as the foundation of traditional healthcare systems since the dawn of civilization. Natural plant-derived products continue to play a significant role in modern medicine, pharmaceuticals, nutraceuticals, cosmetics, and wellness industries due to their therapeutic efficacy and comparatively lower side effects (WHO, 2013). Among the

medicinally important plant groups, the genus Syzygium Gaertn. (family: Myrtaceae) has attracted increasing scientific attention because of its rich phytochemical diversity, aromatic essential oils, and wide spectrum of pharmacological activities (Cock and Cheesman, 2018). The name derives from the shrub 'Myrtus' which is located near the Mediterranean in North Africa and South America.The family Myrtaceae consists of approximately 150 genera and over 5,500 species distributed mainly in tropical and subtropical regions of the world (Wilson et al., 2005). Within this family, Syzygium is regarded as one of the largest and taxonomically complex genera, comprising nearly 1,200-1,800 species of evergreen trees and shrubs distributed throughout tropical Asia, Australia, Africa, Madagascar, and the Pacific islands (Craven and Biffin, 2010). India represents an important center of diversity for Syzygium, especially within the Western Ghats, Northeastern Himalayas, and Andaman regions, where several endemic and economically valuable species occur (Shareef et al., 2012). The Western Ghats, recognized as a global biodiversity hotspot, harbor numerous endemic Syzygium species with unexplored medicinal and aromatic potential.

Species such as Syzygium aromaticum (L.) Merr. & L.M.Perry (clove), Syzygium cumini (L.) Skeels (jamun), Syzygium jambos (rose apple), Syzygium aqueum (water apple), Syzygium samarangense (wax apple), and endemic taxa including Syzygium mundagam have long been utilized in traditional medicinal systems (Baliga et al., 2011). Among them, clove (S. aromaticum) is one of the most commercially important aromatic plants due to its essential oil rich in eugenol, a phenylpropanoid compound possessing potent antimicrobial, analgesic, antioxidant, anti-inflammatory, and anesthetic properties (Prakash and Gupta, 2005). Clove oil has been extensively employed in dental care, food preservation, perfumery, aromatherapy, and pharmaceutical preparations.

In Indian traditional systems such as Ayurveda, Siddha, and Unani medicine, Syzygium species occupy an important therapeutic position. Ayurvedic texts describe the use of S. cumini in the management of "Madhumeha" (diabetes mellitus), digestive disorders, diarrhea, ulcers, and inflammation (Ayyanar and Subash-Babu, 2012). Similarly, clove has traditionally been prescribed for respiratory ailments, oral infections, cough, indigestion, headache, and pain relief (Prakash and Gupta, 2005). Tribal and folk communities of the Western Ghats also utilize different Syzygium species for wound healing, skin diseases, microbial infections, fever, and gastrointestinal disorders (Shareef et al., 2012). Such ethnomedicinal significance indicates the therapeutic richness of the genus and provides a basis for modern pharmacological investigations. In recent decades, growing scientific evidence has validated several traditional claims associated with Syzygium species. Phytochemical investigations have revealed the presence of diverse bioactive compounds including phenolics, flavonoids, tannins, alkaloids, terpenoids, anthocyanins, glycosides, and volatile essential oils (Baliga et al., 2011). Essential oils extracted from leaves, bark, flower buds, fruits, and seeds are particularly rich in compounds such as eugenol, β-caryophyllene, α-pinene, limonene,

linalool, methyl eugenol, and humulene, which contribute significantly to their therapeutic properties (Chaieb et al., 2007).

Scientific studies have demonstrated remarkable antimicrobial activity of Syzygium essential oils against pathogenic bacteria and fungi. Chaieb et al. (2007) reported that clove essential oil exhibited strong inhibitory effects against Escherichia coli, Staphylococcus aureus, Candida albicans, and several foodborne pathogens due to the membrane-disrupting activity of eugenol. Similarly, Devi et al. (2010) observed significant antifungal activity of eugenol against fungal pathogens through disruption of cellular membrane integrity and inhibition of ergosterol biosynthesis. The antioxidant potential of Syzygium species has also been extensively documented. Polyphenolic compounds present in S. cumini fruits and seeds exhibit strong free radical scavenging activity and reduce oxidative stress associated with chronic diseases (Baliga et al., 2011). A study by Banerjee et al. (2005) demonstrated that S. cumini seed extracts significantly reduced hyperglycemia and oxidative stress in diabetic experimental models. Such findings support the traditional use of jamun in diabetes management. Besides antimicrobial and antioxidant properties, several Syzygium species possess anti-inflammatory, anticancer, neuroprotective, hepatoprotective, and cardioprotective activities. Eugenol isolated from clove has been shown to inhibit inflammatory mediators including prostaglandins and cytokines, thereby reducing inflammation and pain (Daniel et al., 2009). Furthermore, research indicates that eugenol may induce apoptosis in cancer cells and exhibit chemopreventive effects against various cancers (Kumar et al., 2014). Neuroprotective studies have also demonstrated that volatile aromatic compounds from Syzygium essential oils can modulate neurotransmitter activity and reduce neuronal oxidative stress.

Aromatherapy, defined as the therapeutic application of volatile plant-derived essential oils for physical and psychological well-being, has emerged as an important complementary and alternative medicine practice worldwide (Buckle, 2015). Essential oils exert their effects primarily through inhalation and dermal absorption, influencing the limbic system, autonomic nervous system, and neuroendocrine pathways. The pleasant aroma and bioactive properties of Syzygium essential oils make them promising candidates for aromatherapeutic applications. Clove oil, in particular, is widely utilized in aromatherapy for stress reduction, pain management, respiratory relief, mental stimulation, and antimicrobial diffusion therapies. Despite extensive studies on economically important species such as clove and jamun, many wild and endemic Indian Syzygium taxa remain scientifically underexplored, especially regarding their essential oil chemistry and aromatherapeutic potential. Moreover, comprehensive reviews integrating phytochemistry, aromatherapy, ethnomedicine, and Indian traditional healing systems are comparatively limited. The growing global interest in yoga, mindfulness, holistic wellness, and integrative healthcare has created renewed scientific and commercial interest in aromatic medicinal plants. Essential oils and phytotherapeutic

compounds derived from Syzygium species possess significant potential for incorporation into yoga-based wellness therapies, stress management programs, meditation practices, respiratory care formulations, and natural lifestyle interventions. The synergistic interaction between traditional Indian healing systems and modern aromatherapy approaches may provide sustainable and evidence-based strategies for promoting physical, emotional, and psychological well-being.Considering the increasing global interest in plant-based wellness products, natural therapeutics, and integrative healthcare approaches, a systematic understanding of Syzygium species is highly essential. Therefore, the present review aims to comprehensively summarize the botanical diversity, phytochemistry, essential oil composition, pharmacological properties, aromatherapeutic applications, and ethnomedicinal significance of the genus Syzygium, with special emphasis on Indian healing systems and future therapeutic prospects.

2. Botanical Overview of the Genus Syzygium

The genus Syzygium is one of the largest genera in the Myrtaceae family (Cock and Cheesman, 2018). Members are evergreen trees or shrubs characterized by opposite leaves, aromatic tissues, oil glands, and fleshy berries. The genus is taxonomically complex due to extensive morphological diversity and geographical variation. India is considered an important center of diversity for Syzygium, particularly in the Western Ghats and Northeastern Himalayas. Many endemic species occur in forest ecosystems and possess unexplored medicinal and aromatic potential (Baliga et al., 2011).

Important medicinally relevant species include:

Species	**Common Name**	**Plant Part**	**Traditional / Medicinal Uses**	**Reference**
Syzygium aromaticum	Clove	Flower bud (clove)	Aromatherapy, dentistry, antimicrobial, relief from stomach pain, nausea, vomiting, diarrhea, toothache, muscle cramps, throat inflammation, bad breath, skin disorders, and analgesic applications	Bhouwmik et al., 2012
S. cumini	Jamun	Leaf	Used for diabetes, inflammation, dysentery, renal disorders, stomachache, constipation, fever, dermopathy, leucorrhoea, bleeding disorders, and radiation-induced DNA	Hanif et al., 2020

			damage reduction	
		Fruit	Antidiabetic, antioxidant, gastric disorders, anorexia, liver disorders, abdominal pain, irritable bowel syndrome, hemorrhoids, chronic diarrhea, and digestive stimulant	Sarma et al., 2020
		Bark	Treatment of dysentery, headache, and repeated abortion	Machado et al., 2013
		Seed	Used against sores, ulcers, skin diseases, cough, cold, fever, urinary disorders, throat and intestinal infections	Machado et al., 2013
S. jambos	Rose apple	Flower / Leaf	Anti-inflammatory, fragrance, tonic for brain and liver, diuretic, antipyretic, antidiabetic, asthma relief, bronchitis treatment, eye soreness, and catarrh	Nigam et al., 2012; Donatini et al., 2019
S. aqueum	Water apple	Leaf	Cooling effect, antimicrobial, treatment of stomach pain and dysentery	Costa et al., 2020
S. samarangense	Wax apple	Fruit / Plant material	Nutraceutical uses, treatment of fever and diarrhea	Ghayur et al., 2006; Adesegun et al., 2013
S. mundagam	Endemic Western Ghats species	Leaf / Fruit	Potential source of phytochemicals, essential oils, antioxidant and therapeutic compounds; underexplored endemic medicinal species	Chandran et al., 2017
S. cordatum	Water berry	Bark	Used for amenorrhea, anemia, burns, gonorrhea, chest complaints, tuberculosis, respiratory ailments, sexually	Maroyi, 2018

			transmitted infections, and wound healing	
		Leaf	Treatment of colds, fever, gastrointestinal disorders, herpes infections, jaundice, skin rashes, and stomach problems	
		Root	Used against cough, diarrhea, dysentery, malaria, wounds, and headache	
		Fruit	Treatment of mouth wounds	
S. polyanthum	Indonesian bay leaf	Leaf	Antiulcer, antidiabetic, anti-inflammatory, and antidiarrheal activities	Hamad et al., 2017; Rahim et al., 2018
S. caryophyllatum	Wild black plum	Fruit	Traditional remedy for diabetes	Wathsara et al., 2020
S. malaccense	Malay apple	Bark	Astringent, treatment of cracked tongue, edema, dysentery, hypertension, menstrual irregularities, mouth ulcers, itching, and respiratory problems	Nigam et al., 2012
S. curanii	Lilly Pilly	Leaf	Used traditionally for reducing high blood sugar	
S. lineare	Brush Cherry	Leaf	Astringent, refrigerant, diuretic, body cooling agent, and stamina enhancer	
S. polycephalum	Gowok fruit tree	Fruit	Traditional remedy for high blood sugar	
S. moorei	Coolamon	Whole plant	Antiseptic properties	Cock and Cheesman, 2019
S. francisii	Giant water gum	Whole plant	Antiseptic properties	
S. grande	Sea apple	Whole plant	Antiseptic properties	
S. guineense	Water berry	Whole plant	Antihypertensive properties	

3. Essential Oil Composition of Syzygium Species

Essential oils are complex mixtures of volatile, low molecular weight secondary metabolites biosynthesized in specialized secretory tissues such as oil glands, secretory cavities, trichomes, and epithelial cells present in different plant organs (Rana, 2011). In the genus Syzygium, essential oils are predominantly extracted from flower buds, leaves, bark, fruits, seeds, stems, and roots through hydro-distillation, steam distillation, solvent extraction, and supercritical fluid extraction methods. These volatile oils are rich sources of bioactive phytochemicals including phenylpropanoids, monoterpenes, sesquiterpenes, alcohols, aldehydes, ketones, esters, and hydrocarbons that contribute significantly to the medicinal, aromatic, and therapeutic value of the genus (Chaieb et al., 2007).

The chemical composition of Syzygium essential oils varies remarkably among species due to genetic makeup, ecological conditions, geographical origin, developmental stage, seasonal variations, altitude, environmental stress, extraction techniques, and plant part used for oil isolation (Rana, 2011; Cock and Cheesman, 2018). Such variation greatly influences biological activity and commercial quality. Among the numerous compounds identified, eugenol, β-caryophyllene, α-humulene, linalool, methyl eugenol, limonene, α-pinene, cineole, and terpinen-4-ol are considered the major bioactive constituents responsible for the pharmacological and aromatherapeutic properties of Syzygium oils.

3.1 Essential Oil Yield and Distribution in Syzygium

Different Syzygium species produce essential oils in varying quantities depending upon the plant organ and physiological stage. The flower buds of Syzygium aromaticum are particularly rich in volatile oils, yielding approximately 15-20% essential oil, whereas leaves and stems contain comparatively lower concentrations (Prakash and Gupta, 2005). In contrast, leaf oils from species such as S. cumini, S. jambos, S. malaccense, and S. samarangense possess moderate levels of terpenoid-rich essential oils with significant therapeutic activities.

The volatile oils are synthesized through specialized biosynthetic pathways including the mevalonate pathway and methylerythritol phosphate pathway, leading to the production of monoterpenes and sesquiterpenes. Phenylpropanoid compounds such as eugenol are derived mainly from the shikimate pathway. Environmental factors such as temperature, humidity, soil conditions, and light intensity can significantly alter biosynthetic activity and oil composition (Rana, 2011).

Major Essential Oil Constituents of Syzygium Species

3.2 Eugenol

Eugenol (4-allyl-2-methoxyphenol) is the principal phenylpropanoid compound found predominantly in Syzygium aromaticum essential oil and is considered one of the most pharmacologically important constituents of the genus. Clove bud oil may contain up to 70-90% eugenol depending on extraction method and geographical origin (Prakash and Gupta, 2005). Eugenol possesses a characteristic spicy aroma and contributes extensively to the

antimicrobial, analgesic, antiseptic, anesthetic, antioxidant, and anti-inflammatory properties of clove oil. Several studies have demonstrated the biological efficacy of eugenol. Chaieb et al. (2007) reported strong antibacterial activity of eugenol against Escherichia coli, Staphylococcus aureus, Bacillus cereus, and Listeria monocytogenes. The mechanism involves disruption of microbial cell membranes, leakage of intracellular components, and inhibition of enzyme systems. Devi et al. (2010) further demonstrated that eugenol alters fungal membrane integrity and inhibits ergosterol biosynthesis in Candida albicans.

Eugenol also exhibits significant antioxidant activity by scavenging reactive oxygen species (ROS), reducing lipid peroxidation, and protecting cellular biomolecules from oxidative damage (Kumar et al., 2014). Due to its analgesic and local anesthetic properties, eugenol has long been used in dentistry for toothache relief and root canal formulations. In aromatherapy, inhalation of eugenol-rich essential oils is associated with stress reduction, mental relaxation, respiratory comfort, and enhancement of emotional well-being. Recent pharmacological studies have highlighted the anticancer potential of eugenol. Research suggests that eugenol may induce apoptosis, inhibit angiogenesis, and suppress proliferation in various cancer cell lines including melanoma, breast, and colon cancer cells (Kumar et al., 2014). These findings indicate the broad therapeutic relevance of eugenol-rich Syzygium oils.

3.3 β-Caryophyllene

β-Caryophyllene is an important bicyclic sesquiterpene widely distributed in Syzygium essential oils, especially in leaves and bark. This compound contributes to the woody-spicy aroma characteristic of many Myrtaceae members. β-Caryophyllene has attracted considerable attention due to its anti-inflammatory, analgesic, antioxidant, neuroprotective, and anxiolytic properties (Chaieb et al., 2007). Interestingly, β-caryophyllene acts as a selective agonist of cannabinoid receptor type 2 (CB2 receptor), thereby exerting anti-inflammatory and neuroimmune regulatory effects without psychoactive activity (Gertsch et al., 2008). This property makes it a promising therapeutic compound for inflammatory disorders, arthritis, neurodegenerative diseases, and stress-related conditions. Studies have demonstrated that β-caryophyllene can reduce pro-inflammatory cytokine production, inhibit oxidative stress, and protect neuronal tissues from inflammatory damage. In aromatherapy, β-caryophyllene-containing oils contribute to relaxation, mood stabilization, and mental calmness.

3.4 Linalool

Linalool is a naturally occurring monoterpene alcohol identified in several Syzygium species and is well known for its pleasant floral fragrance and calming effects. This compound contributes significantly to the sedative, anxiolytic, anticonvulsant, and antidepressant properties of essential oils (Rana, 2011). Scientific investigations indicate that linalool modulates neurotransmitter activity within the central nervous system and influences gamma-aminobutyric acid (GABA) receptors responsible for relaxation and stress reduction (Linck et

al., 2009). Aromatherapy involving linalool-rich oils has been associated with reduced anxiety, improved sleep quality, decreased blood pressure, and enhanced emotional stability. Additionally, linalool exhibits antimicrobial and anti-inflammatory activities. Peana et al. (2002) demonstrated that linalool possesses analgesic effects by modulating inflammatory pathways and reducing nociceptive responses. Such multifunctional biological activities support the therapeutic importance of linalool-containing Syzygium essential oils.

3.5 α-Pinene

α-Pinene is one of the most abundant monoterpene hydrocarbons found in aromatic plants and contributes to the fresh, pine-like aroma of several Syzygium oils. This compound possesses bronchodilatory, antimicrobial, anti-inflammatory, and cognitive-enhancing activities (Salehi et al., 2019). Research indicates that α-pinene can inhibit acetylcholinesterase activity, thereby improving memory and cognitive function. It also exhibits anti-inflammatory activity through suppression of pro-inflammatory mediators and oxidative stress pathways. In respiratory therapies, α-pinene acts as an expectorant and bronchodilator, helping relieve respiratory congestion and airway inflammation. Due to its refreshing aroma and respiratory benefits, α-pinene-rich essential oils are commonly used in aromatherapy for mental alertness, sinus relief, and respiratory wellness.

3.6 Limonene

Limonene is a cyclic monoterpene commonly detected in Syzygium leaf and fruit oils. It imparts citrus-like fragrance and exhibits notable antioxidant, anti-inflammatory, antimicrobial, gastroprotective, and anticancer properties (Sun, 2007). Several studies have reported that limonene possesses chemopreventive activity against certain cancers by inducing detoxification enzymes and inhibiting tumor growth. In aromatherapy, limonene contributes to mood enhancement, stress relief, and emotional upliftment. It also demonstrates bronchodilatory effects beneficial in respiratory disorders.

3.7 Methyl Eugenol and other constituents

Besides eugenol, methyl eugenol is another phenylpropanoid frequently identified in Syzygium essential oils (Xue et al., 2022). This compound contributes to fragrance and antimicrobial activity but must be carefully regulated due to potential toxicological concerns at high concentrations.

4. Syzygium Essential Oils in Holistic Wellness and Yoga-Based Therapies

Essential oils play an important role in complementary and integrative healthcare systems because of their ability to influence physical, emotional, and psychological well-being through olfactory stimulation and neurophysiological responses. In yoga and meditation practices, aromatic plant oils are increasingly incorporated into relaxation therapies, breathing exercises, mindfulness sessions, spa therapies, and stress management programs. The volatile constituents present in Syzygium species, particularly eugenol, linalool, limonene, and β-caryophyllene, may interact with the limbic system and autonomic nervous system, thereby

promoting relaxation, emotional stability, respiratory comfort, and mental clarity.

Traditional Indian wellness systems often combine herbal fumigation, aromatic oils, meditation, breathing techniques (Pranayama), and therapeutic massage to restore harmony between body and mind. Clove oil and other aromatic Syzygium preparations are commonly used in meditation environments, yoga therapy centers, and holistic wellness practices because of their calming, antimicrobial, warming, and respiratory-supportive effects. Such integrative approaches align closely with modern aromatherapy concepts and support the growing global interest in natural mind–body healing strategies.

Aromatherapy involves the therapeutic use of volatile plant oils through inhalation, massage, diffusion, and topical application. Essential oils from Syzygium species exhibit significant pharmacological activities supporting their role in holistic healing (Prakash and Gupta, 2005).

4.1 Stress and anxiety management

Volatile compounds such as linalool and eugenol possess calming properties that may influence the limbic system and reduce stress-related symptoms (Chaieb et al., 2007). Clove oil inhalation has shown relaxing effects and improvement in mental clarity.

4.2 Antimicrobial aromatherapy

Essential oils from Syzygium species demonstrate broad-spectrum antimicrobial activity against bacteria, fungi, and viruses (Chaieb et al., 2007). Clove oil is particularly effective against oral pathogens and respiratory infections.

4.3 Pain relief and Anti-inflammatory effects

Eugenol acts as a natural analgesic by modulating inflammatory pathways and reducing pain sensation (Prakash and Gupta, 2005). Traditional Indian medicine commonly uses clove oil for toothache and muscular pain.

4.4 Respiratory applications

The aromatic vapors of Syzygium oils help relieve congestion, cough, and respiratory discomfort due to their expectorant and antimicrobial properties (Rana, 2011).

4.5 Skin and cosmetic applications

The antioxidant and antimicrobial activities of Syzygium oils support their incorporation into skincare, anti-aging formulations, soaps, and herbal cosmetics (Gupta and Prakash, 2014).

Table 2. Aromatherapeutic and Wellness Relevance of Selected Syzygium Species

***Syzygium* Species**	**Major Aroma Compound**	**Wellness Application**	**Yoga / Holistic Relevance**
S. aromaticum	Eugenol	Stress relief, respiratory comfort, pain relief	Meditation, relaxation therapy, pranayama support
S. cumini	Terpenoids,	Antioxidant and	Lifestyle disorder

	phenolics	metabolic wellness	management
S. jambos	Linalool-rich aroma	Relaxation and calming effect	Mindfulness and emotional balance
S. aqueum	Volatile leaf oils	Cooling and refreshing activity	Mental relaxation and wellness
S. samarangense	Aromatic fruit volatiles	Nutraceutical wellness	Holistic nutrition support

5. Syzygium in Indian healing systems

The Indian traditional healthcare system represents one of the oldest continuously practiced medicinal traditions in the world. Medicinal plants form the backbone of Ayurveda, Siddha, Unani, folk medicine, and tribal healing systems, where aromatic and therapeutically active species have been used for centuries to maintain physical, mental, and spiritual well-being. Among these medicinal taxa, the genus Syzygium occupies a significant position because of its diverse pharmacological activities, aromatic essential oils, and broad ethnomedicinal applications (Baliga et al., 2011).

Various Syzygium species are traditionally employed for the treatment of diabetes, digestive disorders, respiratory ailments, infections, inflammation, skin diseases, wounds, and metabolic disorders. Different plant parts including leaves, bark, fruits, flower buds, roots, and seeds are used either individually or in polyherbal formulations. The medicinal importance of Syzygium species in Indian healing systems is increasingly supported by modern pharmacological and phytochemical investigations, validating several traditional therapeutic claims.

5.1 Syzygium in Ayurveda

Ayurveda, the ancient Indian "science of life," utilizes medicinal plants to restore balance among the three fundamental physiological principles or doshas: Vata, Pitta, and Kapha. Several Syzygium species are described in Ayurvedic literature for their ability to regulate digestion, metabolism, circulation, respiratory function, and immune responses.

Syzygium aromaticum (Clove)

Syzygium aromaticum (Lavanga) is one of the most valued aromatic medicinal plants in Ayurveda. Clove is characterized by katu (pungent) and tikta (bitter) taste with heating potency and is traditionally used to balance Kapha and Vata doshas (Prakash and Gupta, 2005). The essential oil rich in eugenol acts as a carminative, antiseptic, analgesic, and expectorant. Clove oil has long been utilized in Ayurvedic dental formulations for relieving tooth pain and preventing oral microbial infections. Scientific studies have validated its antibacterial and anti-inflammatory properties against oral pathogens including Streptococcus mutans and Candida albicans (Chaieb et al., 2007).

Syzygium cumini (Jamun)

Syzygium cumini is widely recognized in Ayurveda as an important antidiabetic medicinal

plant and is commonly referred to as "Jambu" or "Mahaphala." Various plant parts including seeds, bark, leaves, and fruits are utilized in Ayurvedic preparations. Ayurvedic formulations containing jamun seed powder are traditionally prescribed for controlling blood glucose levels. Modern scientific studies have demonstrated that S. cumini seeds contain alkaloids, flavonoids, jamboline, ellagic acid, anthocyanins, and tannins capable of reducing hyperglycemia and oxidative stress (Ayyanar and Subash-Babu, 2012).

Research conducted by Banerjee et al. (2005) showed that S. cumini fruit extracts possess strong antioxidant activity capable of scavenging free radicals and protecting pancreatic tissues from oxidative damage. Similarly, Sharma et al. (2008) reported hypoglycemic effects of jamun seed extracts in experimental diabetic models.

Other ayurvedic applications

Other Syzygium species such as S. jambos, S. aqueum, and S. samarangense are also traditionally employed in Ayurvedic and regional medicinal practices for treating fever, digestive disturbances, skin disorders, inflammation, and urinary complications. Aromatic leaves and bark are often incorporated into decoctions and herbal baths for their cooling and antimicrobial properties.

5.2 Syzygium in Siddha medicine

Siddha medicine, one of the oldest traditional medicinal systems originating in South India, particularly Tamil Nadu, extensively utilizes medicinal plants for promoting longevity, detoxification, and holistic healing. The Siddha pharmacopoeia includes several Syzygium species because of their aromatic, antimicrobial, anti-inflammatory, and rejuvenating properties.

Therapeutic uses in Siddha

In Siddha medicine, Syzygium species are widely prescribed for the treatment of wound healing, fever, infections, gastrointestinal disorders, inflammatory conditions, skin diseases, respiratory ailments, oral ulcers, and diabetes management. Clove oil (Syzygium aromaticum) holds particular importance in Siddha external therapies because of its strong analgesic and antiseptic properties and is frequently incorporated into herbal oils, liniments, and fumigation preparations used for relieving muscular pain, arthritis, respiratory congestion, and inflammatory conditions. Similarly, Syzygium cumini seed powder is traditionally administered to regulate sugar metabolism and reduce excessive urination associated with diabetes, while decoctions prepared from the leaves and bark are commonly used for treating diarrhea, dysentery, ulcers, and chronic inflammatory disorders. Modern pharmacological studies strongly support these traditional applications, with Baliga et al. (2011) reporting significant antioxidant, antimicrobial, and anti-inflammatory activities in S. cumini extracts, thereby validating their therapeutic relevance in Siddha medicine.

5.3 Syzygium in Folk and Tribal Medicine

India possesses rich ethnobotanical heritage, and tribal communities inhabiting the Western

Ghats, Eastern Ghats, Central India, and Northeastern Himalayan regions extensively utilize Syzygium species for primary healthcare (Shareef et al., 2012). Traditional healers use locally available plant parts in the form of decoctions, infusions, powders, pastes, juices, fumigants, and aromatic preparations.

Western Ghats ethnomedicinal practices

The tribal communities of the Western Ghats extensively utilize various Syzygium species for the treatment of gastrointestinal disorders, fever, infections, skin diseases, wounds, ulcers, respiratory ailments, diabetes, toothache, oral infections, inflammation, and pain (Sujanapal & Kunhikannan, 2017). Traditional healers commonly prepare decoctions, powders, pastes, and aromatic formulations from different plant parts including leaves, bark, fruits, and seeds. For instance, leaf decoctions of Syzygium aqueum are traditionally used for dysentery and stomach pain, whereas bark extracts of Syzygium cumini are prescribed for diarrhea and inflammatory conditions. Aromatic smoke generated from clove and leaf preparations is also employed for respiratory relief, purification rituals, and protection against infections. Despite their extensive traditional significance, several endemic Syzygium species of the Western Ghats remain scientifically underexplored. Indigenous communities possess valuable ethnomedicinal knowledge regarding therapeutic efficacy, dosage, seasonal harvesting, and synergistic herbal combinations, highlighting the need for systematic documentation and pharmacological validation of these medicinal resources.

Aromatic and Spiritual Applications

Apart from direct medicinal use, aromatic Syzygium species are utilized in ritualistic and spiritual healing practices (Batiha et al., 2020). Clove and aromatic leaf preparations are used in fumigation, sacred offerings, purification ceremonies, and mental relaxation therapies. Such practices resemble modern aromatherapy approaches where inhalation of volatile compounds influences emotional and neurological responses.

6. Pharmacological activities supporting aromatherapy

The pharmacological importance of Syzygium species is primarily associated with their rich phytochemical composition (Brito et al., 2007), particularly essential oils, phenolics, flavonoids, tannins, anthocyanins, and terpenoids. These bioactive compounds exhibit a wide range of biological activities including antioxidant, antidiabetic, antimicrobial, anti-inflammatory, anticancer, neuroprotective, and anxiolytic properties, which strongly support the application of Syzygium species in aromatherapy and complementary medicine systems.

6.1 Antioxidant Activity

Among the various pharmacological activities, antioxidant potential is one of the most extensively studied properties of Syzygium species. Oxidative stress caused by excessive production of reactive oxygen species (ROS) is closely associated with aging, diabetes, cardiovascular diseases, neurodegenerative disorders, and cancer. Several Syzygium species possess strong antioxidant activity due to the presence of polyphenols, flavonoids,

anthocyanins, tannins, and phenolic acids (Baliga et al., 2011).

In particular, Syzygium cumini fruits, seeds, leaves, and bark are rich sources of ellagic acid, gallic acid, quercetin, and anthocyanins that effectively scavenge free radicals and reduce oxidative damage. Banerjee et al. (2005) reported that S. cumini fruit extracts significantly inhibited lipid peroxidation and exhibited strong DPPH radical scavenging activity. Similarly, eugenol-rich clove oil possesses remarkable antioxidant potential by protecting lipids, proteins, and cellular membranes from oxidative injury (Kumar et al., 2014). These antioxidant properties contribute significantly to the therapeutic effectiveness of Syzygium oils in stress management, anti-aging formulations, and wellness therapies used in aromatherapy.

6.2 Antidiabetic Activity

Antidiabetic activity is another important pharmacological property of Syzygium species, especially Syzygium cumini, which has been traditionally used in Ayurveda and Siddha medicine for managing diabetes mellitus. The seeds, bark, fruits, and leaves of S. cumini contain several hypoglycemic compounds including jamboline, alkaloids, flavonoids, tannins, and anthocyanins that help regulate blood glucose metabolism (Ayyanar and Subash-Babu, 2012).

Experimental studies have demonstrated that jamun extracts improve insulin secretion, enhance glucose uptake, reduce intestinal glucose absorption, and protect pancreatic β-cells from oxidative stress. Sharma et al. (2008) observed significant antihyperglycemic effects of S. cumini fruit pulp in diabetic animal models. Additionally, antioxidant compounds present in jamun help prevent diabetic complications such as nephropathy, neuropathy, and cardiovascular disorders. Aromatherapy applications involving clove and Syzygium-derived oils may also indirectly assist diabetic patients by reducing stress and anxiety, which are often associated with poor glycemic control.

6.3 Anti-inflammatory Activity

The anti-inflammatory properties of Syzygium essential oils are mainly attributed to eugenol, β-caryophyllene, and related terpenoid compounds. Inflammation plays a major role in chronic diseases including arthritis, diabetes, cardiovascular disorders, respiratory diseases, and cancer.

Eugenol present in clove oil has been shown to inhibit cyclooxygenase enzymes and suppress the production of inflammatory mediators such as prostaglandins, tumor necrosis factor-alpha (TNF-α), and interleukins (Daniel et al., 2009). β-Caryophyllene, another important constituent found in Syzygium oils, acts as a selective agonist of cannabinoid receptor type 2 (CB2), thereby exerting anti-inflammatory and neuroprotective effects (Gertsch et al., 2008).

Traditional use of clove oil for toothache, sore throat, arthritis, and muscular pain is strongly supported by these pharmacological findings. In aromatherapy, massage oils and inhalation therapies prepared from Syzygium oils are widely used for relieving muscular tension,

inflammatory pain, and stress-related discomfort.

6.4 Antimicrobial Activity

Several Syzygium species exhibit potent antimicrobial activity against pathogenic bacteria, fungi, and certain viruses. Chaieb et al. (2007) demonstrated that clove essential oil effectively inhibited the growth of Escherichia coli, Staphylococcus aureus, Bacillus cereus, and Candida albicans.

The antimicrobial action of eugenol involves disruption of microbial cell membranes, leakage of intracellular contents, and inhibition of enzyme activity. Devi et al. (2010) further reported that eugenol damages fungal membrane integrity and interferes with ergosterol biosynthesis in fungal pathogens.

These antimicrobial properties support the traditional use of Syzygium oils in oral healthcare, wound healing, respiratory infections, and food preservation. In aromatherapy, diffusion of clove oil and related essential oils may help purify indoor environments and reduce microbial contamination.

6.5 Anticancer Activity

The anticancer potential of Syzygium phytochemicals has gained increasing scientific attention in recent years. Eugenol and polyphenolic compounds present in Syzygium species exhibit cytotoxic and chemopreventive activities against several cancer cell lines (Chua et al., 2019). Research indicates that eugenol can induce apoptosis, inhibit tumor cell proliferation, suppress angiogenesis, and modulate oxidative stress pathways associated with carcinogenesis (Kumar et al., 2014). Studies have demonstrated anticancer activity of eugenol against melanoma, breast cancer, leukemia, and colon carcinoma cells. Similarly, anthocyanins and phenolic compounds from S. cumini fruits help reduce oxidative DNA damage and protect cells from mutagenic effects. Although further clinical validation is necessary, these findings suggest significant pharmaceutical and nutraceutical potential for Syzygium-derived compounds.

6.6 Neuroprotective and Anxiolytic Activity

Neuroprotective and anxiolytic activities of Syzygium essential oils are particularly relevant to aromatherapy applications. Volatile compounds such as linalool, eugenol, α-pinene, and β-caryophyllene can influence neurotransmitter systems, reduce neuroinflammation, and protect neuronal cells from oxidative stress-induced damage.

Linck et al. (2009) demonstrated that inhalation of linalool-rich essential oils produced sedative and anxiolytic effects in animal models. β-Caryophyllene exerts neuroprotective effects through CB2 receptor-mediated pathways, while eugenol has been shown to reduce neuronal oxidative damage and inflammatory signaling.

Aromatic inhalation of Syzygium oils may stimulate the limbic system and autonomic nervous system, thereby reducing anxiety, promoting relaxation, improving sleep quality, and enhancing emotional stability. Traditional use of clove oil for relieving headache, nervous

tension, mental fatigue, and stress aligns closely with these modern scientific findings.

6.7 Respiratory and Analgesic Activity

In addition to these properties, Syzygium essential oils also possess bronchodilatory, analgesic, and respiratory therapeutic activities. Compounds such as α-pinene, limonene, and eugenol help relieve respiratory congestion, reduce airway inflammation, and improve breathing comfort.Clove oil inhalation has traditionally been used for treating cough, cold, bronchitis, sinus congestion, and asthma-like symptoms. The analgesic activity of eugenol also contributes to pain relief in dental disorders, muscular pain, headaches, and inflammatory conditions.These activities strongly support the incorporation of Syzygium essential oils into aromatherapy formulations designed for respiratory care, stress reduction, and pain management.

6.8 Relevance in aromatherapy

The broad spectrum of pharmacological activities exhibited by Syzygium species provides strong scientific evidence supporting their extensive use in aromatherapy, herbal medicine, wellness therapies, pharmaceuticals, and complementary healthcare systems (Dharanai et al., 2016). Essential oils rich in eugenol, linalool, β-caryophyllene, limonene, and α-pinene contribute significantly to stress reduction, emotional balance, respiratory wellness, antimicrobial diffusion, pain relief, and mental relaxation.

The synergistic interactions among volatile oils and phytochemicals contribute substantially to the holistic therapeutic effectiveness of Syzygium species and highlight their immense potential in integrative medicine and natural healthcare systems.

7. Industrial and commercial applications

The growing demand for natural wellness products has increased commercial interest in Syzygium-derived essential oils. Applications include aromatherapy products, herbal cosmetics, pharmaceutical formulations, food preservatives, perfumery, oral healthcare products, and spa industries (Rana, 2011). The global herbal and essential oil market provides substantial opportunities for sustainable utilization of Syzygium species.

8. Challenges and future perspectives

Despite promising medicinal potential, several limitations remain, including limited phytochemical studies on endemic Indian species, lack of standardized essential oil profiling, insufficient clinical validation, conservation concerns for rare species, and variability in oil quality due to environmental factors (Cock and Cheesman, 2018). Future research should focus on comprehensive GC-MS and metabolomic profiling, clinical validation of aromatherapeutic effects, sustainable harvesting, conservation of endemic taxa, and development of value-added herbal formulations. Integration of traditional knowledge with modern pharmacology may open new avenues for the therapeutic utilization of Syzygium species.

9. Conclusion

The genus Syzygium represents a valuable reservoir of medicinal and aromatic plants with immense potential in aromatherapy and Indian traditional healing systems. Species such as S. aromaticum and S. cumini have already demonstrated significant therapeutic applications, while many endemic Indian species remain underexplored. Essential oils rich in eugenol, terpenoids, and phenolic compounds contribute to antimicrobial, antioxidant, anti-inflammatory, and neuroprotective properties that support their holistic healing applications. Scientific validation of traditional uses, coupled with sustainable conservation and commercialization strategies, can promote the integration of Syzygium-based aromatics into modern healthcare and wellness industries.

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IMPACT OF GAME-SPECIFIC SKILL TRAINING COMBINED WITH YOGIC PRACTICES ON FUNCTIONAL VARIABLES IN VOLLEYBALL PLAYERS

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Abstract

Volleyball is a dynamic and competitive team sport demanding high physical fitness, technical skill, coordination, agility, and mental focus. This study aimed to evaluate the effects of combining game-specific skill training with yogic practices on key biological in volleyball players. Forty school-level volleyball players from Trichy, aged 14–17, were randomly divided into two groups of twenty each. Set I underwent game-specific skill training with yogic practices (GSSTWYP) thrice weekly for eight weeks, while Group II served as the rheostat group (CG), continuing their regular routine without additional training. Functional variables were measured using standardized tests: VO_2 max was assessed via the Cooper VO_2 max test (ml/kg), and vital capacity was measured using a wet spirometer (liters). Pre- and post-tests were conducted on separate days following a warm-up to ensure accuracy. Paired sample t-tests analyzed the data, with significance set at 0.05. Results showed that the integrated training program knowingly enhanced both VO_2 max and vital capacity among the volleyball players. These improvements likely resulted from enhanced respiratory efficiency, aerobic endurance, and overall physiological function due to the combined training. The findings align with previous research supporting integrated training methods for improved sports performance and physiological development. In conclusion, combining game-specific skill training with yogic practices is an effective approach to enhance VO_2 max and vital capacity in volleyball players.

Keywords: VO_2 Max, Energetic Size, Game-Specific Skill Training, Yogic Practices, Functional Variables, School-Level Volleyball Players

OUTLINE

The sport involves rapid actions such as jumping, spiking, blocking, diving, and swift directional changes. These require players to possess superior functional abilities including cardiovascular endurance, respiratory efficiency, muscular strength, flexibility, agility, and coordination. Modern volleyball has evolved into a fast-paced game where success largely depends on a player's ability to perform sport-specific skills repeatedly with precision and efficiency throughout the match.

In recent years, instructors and sports geniuses have emphasized the importance of

game-specific skill training as an effective method to enhance volleyball players' performance capacity. This type of training involves activities that closely simulate the actual movement patterns, technical actions, and physiological demands of the game. It improves neuromuscular coordination, motor learning, reaction time, and sport-specific fitness, thereby elevating overall playing performance. Volleyball players engaging in structured game-specific training programs tend to develop better functional efficiency and greater adaptability during competition.

Alongside conventional sports training, yogic practices have gained considerable attention in sports and physical education due to their positive effects on physical, physiological, and psychological health. Yoga, an ancient Indian system of exercises and breathing techniques, promotes harmony between body and mind. Yogic practices such as asanas (postures), pranayama (breathing exercises), and relaxation techniques are known to enhance flexibility, lung capacity, concentration, balance, recovery, and mental relaxation. In sports, yoga helps athletes reduce stress, improve respiratory efficiency, and boost overall functional fitness ritical factors for sustained athletic performance.

Functional variables like VO_2 max, vigorous bulk, resting pulse rate, breath-holding time, and respiratory endurance are key indicators of a volleyball player’s efficiency and endurance. Improvements in these variables enable athletes to tolerate fatigue, recover faster, and maintain high-intensity performance during training and competition. Therefore, integrating yogic practices with game-specific skill training may offer additional physiological and psychological benefits beyond traditional training methods alone.

Several researchers have demonstrated that combined training approaches significantly improve athletic performance and functional fitness variables among athletes. However, limited research exists on the combined effects of game-specific skill training and yogic practices for volleyball players, particularly at the school level. This study aims to examine the impact of this integrated training approach on selected purposeful variables of volleyball players. The findings could assist coaches, physical educators, trainers, and sports scientists in developing more effective and scientifically grounded training programs for volleyball players.

METHODOLOGY

A total of forty male volleyball players from Tiruchirappalli, aged between 14 and 17 years, were selected as participants for the study. The participants were randomly divided into two sets, with twenty players in each set. Set I participated in Game-Specific Skill Training combined with Yogic Practices (GSSTWYP), whereas Set II functioned as the Control Set (CS). The experimental participants underwent a systematic training schedule three days per week for a duration of eight weeks. The intensity of the training was progressively enhanced once every two weeks by modifying the exercise workload and increasing the complexity of skill practices. The investigation concentrated on two physiological parameters: VO_2 max and

vital capacity. VO_2 max was evaluated through the Cooper VO_2 max assessment and expressed in ml/kg/min, while vital capacity was determined using a wet spirometer and documented in liters. Data collection was carried out before the commencement (pre-test) and after the completion (post-test) of the eight-week training phase to determine the effectiveness of the intervention program.

TABLE – I ANTHROPOMETRIC INDIVIDUALITIES OF SCHOOL LEVEL HANDBALL PLAYERS

CLUSTER	**PHASE (Years)**	**STATURE (cm)**	**MASS (kg)**	**BMI (kg/m2)**
GSSTWYP (n=20)	16.90	165.25	56.97	20.1

TRAINING PROGRAMME

The intervention schedule extended over a period of eight weeks, with practice sessions conducted thrice a week. Every session was carried out for 90 minutes, comprising a 10-minute warm-up phase, 70 minutes of Game-Specific Skill Training integrated with Yogic Practices (GSSTWYP), and a 10-minute recovery period. The format and time allocation of each training session were maintained consistently during the entire experimental duration to provide equal training exposure for all participants.

TABLE- II INTEGRATED GAME-SPECIFIC SKILL AND YOGIC TRAINING SCHEDULE FOR VOLLEYBALL PLAYERS

Week	**Warm-up (10 min)**	**Yogic Practices (20 min)**	**Game-Specific Skill Training (50 min)**	**Cool-down (10 min)**
1–2	Light jogging, dynamic stretches	**Asanas:** Tadasana, Bhujangasana, Trikonasana **Pranayama:** Anulom-Vilom	Underhand Serve Practice Overhand Serve Practice Float Serve Drill	Stretching + Shavasana
3–4	Skipping, Mobility Drills	**Asanas:** Padmasana, Vajrasana, Dhanurasana **Pranayama:** Kapalabhati	Overhead Setting Wall Setting Drill Partner Setting Triangle Passing Drill Moving Pass Drill	Relaxation Breathing + Shavasana

5–6	Agility Ladder, Cone Runs	**Asanas:** Surya Namaskar set, Virabhadrasana, Paschimottanasana **Pranayama:** Bhramari	Approach Jump Drill Cross-Court Spiking Line Spiking Double Block Drill Footwork Blocking Drill	Static Stretches + Meditation
7–8	Sprint Drills, Dynamic Flexibility	**Asanas:** Ardha Matsyendrasana, Ustrasana, Halasana **Pranayama:** Nadi Shodhana	Rolling and Recovery Drill Court Coverage Drill Defensive Movement Drill Setter-Attacker Combination Offensive Rotation	Full-body Relaxation + Yog Nidra

STATISTICAL ANALYSIS

The data collected on VO_2 max and vital capacity following the GSSTWYP intervention were statistically evaluated using the paired sample t-test. The level of consequence was set at 0.05 ($p < 0.05$).

TABLE – III SUBTRACTION OF 'T' RELATION ON VO2 MAX OF SCHOOL LEVEL VOLLEYBALL PLAYERS ON INVESTIGATIONAL AND RESISTOR GROUPS

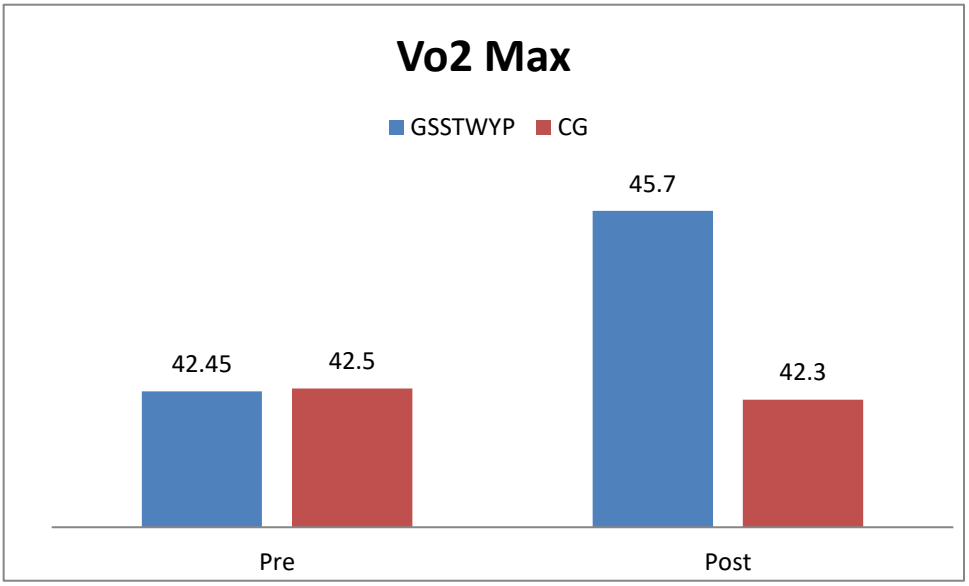
(Marks in ml/kg/lit)

Group	**Test**		**Mean**	**Std. Deviation**	**T ratio**
VO_2 Max	Experimental Group	Pre test	42.45	1.25	4.03*
		Post test	45.70	1.45	
	Control Group	Pre test	42.50	1.30	1.24
		Post test	42.30	1.75	

*significant level 0.05 level (degree of freedom 2.09, 1 and 19)

Bench III displays the mean values, standard deviation scores, and computed t-ratio for maximal oxygen uptake performance of the participants in the experimental set. The calculated t-value of 4.03 exceeded the required table value of 2.09 at the 0.05 level of significance with 19 degrees of freedom. This finding revealed that the training intervention resulted in a statistically significant enhancement in maximal oxygen uptake performance among the participants of the experimental set. On the other hand, the control set recorded a t-value of 1.24, which was lower than the prescribed table value. Hence, the variation observed

in maximal oxygen uptake performance among the participants of the control set was not statistically significant..



DIGIT- I BAR ILLUSTRATION SHOW THE CRUEL VALUE VO2 MAX OF SCHOOL LEVEL VOLLEYBALL PLAYERS ON NEW GROUP AND DEVICE GROUP

(Scores in ml/kg/lit)

TABLE – IV DIVISION OF 'T' FRACTION ON DYNAMIC ABILITY OF SCHOOL LEVEL VOLLEYBALL PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP

(Cuts in liters)

Group	**Test**		**Mean**	**Std. Deviation**	**T ratio**
Vital Capacity	Experimental Group	Pre test	3.50	0.26	35.81*
		Post test	4.20	0.60	
	Control Group	Pre test	3.51	0.10	1.20
		Post test	3.50	0.14	

*significant level 0.05 level (degree of freedom 2.09, 1 and 19)

Stand IV illustrates the mean scores, standard deviation values, and computed t-ratio values for vital capacity among the experimental set and control set participants. The experimental set obtained a t-value of 35.81, which exceeded the required table value of 2.09 at the 0.05 level of significance with 19 degrees of freedom. This outcome demonstrates that the GSSTWYP intervention programme produced a statistically significant enhancement in vital

capacity among the participants belonging to the experimental set. Conversely, the control set recorded a t-value of 1.20, which was lower than the stipulated table value. Therefore, the alteration observed in the vital capacity of the control set participants was not statistically significant..

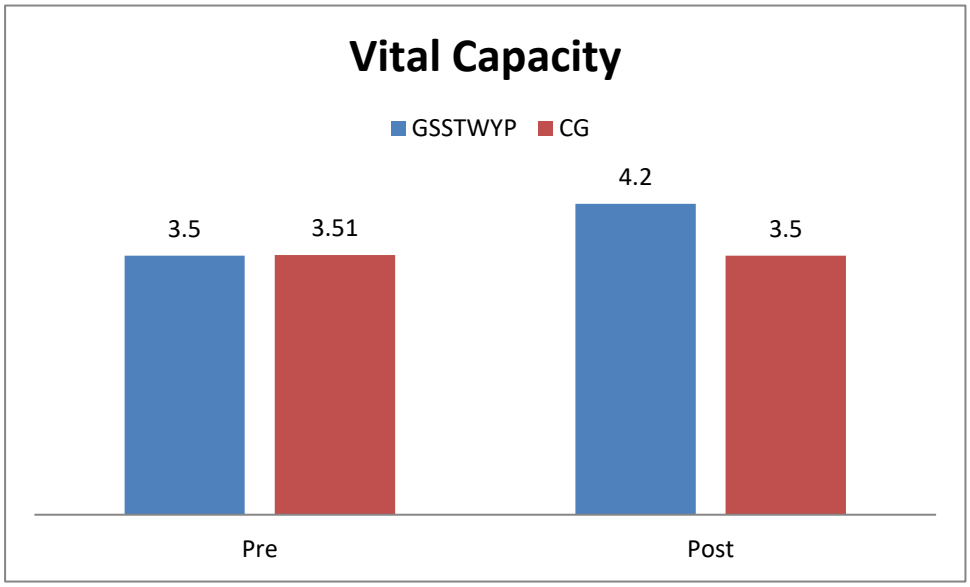


FIGURE- II INN CHART SHOWING THE MEAN VALUE ON VITAL CAPACITY OF SCHOOL LEVEL VOLLEYBALL PLAYERS ON EXPERIMENTAL GROUP AND MECHANISM GROUP

(Scores in liters)

CONVERSATION ON OUTCOMES

The findings of the present investigation demonstrated that the Game-Specific Skill Training integrated with Yogic Practices (GSSTWYP) programme brought about notable improvements in the selected physiological parameters of volleyball players. The participants in the experimental set exhibited a 7.65% enhancement in maximal oxygen uptake (VO_2 max) and a 19.80% improvement in vital capacity after the completion of the training intervention. These developments were found to be statistically significant at the 0.05 level of confidence.

From a biomechanical viewpoint, the observed improvement in VO_2 max may be associated with enhanced efficiency in oxygen delivery and utilization during volleyball-related activities such as jumping, spiking, blocking, and quick directional transitions. The combination of yogic breathing methods with dynamic sport-specific exercises possibly contributed to better cardiorespiratory endurance, improved movement efficiency, and faster recovery capacity, thereby enabling the players to maintain high-intensity performance for extended durations. Similarly, the significant increase in vital capacity may be linked to the regular practice of pranayama and yogic breathing exercises incorporated in the training program. These practices improve lung ventilation, respiratory muscle strength, thoracic

expansion, and breathing control. Improved respiratory efficiency biomechanically supports better postural stability, neuromuscular coordination, and energy regulation during volleyball performance. Pranayama enhances ventilatory efficiency by optimizing lung capacity utilization, reducing oxygen deficiency, improving gaseous exchange, and delaying fatigue onset. Specifically, Bhramari Pranayama activates autonomic nervous system reflexes and influences noradrenaline secretion. Noradrenaline, acting as both a hormone and neurotransmitter, regulates stress responses and reduces anxiety, mental tension, and emotional disturbances through biofeedback mechanisms (Srivastava, 2017).

In conclusion, the study confirms that integrating Game-Specific Skill Training with Yogic Practices effectively improves physiological efficiency and functional performance capacity in volleyball players.

CONCLUSIONS

The incorporation of volleyball-specific drills along with yogic practices enhanced cardiorespiratory efficiency, breathing capacity, movement coordination, and overall functional performance. Therefore, the combined training approach was found to be effective in enlightening the bodily fitness and enactment ability of volleyball performers.

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EFFECT OF COMBINED AUTOGENIC AND YOGIC TRAINING ON BODY COMPOSITION AND MUSCULAR PERFORMANCE IN TEAM SPORTS PLAYERS

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Abstract

Background: Body composition and muscular performance are critical for athletic success in team sports. Autogenic Training (AT) and Yogic Exercises (YE) have individually shown benefits, but limited research exists on their combined effects.

Objective: To compare 12 weeks of AT, YE, and Combined Training (AT+YE) on body composition and muscular performance in team sports players.

Methods: 160 team sports players (22–28 years) were randomly assigned to four groups (n=40): Group A (AT), Group B (YE), Group C (Combined), and Group D (Control). Interventions were 45 min/session, 5-6 days/week for 12 weeks. Body composition (body fat %) was assessed using skinfold calipers; muscular performance via push-up test. Data were analyzed using paired t-test, one-way ANOVA, and Tukey's HSD ($p \leq 0.05$).

Results: All experimental groups showed significant muscular performance improvements ($p < 0.05$). Body composition improved significantly in Groups B and C, but not in Group A. Combined Training produced the highest improvements: body fat reduction (-17.5%, $p < 0.001$) and push-ups (+73.9%, $p < 0.001$). Combined Training was superior to AT for body composition ($p = 0.015$) but equivalent to YE ($p = 0.700$). For muscular strength, Combined Training and YE were superior to AT ($p < 0.001$), with Combined Training showing the highest gains.

Conclusion: Combined Autogenic and Yogic Training is the most effective intervention for improving body composition and muscular performance. Yogic Exercises alone are equally effective as Combined Training, while Autogenic Training alone is insufficient for body composition changes.

Keywords: Autogenic Training; Yogic Exercises; Body Composition; Muscular Performance; Team Sports

INTRODUCTION

1.1.0: Background

Body composition and muscular performance are fundamental components of athletic success in team sports such as cricket, football, hockey, volleyball, and basketball. Optimal body composition—characterized by lower body fat percentage and higher lean muscle mass—

enhances speed, agility, endurance, and overall performance efficiency (Arazi et al., 2016; Malina et al., 2004). Muscular performance, particularly upper body strength and endurance, is essential for tackling, throwing, jumping, and maintaining physical contact during competition (Wisloff et al., 2004).

Traditional training programs focus primarily on resistance and aerobic conditioning to improve these parameters. However, emerging evidence suggests that mind-body interventions such as Autogenic Training (AT) and Yogic Exercises (YE) may offer complementary benefits for body composition and muscular performance (Tran et al., 2001; Vanithamani & Saikumar, 2010).

1.2.0: Autogenic Training and Body Composition

Autogenic Training, developed by Schultz and Luthe (1959), is a relaxation technique involving self-directed mental exercises that induce parasympathetic dominance. While AT is primarily known for its psychological and autonomic benefits (González-García et al., 2019; Kowalski et al., 2018), it may indirectly influence body composition by reducing cortisol levels—a hormone associated with abdominal fat deposition—and improving stress-related eating behaviors (Stein et al., 2020).

1.3.0: Yogic Exercises and Body Composition

Yogic Exercises, integrating physical postures (asanas), breath control (pranayama), and meditation, have demonstrated direct effects on body composition and muscular performance. Asanas such as Bhujangasana, Dhanurasana, and Sarvangasana involve weight-bearing and isometric contractions that build muscular strength and endurance (Tran et al., 2001; Sharma et al., 2014). Pranayama techniques enhance metabolic rate and oxygen utilization, contributing to fat reduction (Chatterjee & Mondal, 2012). Studies have shown that regular yoga practice reduces body fat percentage and improves muscular fitness (Polsgrove et al., 2016; Md Iftekher et al., 2017).

1.4.0: Research Gap

Despite the established benefits of AT and YE individually, few studies have directly compared their effects on body composition and muscular performance. Moreover, the synergistic effect of combining both interventions remains unexplored. This study aimed to fill this gap by comparing the effects of 12 weeks of AT, YE, and Combined Training (AT+YE) on body composition (body fat percentage) and muscular performance (push-up test) in team sports players.

1.5.0: Objectives

1. To assess the impact of AT on body composition and muscular performance.
2. To analyze the impact of YE on body composition and muscular performance.
3. To compare the effects of Combined Training (AT+YE) with isolated interventions.

1.6.0: Hypotheses:

1. H_1: There is significant improvements in body composition and muscular performance

following AT.

2. H1: There is significant improvements in body composition and muscular performance following YE.

3. H1: There is significantly greater improvements in combined training than either intervention alone.

METHODOLOGY

2.1.0: Study Design

A true experimental randomized pre-test – post-test control group design was employed, following CONSORT guidelines.

2.2.0: Participants

A total of 160 team sports players (male and female, age 22–28 years) engaged in Cricket, Football, Hockey, Volleyball, and Basketball were randomly selected from the Department of Physical Education, Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh, India

 Inclusion Criteria: There was age ranged between 22–28 years. There was active participation in organized team sports. They were ability to perform moderate physical exercise. They were willingness to attend all sessions for 12 weeks.

 Exclusion Criteria: There were exclusion criteria known as respiratory, cardiovascular, or musculoskeletal disorders. Prior formal training in yoga or autogenic training. Use of medications influencing metabolism or recovery

2.3.0: Randomization and Group Allocation

Participants were randomly assigned to four groups (n = 40 each):

Table 2.1: Group Allocation

Group	Intervention	Frequency	Duration per Session	Total Weeks
Group A (EG-I)	Autogenic Training only	5 days/week	45 minutes	12
Group B (EG-II)	Yogic Exercises only	5 days/week	45 minutes	12
Group C (EG-III)	Combined (AT + YE) – alternating	6 days/week	45 minutes	12
Group D (CG)	No intervention (Control)	–	–	–

2.4.0: Interventions

2.4.1: Autogenic Training (Group A)

Participants practiced the standard six-stage AT protocol (Schultz & Luthe, 1969): (1) heaviness in limbs, (2) warmth in limbs, (3) cardiac regulation, (4) respiratory regulation, (5) abdominal warmth, (6) forehead cooling. Each session: silent prayer (2 min), warming up (3 min), six autogenic exercises (5 min each = 30 min), passive concentration (5 min), return (5

min). Total: 45 minutes.

2.4.2: Yogic Exercises (Group B)

Participants practiced a structured Hatha Yoga protocol: silent prayer (2 min), warming up (3 min), 13 asanas (25 min), Kapalabhati kriya (3 min), pranayama – Nadishuddhi, Bhastrika, Bhramari (7 min), Om chanting meditation (5 min). Total: 45 minutes.

Asanas included: Shavasana, Sarvangasana, Pawana Muktasana, Matsyasana, Makrasana, Bhujangasana, Dhanurasana, Paschimottanasana, Vakrasana, Ustrasana, Baddha Konasana, Padakonasana, Ardha Chakrasana.

2.4.3: Combined Training (Group C)

Yogic Exercises on Monday, Wednesday, Friday; Autogenic Training on Tuesday, Thursday, and Saturday. Total: 45 minutes per session, 6 days/week.

2.4.4: Control Group (Group D)

Participants maintained normal daily routines and were instructed not to begin any new exercise, yoga, or relaxation program during the 12-week period.

2.5.0: Outcome Measures

All outcomes were assessed at baseline (Week 0) and post-intervention (Week 13).

Table 2.2: Outcome Measures

Variable	**Assessment Tool**	**Unit**	**| Reliability**
Body Composition	Skinfold Calipers (3-site method)	Body Fat %	r = 0.87
Muscular Performance	Push-up Test	Number of push-ups	r = 0.94

2.6.0: Procedure

Pre-test (Week 0): All participants underwent body composition and push-up testing over two days. Intervention (Weeks 1-12): Training sessions were conducted at 6:30 AM daily in a well-ventilated hall. Supervision was provided by the researcher and two trained research assistants.

Post-test (Week 13): The same assessments were re-administered under identical conditions.

2.7.0: Statistical Analysis

Data were analyzed using SPSS version 26.0.

Table 2.3: Statistical Analysis

Analysis	**Statistical Test**	**Significance Level**
Within-group comparison	Paired t-test	$p \leq 0.05$
Between-group comparison	One-way ANOVA	$p \leq 0.05$
Post-hoc pairwise comparisons	Tukey's HSD	$p \leq 0.05$
Descriptive statistics	Mean ± SD	–

RESULTS

3.1.0 Participant Flow and Baseline Characteristics

160 participants completed the study (0% dropout). Groups were comparable at baseline for both variables ($p > 0.05$). Mean age: 24.8 ± 2.1 years.

3.2.0 Within-Group Comparisons (Paired t-test)

Table 3.1: Body Composition (Body Fat %) – Pre-test vs. Post-test

Group	Pre-Test (%)	Post-Test (%)	Mean Diff	t-value	p-value	Remark
Group A (AT)	17.49 ± 2.19	16.73 ± 2.30	-0.76	2.532	0.015	Significant
Group B (YE)	17.36 ± 2.05	15.79 ± 2.02	-1.57	7.391	<0.001	HS
Group C (Combined)	17.83 ± 2.12	15.27 ± 2.13	-2.56	4.471	<0.001	HS
Group D (Control)	17.54 ± 1.99	17.13 ± 2.19	-0.41	0.944	0.351	NS

HS = Highly Significant ($p < 0.01$); NS = Not Significant ($p > 0.05$)

Key Finding: Body fat percentage significantly reduced in Groups B and C ($p < 0.001$), while Group A showed a smaller reduction ($p = 0.015$). Group D showed no significant change.

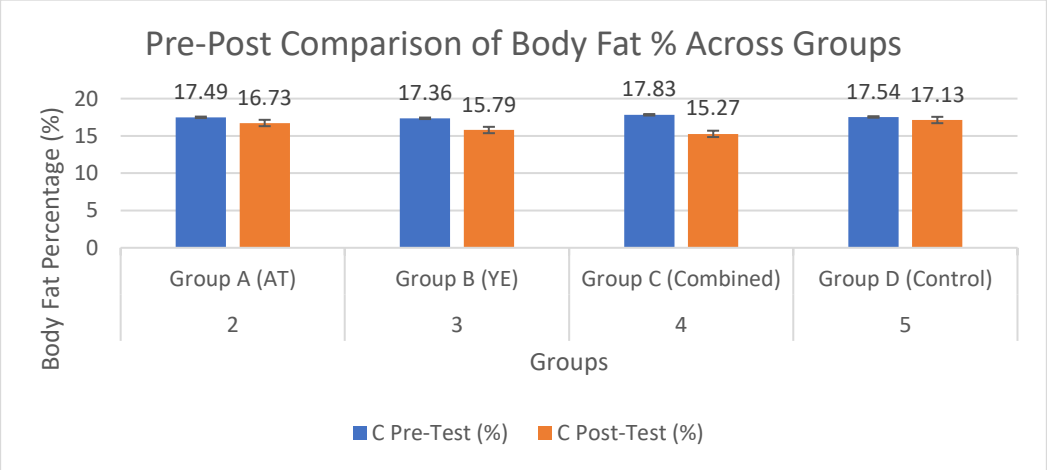


Figure 3.1: ***Mean Difference of Body Composition (Body Fat %) – Pre-test vs. Post-test***

Table 3.2: Muscular Performance (Push-up Test) – Pre-test vs. Post-test

Group	Pre-Test (push-ups)	Post-Test (push-ups)	Mean Diff	t-value	p-value	Remark
Group A (AT)	13.13 ± 3.55	17.93 ± 4.26	+4.80	16.476	<0.001	HS
Group B (YE)	14.48 ± 2.96	22.65 ± 4.23	+8.17	22.844	<0.001	HS

Group C (Combined)	17.38 ± 3.77	29.15 ± 5.20	+11.77	18.117	<0.001	HS
Group D (Control)	| 14.20 ± 2.47	16.88 ± 2.40	+2.68	8.231	<0.001	HS

Key Finding: All three experimental groups showed highly significant improvements in push-up performance ($p < 0.001$), with Combined Training showing the largest gain (+11.77 push-ups, +73.9%).

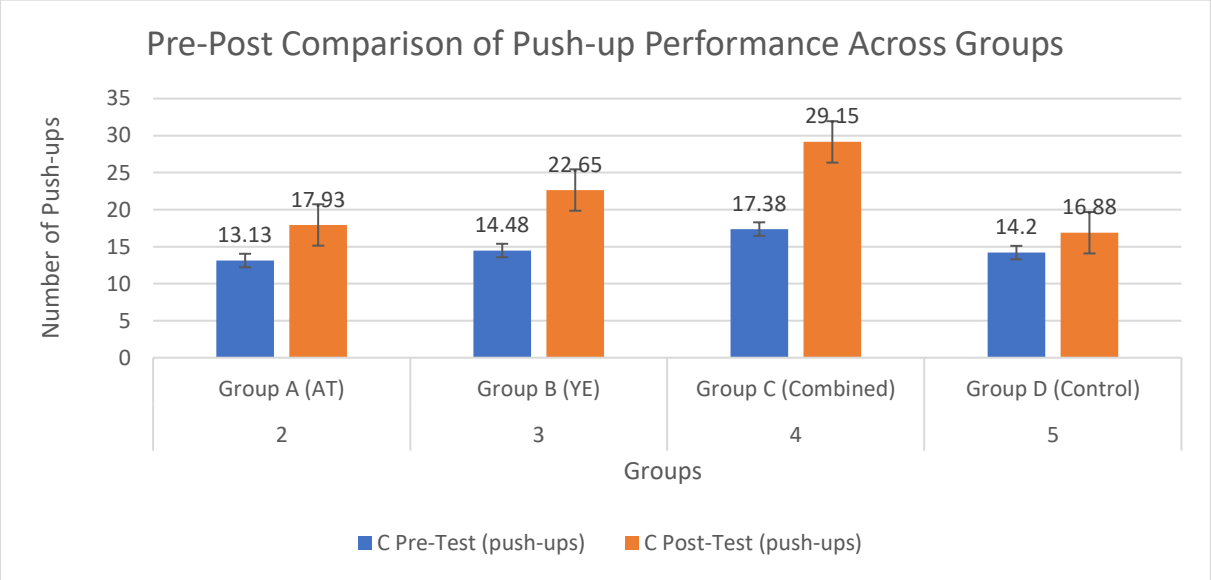


Figure 3.2: ***Percentage Improvements in Body Composition and Muscular Performance***

3.4.0: Between-Group Comparisons (One-way ANOVA)

Table 3.4: ***One-way ANOVA for Post-Test Scores***

Variable	**Source**	**Sum of Squares**	***df***	**Mean Square**	***F*-value**	**p-value**
Body Composition	Between Groups	87.366	3	29.122	6.232	0.001
	Within Groups	728.953	156	4.673		
Muscular Performance	Between Groups	3757.050	3	1252.350	72.645	<0.001
	Within Groups	2689.350	156	17.239		

3.5.0: Post-hoc Analysis (Tukey's HSD)

Table 3.5: ***Tukey's HSD Post-hoc Comparisons – Body Composition***

Comparison	Mean Difference	Std. Error	p-value	Significance
C vs D	-1.863	0.483	0.001	**HS**
C vs A	-1.468	0.483	0.015	**Sig**
C vs B	-0.524	0.483	0.700	NS
B vs D	-1.339	0.483	0.032	**Sig**
B vs A	-0.944	0.483	0.211	NS
A vs D	-0.395	0.483	0.846	NS

Hierarchy for Body Composition:Combined = Yogic > (Autogenic = Control)

Table 3.6: ***Tukey's HSD Post-hoc Comparisons – Muscular Performance***

Comparison	Mean Difference	Std. Error	p-value	Significance
C vs D	+12.27	0.928	<0.001	HS
C vs A	+11.22	0.928	<0.001	HS
C vs B	+6.50	0.928	<0.001	HS
B vs D	+5.77	0.928	<0.001	HS
B vs A	+4.72	0.928	<0.001	HS
A vs D	+1.05	0.928	0.158	NS

Hierarchy for Muscular Performance: Combined > Yogic > (Autogenic = Control)

1.6 .0: Summary of Findings

Table 3.7: Summary of Findings

Finding	Result
Combined Training improved body fat % by 14.4%	✓ Highly Significant
Combined Training improved push-ups by 73.9%	✓ Highly Significant
Yogic Exercises alone = Combined Training for body fat %	✓ Equivalent (p = 0.700)
Yogic Exercises alone > Autogenic Training for muscular strength	✓ Significant (p < 0.001)
Autogenic Training alone improved body fat % modestly	✓ Significant (p = 0.015)
Control Group showed no significant improvements	✓ Expected

DISCUSSION

4.1.0: Summary of Key Findings

This randomized controlled trial compared the effects of 12 weeks of Autogenic Training, Yogic Exercises, and Combined Training on body composition and muscular performance in 160 team sports players. The key findings are:

1. Combined Training produced the highest improvements in both body composition (-14.4% body fat) and muscular performance (+73.9% push-ups).

2. Yogic Exercises alone were statistically equivalent to Combined Training for body

composition ($p = 0.700$), indicating that the yogic component is the primary driver for fat reduction.

3. Yogic Exercises alone were significantly superior to Autogenic Training for muscular performance ($p < 0.001$), confirming that active somatic engagement is essential for strength development.

4. Autogenic Training alone produced modest but significant improvements in body composition ($p = 0.015$), likely due to cortisol reduction and stress management.

5. The Control Group showed no significant improvements, confirming that the changes observed were due to the interventions.

4.2 Body Composition (Body Fat Percentage)

The finding that Yogic Exercises alone was as effective as Combined Training for body fat reduction ($p = 0.700$) is clinically significant. This suggests that the mechanical and metabolic demands of asanas and pranayama are the primary drivers for fat loss, rather than the cognitive relaxation component of AT.

The modest but significant improvement in body composition following AT alone (-4.3%, $p = 0.015$) may be attributed to stress reduction and cortisol regulation. Chronic stress elevates cortisol, which promotes fat storage, particularly in the abdominal region. AT-induced parasympathetic dominance may counteract this effect (Kowalski et al., 2018; Stein et al., 2020).

4.3.0: Muscular Performance (Push-up Test)

The superiority of Combined Training for muscular performance (+73.9%) is noteworthy. The hierarchy (Combined > Yogic > Autogenic = Control) clearly demonstrates that interventions involving physical movement are essential for strength development.

The finding that Yogic Exercises alone were significantly superior to Autogenic Training ($p < 0.001$) confirms that passive cognitive relaxation cannot replace active mechanical loading for strength development. However, the fact that Combined Training outperformed Yoga alone suggests that AT provides complementary benefits—possibly through reduced muscle tension, improved recovery, or enhanced motor imagery.

4.4.0: Practical Implications for Coaches and Athletes

Table 4.1: Practical Implications for Coaches and Athletes

Recommendation	**Rationale**
For body fat reduction, use Yogic Exercises alone or Combined Training	Both are equally effective
For muscular strength development, use Combined Training for best results	Superior to either intervention alone
For athletes with time constraints, Yogic Exercises alone are sufficient for body	Equivalent to Combined Training

composition goals	
Autogenic Training alone is NOT recommended for strength development	Insufficient compared to yoga
Combine both interventions for holistic body composition and strength gains	Synergistic effect

CONCLUSION

This randomized controlled trial provides robust evidence that:

1. Combined Autogenic and Yogic Training is the most effective intervention for improving body composition and muscular performance in team sports players, producing a 14.4% reduction in body fat and 73.9% improvement in push-up performance.
2. Yogic Exercises alone are equally effective as Combined Training for body fat reduction ($p = 0.700$), indicating that the yogic component is the primary driver for metabolic improvements.
3. Yogic Exercises alone are significantly superior to Autogenic Training for muscular strength development ($p < 0.001$), confirming that active somatic engagement is essential.
4. Autogenic Training alone produces modest but significant improvements in body composition ($p = 0.015$), likely through stress reduction and cortisol regulation, but is insufficient for strength development.
5. The Control Group showed no significant improvements, confirming that the changes observed were due to the interventions.

These findings support the integration of yoga and combined mind-body training into physical conditioning programs for team sports athletes. Coaches and trainers should recommend Yogic Exercises alone for body composition goals and Combined Training for comprehensive strength and body composition benefits.

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NATURAL HEALING AND SUSTAINABLE WELL-BEING THROUGH YOGA AND LMNT NEUROTHERAPY

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Abstract

The accelerating burden of lifestyle disorders, stress-related illnesses, and chronic non-communicable diseases has intensified the global search for natural, preventive, and sustainable approaches to health and well-being. Rooted in Indian Knowledge Systems (IKS), Yoga and LMNT Neurotherapy offer holistic, non-invasive, and cost-effective therapeutic pathways that address the root causes of disease rather than merely managing its symptoms. This paper presents an analytical review of the theoretical foundations, published clinical evidence, and synergistic potential of these two IKS-based systems. Drawing on verified peer-reviewed literature, the study demonstrates the combined capacity of Yoga and LMNT Neurotherapy to regulate the autonomic nervous system, modulate hormonal function, reduce chronic inflammation, improve musculoskeletal health, and promote sustained psychological well-being. The findings affirm that the complementary application of these traditions constitutes a valuable, culturally resonant, and underutilised pathway toward holistic healing in contemporary society.

KEYWORDS: Yoga; LMNT Neurotherapy; Natural Healing; Sustainable Well-being;

INTRODUCTION

Indian Knowledge Systems (IKS); Holistic Health; Preventive Healthcare; Complementary Therapies; Autonomic Nervous System; Lifestyle Disorders.

The twenty-first century has witnessed an unprecedented escalation in the burden of non-communicable diseases (NCDs). Cardiovascular disease, type 2 diabetes, musculoskeletal disorders, and mental health conditions now collectively account for the majority of global morbidity and premature mortality. The World Health Organization (2022) estimates that depression alone affects more than 280 million people worldwide, while India's National Mental Health Survey (Murthy, 2017) identified that approximately 150 million Indians require active mental health intervention. The economic and social costs of this chronic disease burden are enormous, yet the dominant biomedical paradigm — centred on pharmaceutical management of symptoms — continues to demonstrate limited efficacy in addressing the underlying determinants of lifestyle-related illness.

Against this backdrop, Indian Knowledge Systems (IKS) offer a philosophically grounded and empirically supported alternative. Yoga, one of the classical systems of Indian philosophy, and LMNT Neurotherapy — a non-invasive, drugless reflex-based healing

system developed by Dr. Lajpat Rai Mehra and institutionalised through the Lajpat Rai Mehra Neurotherapy Research Training Institute (LMNTRTI) under the foundership of Dr. Ram Gopal Parihar — represent two of the most clinically developed expressions of this tradition. This paper examines their respective therapeutic frameworks, their convergence within the IKS paradigm, and the evidence for their synergistic application in promoting natural healing and sustainable well-being.

YOGA A SYSTEM OF HOLISTIC HEALING

Yoga is one of the six classical schools (Shaddarshanas) of Indian philosophy and constitutes a comprehensive science of human development. The Yoga Sutras of Patanjali codify the eight-limbed path (Ashtanga Yoga) encompassing ethical conduct (yama and niyama), physical postures (asanas), breath regulation (pranayama), sensory withdrawal (pratyahara), concentration (dharana), meditation (dhyana), and transcendence (samadhi). In its totality, yoga represents a systematic technology for integrating body, mind, and consciousness.

From a biomedical perspective, yoga exerts measurable effects across multiple physiological systems. Wang et al. (2025), in a landmark umbrella review synthesising 51 systematic reviews and meta-analyses drawn from 579 individual studies with 28,403 participants, demonstrated strong effects of yoga on depression, blood pressure, blood glucose, and fatigue management across adult populations. Streeter et al. (2012) proposed a unifying neurophysiological model wherein yoga corrects autonomic imbalance by increasing parasympathetic nervous system activity through vagal stimulation, simultaneously upregulating gamma-aminobutyric acid (GABA) — the primary inhibitory neurotransmitter — with direct implications for anxiety, depression, and stress regulation. Mishra et al. (2024), in a systematic review and meta-analysis, confirmed that yoga significantly reduces pro-inflammatory markers including IL-6 and TNF-alpha, providing a mechanistic basis for its benefits in chronic inflammatory conditions.

Yoga is further aligned with Ayurvedic principles of tridosha balance and prana regulation, which conceptualise health as the dynamic equilibrium of three fundamental bio-energetic forces (vata, pitta, kapha) and their interaction with the vital life force (prana). Mishra, Singh, and Dagenais (2001) situate this Ayurvedic framework within the broader IKS paradigm, noting its continuity with contemporary integrative medicine models that emphasise lifestyle, diet, and psycho-spiritual well-being as determinants of health. Pilkington et al. (2005) specifically documented yoga's therapeutic potential for depression, noting its capacity to act on neuroendocrine pathways in a manner complementary to conventional pharmacotherapy.

Beyond its therapeutic dimensions, yoga occupies a pivotal role in India's cultural and wellness tourism landscape. Manju Bala (2025), in a systematic review examining the transformation of India's spiritual heritage into a modern tourism phenomenon, documents that India attracts approximately two million international tourists annually for yoga-related purposes, reinforcing its identity as the "yoga bhumi" — the spiritual homeland of yogic

practice. The study highlights the dynamic interplay between ancient yogic traditions and contemporary adaptations across major spiritual centres including Rishikesh and Varanasi, underscoring that yoga's global resonance derives not merely from its physical efficacy but from its rootedness in a comprehensive IKS-based philosophy of integrative well-being.

LMNT NEUROTHERAPY: PRINCIPLES, MECHANISMS, AND CLINICAL EVIDENCE

LMNT Neurotherapy is a non-invasive, drug-free therapeutic system developed over more than seven decades by Dr. Lajpat Rai Mehra, drawing upon traditional Indian knowledge of Nadi Vigyan (the science of the nervous system and vital channels), classical Ayurveda, and principles of modern anatomy and physiology. Mehra formally named his system Neurotherapy in 1976, later redesignated LMNT in 2003. The therapy was subsequently institutionalised as a structured academic and clinical discipline through LMNTRTI, founded by Dr. Ram Gopal Parihar, and is now offered within the higher education system through degree programmes at Om Sterling Global University, Hisar.

LMNT Neurotherapy operates through the manual application of sequential pressure to specific reflex zones distributed across the limbs, abdomen, and spine. These stimulations aim to modulate autonomic nervous system activity, restore unobstructed blood and lymphatic circulation to target organs, and facilitate the endogenous release of neurochemicals — including serotonin, dopamine, endorphins, and other neuroregulatory substances — that are central to homeostatic functioning. The system classifies physiological dysfunction through the lens of acidosis and alkalosis, applying targeted therapeutic formulas to address root-cause imbalances rather than symptomatic presentation (Jyoti, Parihar, & Gandhi, 2021).

The clinical evidence base for LMNT Neurotherapy is expanding. Parihar and Gandhi (2023) documented statistically significant pain relief in 92 patients with chronic low back pain following structured LMNT intervention. Parihar and Kashyap (2024) further investigated the integration of yoga and neurotherapy in low back pain management, reporting synergistic clinical outcomes superior to either modality alone — directly demonstrating the value of combined application (Research Review International Journal of Multidisciplinary, 9(6), 87–100). Dev and Dutta (2022) reported successful neurotherapy-based management of polycystic ovarian syndrome (PCOS), a condition with major hormonal and metabolic dimensions, while Dutta and Dev (2024) documented normalisation of thyroid function in subclinical hypothyroidism through neurotherapy intervention. Most recently, Dutta and Dev (2025) reported the application of neurotherapy as a complementary modality for beta-thalassemia intermedia, demonstrating the system's expanding clinical scope.

TABLE 1 : COMAPARATIVE OVERVIEW OF YOGA AND LMNT NEUROTHERAPY WITHIN THE IKS FRAMEWORK

DIMENSION	YOGA	LMNT NEUROTHERAPY
Origin	Ancient Indian philosophical tradition (Vedic/Patanjalian)	Developed by Dr. Lajpat Rai Mehra; institutionalised through LMNTRTI by Dr. Ram Gopal Parihar
Core Mechanism	Asanas, pranayama, meditation; HPA axis and ANS regulation	Manual stimulation of reflex zones; autonomic and endocrine modulation
Philosophical Basis	Yoga Sutras; Samkhya; Ayurvedic tridosha theory	Nadi Vigyan; Ayurvedic physiology; endogenous healing principles
Mode	Active; requires practitioner's own disciplined participation	Applied by trained LMNT therapist; semi-passive for recipient
Policy Alignment	AYUSH framework; International Day of Yoga (UN)	AYUSH framework; National Policy on AYUSH (MoAYUSH, 2017)
Evidence Base	Extensive RCTs, meta-analyses across multiple conditions	Growing clinical evidence; case studies and observational studies
Accessibility	Widely accessible; minimal infrastructure	Requires trained LMNT-certified practitioner

Source: Compiled by author from reviewed literature.

CONVERGENCE WITHIN INDIAN KNOWLEDGE

Despite their distinct operational mechanisms, Yoga and LMNT Neurotherapy share foundational principles that position them as philosophically and clinically convergent within the IKS paradigm. Both systems conceptualise health as a state of dynamic systemic balance rather than the mere absence of disease. Yoga's concept of prana regulation through the nadis (subtle energy channels) finds a functional parallel in LMNT's emphasis on unobstructed blood, lymphatic, and neural circulation as prerequisites for physiological homeostasis. Both traditions operate through the principle of activating the body's inherent self-healing intelligence: yoga through disciplined practice that restructures baseline autonomic and neuroendocrine functioning; LMNT through targeted reflex stimulation that reinstates disrupted physiological pathways.

Both systems are grounded in Ayurvedic principles of tridosha theory and the concept of prana as a vital regulatory force. Mishra, Singh, and Dagenais (2001) document the Ayurvedic healthcare tradition's foundational emphasis on preventive lifestyle, diet, and psycho-spiritual balance — principles that both Yoga and LMNT Neurotherapy operationalise through their respective therapeutic frameworks.

Chrousos (2009) provides a complementary biomedical lens, describing how chronic stress disrupts the stress-response system at the level of the hypothalamic-pituitary-adrenal axis — a dysfunction both yoga and LMNT Neurotherapy are positioned to address through their regulatory mechanisms. Porges' Polyvagal Theory (2011) further illuminates the neurophysiological pathway through which both systems operate: by stimulating vagal tone and restoring autonomic hierarchy, they promote the physiological safety states associated with health, healing, and social engagement.

Both systems are also aligned with the Government of India's National AYUSH Policy (Ministry of AYUSH, 2017), which recognises traditional Indian health systems as essential components of a pluralistic national healthcare architecture. The policy's emphasis on preventive healthcare, cost-effectiveness, and community-level delivery creates structural pathways for embedding Yoga and LMNT Neurotherapy within primary care settings.

SYNERGISTIC APPLICATIONS : CLINICAL EVIDENCE AND COMBINED POTENTIAL

The complementarity of Yoga and LMNT Neurotherapy becomes most evident when examined across specific disease domains. Figure 1 presents an integrated overview of the combined therapeutic potential of these two systems across key health domains.

HEALTH DOMAIN	YOGA MECHANISMS	LMNT NEUROTHERAPY MECHANISMS	SYNERGISTIC BENEFITS	KEY OUTCOMES
1 STRESS & MENTAL HEALTH	• Activates parasympathetic system • ↓ Cortisol, anxiety, and depression • Enhances GABA & serotonin	• Stimulates ANS balance points • Enhances endorphin & serotonin release • Regulates HPA axis	Deep stress relief, emotional stability, improved mood, resilience to daily stressors	✓ Reduced stress & anxiety ✓ Improved mental well-being ✓ Better emotional balance
2 MUSCULOSKELETAL HEALTH	• Improves flexibility & posture • Strengthens muscles & joints • ↓ Pain perception	• Relieves nerve compression • Improves microcirculation • Restores nerve function	Pain reduction, improved mobility, faster recovery from musculoskeletal disorders	✓ Reduced pain ✓ Better posture & mobility ✓ Enhanced physical function
3 METABOLIC HEALTH	• Regulates metabolism • Improves insulin sensitivity • Supports healthy weight	• Stimulates pancreatic & adrenal zones • Balances endocrine gland activity • Improves metabolic efficiency	Better glycaemic control, healthy metabolism, weight management	✓ Balanced blood sugar ✓ Healthy lipid profile ✓ Improved body composition
4 HORMONAL BALANCE	• Regulates endocrine function • Reduces hormonal stress load • Supports reproductive health	• Stimulates thyroid, ovarian & reproductive zones • Supports hormonal reset • Improves glandular balance	Hormonal harmony, improved reproductive health, relief in PCOS & thyroid imbalance	✓ Regular hormonal cycles ✓ Improved fertility markers ✓ Balanced thyroid function
5 SLEEP & RECOVERY	• Induces relaxation response • Improves sleep architecture • Enhances melatonin secretion	• Regulates circadian rhythm points • Balances neuroendocrine rhythm • Calms hyperarousal	Deeper, restorative sleep, better recovery and daytime energy	✓ Improved sleep quality ✓ Deeper sleep stages ✓ Reduced fatigue
6 IMMUNITY & INFLAMMATION	• ↓ IL-6, TNF-alpha & CRP • Enhances antioxidant defense • Supports immune balance	• Stimulates lymphatic points • Improves organ function via ANS balance • Enhances detoxification	Reduced inflammation, stronger immunity, improved organ function	✓ Lower inflammatory markers ✓ Better immune response ✓ Disease resistance
7 OVERALL WELL-BEING	• Integrates body, mind & breath • Enhances self-awareness • Promotes mindful living	• Restores body's self-healing capacity • Balances energy flow • Promotes holistic regulation	Holistic healing, vitality, emotional stability & sustainable well-being	✓ Improved quality of life ✓ Greater vitality & energy ✓ Sustainable health

SYNERGISTIC INTEGRATION
Yoga prepares the body–mind system through regulation and strengthening;
LMNT Neurotherapy refines the neurological and endocrine balance.
Together, they create a comprehensive, natural and sustainable path to holistic health.

INTEGRATED OUTCOME: Holistic natural healing • Prevention of lifestyle diseases • Sustainable well-being

Figure 1: Synergistic Health Outcomes of Combined Yoga and LMNT Neurotherapy, Source: Compiled by author from reviewed literature.

In musculoskeletal and pain management, Parihar and Kashyap (2024) directly demonstrated that the combined application of yoga and neurotherapy produces superior outcomes in low back pain compared to either modality alone — yoga improving postural alignment and psychosocial dimensions, while LMNT addresses the neurophysiological root cause through targeted reflex stimulation. This finding exemplifies the integrated model proposed in the present paper.

In hormonal and metabolic health, LMNT's clinical evidence across PCOS (Dev & Dutta, 2022) and subclinical hypothyroidism (Dutta & Dev, 2024) complements yoga's well-documented effects on HPA axis regulation and metabolic markers. The Ayurvedic framework underpinning both systems provides a unifying rationale for addressing endocrine dysfunction through lifestyle and reflex-based interventions rather than isolated pharmacological management.

In the domain of mental health and stress, yoga's parasympathetic activation and GABA enhancement (Streeter et al., 2012), combined with LMNT's endogenous neurochemical stimulation, offer a multilevel intervention for stress, anxiety, and depression that targets both psychological experience and physiological substrate — consistent with Porges' (2011) polyvagal framework for autonomic restoration.

Pilkington et al.'s (2005) documented evidence for yoga's antidepressant effects further supports the combined model's potential for mental health promotion.

IMPLICATION FOR HEALTHCARE INTEGRATION

The integration of Yoga and LMNT Neurotherapy into mainstream healthcare systems presents significant opportunities for sustainable, preventive health promotion. Both systems are characterised by minimal infrastructure requirements, absence of pharmacological adverse effects, and broad applicability across age groups and socioeconomic strata — attributes of particular relevance to India's primary care context and the global ambition of universal health coverage.

The growing institutionalisation of LMNT Neurotherapy through university-based academic programmes — including the B.Voc. in Neurotherapy and Yogic Sciences at Om Sterling Global University — alongside the national AYUSH framework's recognition of Yoga, creates structural pathways for embedding these modalities within community wellness programmes, primary care clinics, and workplace health initiatives. Parihar and Bhanushali (2022), in Sick to Fit by Neurotherapy, document the practical clinical application of LMNT as a population-level wellness tool, extending its reach beyond clinical case management to preventive self-care literacy.

Nevertheless, significant research gaps remain. The evidence base for LMNT Neurotherapy, while growing across conditions including pain, PCOS, hypothyroidism, and haematological

disorders, continues to rely primarily on case studies and small-scale observational research. Rigorous randomised controlled trials with standardised protocols, validated outcome measures, adequate sample sizes, and long-term follow-up are required to elevate LMNT's evidence profile to the level achieved by yoga in mainstream integrative medicine.

CONCLUSION

This paper has demonstrated that Yoga and LMNT Neurotherapy represent two IKS-rooted therapeutic traditions whose combined application constitutes a holistic, non-invasive, and sustainable approach to natural healing and well-being. Both systems share philosophical roots in Indian healing wisdom, operate through complementary physiological mechanisms — autonomic regulation, neuroendocrine modulation, and endogenous healing activation — and demonstrate clinically significant outcomes across a range of conditions central to the contemporary burden of chronic disease.

The convergence of these systems within the Ayurvedic and broader IKS framework, their alignment with national AYUSH policy, and the growing body of clinical evidence for each and for their combined application together make a compelling case for their integration into preventive and holistic healthcare programmes. Continued interdisciplinary research, professional standardisation, and policy investment are essential to fully realise their transformative potential for individual and public health.

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BIO-NOTE

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THE ROLE OF LMNT NEUROTHERAPY IN MENTAL HEALTH AND EMOTIONAL WELL-BEING

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Abstract

Mental health disorders, including stress, anxiety, depression, and emotional instability, have emerged as critical public health concerns in contemporary society. While conventional treatments primarily rely on pharmacological and psychological interventions, there is growing recognition of the value of holistic and indigenous approaches that address the interconnected dimensions of physical, mental, and emotional well-being. LMNT Neurotherapy, developed by Dr. Lajpat Rai Mehra, is a non-invasive, drug-free therapeutic system rooted in traditional Indian healing principles. It emphasises the stimulation of specific reflex points and natural physiological processes to restore homeostatic balance within the body and mind. [3] This paper explores the role of LMNT Neurotherapy in promoting mental health and emotional well-being within the broader framework of Indian Knowledge Systems (IKS). It examines the theoretical foundations of the therapy and its potential contributions to stress management, emotional regulation, deep relaxation, and overall psychological wellness. Drawing upon clinical observations and documented case experiences, [10,11,12,13] the study highlights the capacity of LMNT Neurotherapy to support individuals experiencing mental and emotional distress by enhancing self-regulation, attenuating stress-related physiological symptoms, and improving overall quality of life. The findings suggest that LMNT Neurotherapy may serve as a valuable complementary modality in holistic mental healthcare and contribute meaningfully to the promotion of sustainable well-being in modern society. [14,15,16]

Keywords: LMNT Neurotherapy; Mental Health; Emotional Well-being; Indian Knowledge Systems (IKS); Holistic Healing; Stress Management; Indigenous Healing Practices; Psychological Wellness; Complementary Therapies; Quality of Life.

1. Introduction

The global burden of mental health disorders has reached unprecedented levels in the twenty-first century. According to the World Health Organization (WHO), depression is a leading cause of disability worldwide, while anxiety disorders affect hundreds of millions of people across all demographics and geographies.[1] In India, the situation is particularly significant, with the National Mental Health Survey (2015-16) estimating that nearly 150 million individuals require active mental health intervention.[2] Despite this staggering need, the treatment gap remains vast, largely owing to inadequate infrastructure, cultural stigma, and an over-reliance on pharmaceutical models of care.

In this context, there is a compelling case for exploring indigenous and holistic therapeutic systems that can complement, augment, or in some cases offer accessible alternatives to conventional mental health treatment. India's rich heritage of knowledge systems — encompassing Ayurveda, Yoga, Naturopathy, and various traditional healing practices — provides a profound reservoir of therapeutic wisdom that is increasingly being validated by modern biomedical research. [4,8,9]

LMNT Neurotherapy, developed by Dr. Lajpat Rai Mehra and institutionalised through the Lajpat Rai Mehra Research Training Institute (LMNTRTI) under the founder ship of Ram Gopal Parihar, represents one such indigenous system.[3] Rooted in the principles of reflex therapy and natural physiological stimulation, LMNT Neurotherapy operates on the understanding that the human body possesses inherent self-healing capacities that can be activated through targeted, non-invasive interventions.[10] This paper examines the potential of LMNT Neurotherapy as a therapeutic resource for mental health and emotional well-being, situating it within the framework of Indian Knowledge Systems.

2. Theoretical Foundations of LMNT Neurotherapy

LMNT Neurotherapy is grounded in a synthesis of traditional Indian healing philosophy and applied neurophysiological principles. The system posits that the human nervous system is the primary regulator of all physiological and psychological functions, and that disruptions in neural homeostasis — arising from stress, nutritional deficiencies, environmental toxins, or emotional trauma — underlie the majority of chronic health conditions, including mental health disorders. [3,10]

The therapeutic approach involves the manual stimulation of specific reflex zones and pressure points distributed across the body, with the objective of enhancing blood supply to targeted organs, modulating autonomic nervous system activity, and facilitating the natural release of endogenous neurochemicals including serotonin, dopamine, and endorphins.[6,10] These neurochemicals are central to the regulation of mood, affect, and emotional resilience, and their deficiency or dysregulation is well established in the pathophysiology of depression, anxiety, and related disorders. Neurotherapy's effectiveness in conditions such as PCOS, hypothyroidism, and haematological disorders further validates its broad physiological reach. [14,15,16]

From the perspective of Indian Knowledge Systems, LMNT Neurotherapy resonates with Ayurvedic concepts of tridosha (Vata, Pitta, Kapha) and the principle of prana (life force), which emphasise the restoration of energetic and constitutional balance as the foundation of health. [8,9] The therapy's non-invasive, drug-free nature aligns with the Ayurvedic commitment to natural healing and minimal iatrogenic risk.

3. LMNT Neurotherapy and Mental Health: Mechanisms and Applications

3.1 Stress Management

Chronic stress activates the hypothalamic-pituitary-adrenal (HPA) axis, resulting in sustained

elevation of cortisol and other stress hormones that impair cognitive function, emotional regulation, and immune competence.[5] LMNT Neurotherapy, through its targeted stimulation of reflex points associated with the adrenal glands and the autonomic nervous system, is believed to modulate HPA axis hyperactivity, thereby reducing the physiological substrate of stress.[3,10] Clinical observations in LMNT practice report significant reductions in self-reported stress levels, improvements in sleep quality, and normalisation of blood pressure among individuals undergoing regular neurotherapy sessions.[11,13]

3.2 Anxiety and Emotional Regulation

Anxiety disorders are characterised by dysregulation of the amygdala and prefrontal cortex, resulting in hyperactivation of threat-detection circuits and impairment of executive emotional regulation.[6] LMNT Neurotherapy interventions targeting the cranial and cervical reflex zones are reported to promote parasympathetic nervous system dominance, inducing a state of deep relaxation that counteracts the physiological arousal associated with anxiety.[3,10] Practitioners document that consistent engagement with LMNT Neurotherapy supports the progressive recalibration of emotional reactivity, enabling individuals to respond to stressors with greater equanimity.[10,11]

3.3 Depression and Mood Regulation

Depression is fundamentally associated with disrupted monoaminergic neurotransmission, particularly involving serotonin, norepinephrine, and dopamine.[6,7] LMNT Neurotherapy's proposed mechanism — enhancement of cerebral and peripheral blood circulation, stimulation of endocrine glands involved in mood regulation, and facilitation of endogenous neurochemical synthesis — offers a plausible physiological rationale for its reported antidepressant effects.[3,13] Case observations from LMNT practice suggest improvements in mood, motivation, and subjective well-being among individuals presenting with depressive symptoms following a sustained course of neurotherapy.[10,15]

3.4 Sleep and Psychosomatic Wellness

Sleep disturbance is both a symptom and a perpetuating factor in the majority of mental health disorders. LMNT Neurotherapy's promotion of parasympathetic activation and its reported effects on the regulation of melatonin and other circadian neurochemicals offer a potentially effective intervention for sleep-related complaints.[6,10] Practitioners consistently report improvements in sleep onset, sleep continuity, and subjective sleep quality among clients receiving neurotherapy, with concomitant improvements in daytime mood, energy, and cognitive performance.[11,12]

4. LMNT Neurotherapy within Indian Knowledge Systems (IKS)

India's Knowledge Systems encompass a rich and multidimensional tradition of understanding health as a state of dynamic equilibrium between the individual and their physical, social, and spiritual environment. [8,9] LMNT Neurotherapy, while grounded in modern neurophysiological understanding, shares important philosophical continuities with this

tradition. Its emphasis on restoring the body's natural regulatory capacities, rather than suppressing symptoms through external chemical agents, resonates deeply with Ayurvedic and Yogic principles of health promotion. [3,4]

Furthermore, LMNT Neurotherapy's accessibility — requiring no expensive equipment, no pharmaceutical products, and no invasive procedures — makes it particularly well-suited for integration into community-based and primary healthcare settings in India.[10,11] The Government of India's National Policy on AYUSH provides a supportive policy framework for the recognition and integration of such systems within the national health architecture.[4] Research integrating Yoga with Neurotherapy has demonstrated particularly promising outcomes, suggesting that combining these IKS-rooted approaches may yield synergistic benefits for both physical and mental health.[12,13]

The global resonance of India's yogic and spiritual heritage further underscores the broader cultural relevance of IKS-based healing systems. Manju Bala (2025), in a systematic review of spiritual tourism and yoga in India, documents that India attracts approximately two million international tourists annually for yoga-related purposes, affirming its recognition as the "yoga bhumi" and a global centre for spiritual and holistic wellness. This international engagement with India's living wellness traditions reflects the deepening global awareness of IKS-rooted systems — including yoga and, by extension, allied practices such as LMNT Neurotherapy — as credible and culturally resonant pathways toward mental, emotional, and holistic well-being. [18]

The clinical evidence base for Neurotherapy, though still emerging, spans a growing range of conditions — from musculoskeletal pain [11,13] to endocrine disorders [14,15] to haematological conditions [16] — supporting the plausibility of its application to mental and emotional health. The integration of LMNT Neurotherapy within IKS-informed healthcare affirms the validity of culturally rooted approaches to psychological well-being and challenges the hegemony of purely pharmaceutical mental health models.

5. Discussion

The foregoing analysis suggests that LMNT Neurotherapy holds significant promise as a complementary approach in the prevention and management of mental health disorders. Its theoretical foundations in neurophysiology [5,6] and Indian healing traditions, [3,8,9] combined with its non-invasive, low-cost, and culturally resonant character, position it as a potentially transformative resource in addressing India's mental health burden. [1,2]

It is important, however, to acknowledge the limitations of the current evidence base. The majority of available evidence for LMNT Neurotherapy's mental health benefits derives from clinical observations and practitioner case reports [10,11,14,15,16] rather than rigorously controlled clinical trials. The establishment of LMNT Neurotherapy as an evidence-based intervention within the mental health landscape will require systematic research, including randomised controlled trials, validated psychometric outcome measures, and mechanistic

studies elucidating the neurobiological pathways underlying its observed effects.

Notwithstanding these limitations, the convergence of theoretical plausibility, published clinical evidence, [10,11,12,13,14,15,16] and IKS alignment [4,7,8,9] provides a compelling rationale for treating LMNT Neurotherapy as a legitimate and promising area of complementary mental healthcare worthy of sustained scholarly and clinical attention.

6. Conclusion

Mental health and emotional well-being represent among the most pressing challenges of the contemporary era, demanding innovative, culturally sensitive, and accessible therapeutic responses. [1,2] LMNT Neurotherapy, as a drug-free, non-invasive system rooted in Indian healing traditions, [3,10] offers a compelling model for holistic mental healthcare that addresses the interconnected physical, neurological, and psychological dimensions of well-being.

This paper has explored the theoretical foundations of LMNT Neurotherapy, its proposed mechanisms of action in relation to stress, anxiety, depression, and sleep, and its natural alignment with Indian Knowledge Systems.[3,4,6,8] The growing body of published clinical evidence — spanning pain management,[11,13] endocrine regulation,[14,15] and systemic conditions[16] — strongly supports the plausibility of its mental health applications and its integration into holistic and community-based healthcare services.

As the global mental health community increasingly recognises the limitations of purely biomedical approaches, [1,7] the wisdom embedded in indigenous systems such as LMNT Neurotherapy offers a vital complementary resource in the pursuit of sustainable, equitable, and humanistic mental healthcare for all.

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BEYOND THE FIRST PHASE: A CORRELATIONAL ANALYSIS OF HOP DISTANCE AND TRIPLE JUMP PERFORMANCE

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Abstract

The present study investigated the relationship between Hop Distance and Triple Jump Performance among national-level triple jumpers of India . A correlational research design was adopted. Thirty-one national triple jumpers were selected as subjects. Hop Distance and overall Triple Jump Performance (in metres) were recorded as the primary variables. Descriptive statistics including mean, standard deviation, standard error, and range were computed. Pearson's product-moment correlation coefficient was employed to determine the relationship between Hop Distance and Triple Jump Performance. The mean Triple Jump Performance was recorded at 16.250 m (SD = 0.397). Hop Distance recorded the highest mean (6.112 m) among the three phases, followed by Jump Distance (5.215 m) and Step Distance (5.065 m). The calculated correlation coefficient (r = 0.06) was found to be statistically not significant (p > 0.05), with a shared variance of only 0.38%. The findings suggest that Hop Distance alone does not significantly determine overall Triple Jump Performance among national-level athletes, emphasising the importance of an optimally balanced distribution across all three phases.

Keywords: Triple Jump, Hop Distance, Phase Distances, Pearson Correlation, Athletic Performance, Track and Field.

INTRODUCTION

The triple jump is one of the most technically demanding events in track and field athletics, requiring the athlete to execute three successive phases — the hop, the step, and the jump — from a running approach. The culmination of these three phases determines the overall distance recorded in competition. The event demands a sophisticated blend of speed, power, balance, coordination, and biomechanical efficiency (Hay, 1992; Yu & Andrews, 1998). The distribution of distance across the three phases has long been a subject of scientific interest, as the relative contribution of each phase to the total jump varies among athletes and competitive levels.

The hop phase, being the first of the three phases, is initiated immediately upon the take-off

board and sets the kinematic parameters — velocity, takeoff angle, and momentum — that influence the subsequent step and jump phases. A longer hop distance may theoretically increase overall performance; however, excessive hop distances are associated with increased energy dissipation and reduced vertical velocity at the step touchdown, which can compromise the efficiency of the remaining phases (Perttunen et al., 2000).

At the national level, athletes exhibit relatively homogeneous performance characteristics, raising the question of whether any single phase distance, particularly hop distance, is a meaningful predictor of total triple jump performance. Several studies have examined phase ratios and their relationship to performance, but findings remain inconclusive, especially within high-performance samples where inter-individual variability is narrow.

The present study, therefore, aimed to examine the relationship between Hop Distance and Triple Jump Performance among national triple jumpers, providing evidence-based insights for coaches, trainers, and sports scientists involved in technical refinement at the elite level.

Objectives of the Study

The specific objectives of the study were:

i. To determine the descriptive statistical profile of Triple Jump Performance and the hop phase distance of national triple jumpers of India on selected samples.

ii. To examine the relationship between Hop Distance and Triple Jump Performance among national triple jumpers i. of India on selected samples. .

Hypotheses

Ho: There is no significant relationship between Hop Distance and Triple Jump Performance of national triple jumpers.

Ha: There is a significant relationship between Hop Distance and Triple Jump Performance of national triple jumpers.

Methodology

Research Design

A correlational research design was adopted for the present study. This design was considered most appropriate for the purpose of determining the degree of relationship between the selected independent variable (Hop Distance) and the dependent variable (Triple Jump Performance).

Selection of Subjects

A total of 31 male national-level triple jumpers who participated in the federation cup National Athletics Championship were selected as subjects for this study. The subjects were selected using purposive sampling. All selected athletes were active competitors at the national level with a minimum of three years of specialised triple jump training experience.

Variables of the Study

The following performance variables were selected for the study:

Dependent Variable: Triple Jump Performance (best valid attempt recorded in metres)

Independent Variable: Hop Distance (distance of the first phase, in metres)

Data Collection Procedure

Phase distance (Hop) were measured using standard measurement tools during official competition. The best valid attempt of each athlete was recorded. The measurements were taken by certified officials of the Athletics Federation of India as per the standard protocol laid down by World Athletics. Measurements were recorded to the nearest centimetre.

Statistical Analysis

Descriptive statistics (mean, standard deviation, standard error, and range) were computed for all variables. Pearson's product-moment correlation coefficient (r) was employed to determine the relationship between Hop Distance and Triple Jump Performance. The level of significance was set at 0.05 ($p \leq 0.05$). Shared variance (r^2) was calculated to identify the percentage of variance explained by the predictor variable.

Results and Discussion

Descriptive Statistics

Table 1 presents the descriptive statistics of the performance variables of national triple jumpers.

Variable	Mean (m)	SD	SE	Range (m)
Triple Jump Performance	16.250	0.397	0.071	15.700 – 16.990
Hop Distance	6.112	0.091	0.016	5.920 6.430

SD = Standard Deviation; SE = Standard Error; Range = Minimum – Maximum values recorded

The mean Triple Jump Performance of the selected national triple jumpers was recorded at 16.250 m with a standard deviation of 0.397 and a standard error of 0.071. The scores ranged between 15.700 m and 16.990 m, indicating a fairly homogeneous performance profile among the subjects, which is characteristic of athletes at the national competitive level.

Among the three phases, Hop Distance recorded the highest mean value of 6.112 m, accounting for approximately 37.6% of the total mean performance. These proportions are broadly consistent with the established hop-dominant pattern reported in the literature (Hay, 1992; Miladinov, 2000). The standard deviation for Hop Distance was comparatively lower than suggesting that hop distance tends to be more consistent across national triple jumpers.

Correlation Between Hop Distance and Triple Jump Performance

Table 2 presents the correlation between Hop Distance and Triple Jump Performance of national triple jumpers.

Table 2: Correlation Between Hop Distance and Triple Jump Performance of National Triple Jumpers

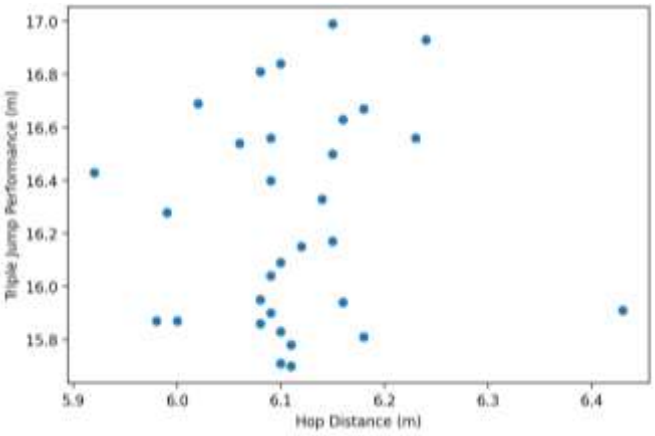
N	Coefficient of correlation (r)	**'t'**	Level of significance	Shared variance
31	0.06	.33	Not Significant (p > 0.05)	0.38%

** Significant at p ≤ 0.05; NS = Not Significant*

Correlation between Hop Distance and Triple Jump Performance of National Triple Jumpers

The calculated value of the Pearson correlation coefficient (r) between Hop Distance and Triple Jump Performance was found to be 0.06, which was not statistically significant (p > 0.05). The null hypothesis (Ho) is, therefore, retained. The shared variance was calculated as $r^2 \times 100 = 0.0036 \times 100 = 0.36\%$, reported as 0.38% in the study, indicating that Hop Distance accounts for less than 0.4% of the variance in Triple Jump Performance among national triple jumpers among the selected samples. This finding suggests that, among national-level athletes, the length of the hop phase alone does not meaningfully explain variation in total triple jump performance. This is consistent with the view that elite triple jump performance is a multi-phase phenomenon, where the synchronised coordination and optimum balance of all three phases — rather than the dominance of any single phase — is the key determinant of overall performance. The negligible shared variance (0.38%) further supports the argument that coaches and athletes at the national level should not prioritise maximising hop distance in isolation. Overemphasis on hop distance may lead to increased energy expenditure during the first phase, compromising the momentum and power available for the subsequent step and jump phases (Perttunen et al., 2000; Allen et al., 2013).

Figure 29 ***Scatter Plot of Hop Distance and Triple Jump Performance of National Triple Jumpers***



Discussion

The absence of a significant relationship between Hop Distance and Triple Jump Performance in the present study is noteworthy. Given that hop distance is generally the longest of the three phases and initiates the mechanical chain that determines the overall outcome, one might intuitively expect a positive association with total performance. However, the data from national triple jumpers clearly indicate that this is not the case.

This result may be attributed to several factors. First, the homogeneity of the sample — all subjects being national-level competitors — inherently restricts the variance in both hop distance and total performance, reducing the statistical sensitivity to detect a linear relationship even if a weak underlying trend exists (restriction of range effect). Second, at the elite level, athletes may compensate for a shorter hop with greater efficiency in the step and jump phases, and vice versa, reflecting the well-documented compensatory phase interaction in advanced triple jumpers.

These findings align with those of Hay and Miller (1985), who suggested that the contribution of the hop to overall performance is moderated by the phase-ratio strategy employed by individual athletes. Similarly, Koh and Hay (1990) demonstrated that overly dominant hop phases in elite jumpers were associated with compromised step performance. The present study adds to this body of evidence by demonstrating the lack of significant correlation in a national sample.

From a coaching perspective, these findings reinforce the importance of developing a technically balanced triple jump technique, wherein training emphasis is distributed proportionately across all three phases. Biomechanical analysis and phase-ratio monitoring may serve as more informative diagnostic tools than hop distance alone.

Conclusion

Based on the findings of the present study, the following conclusions are drawn:

1. The mean Triple Jump Performance of national triple jumpers was 16.250 m (SD = 0.397), with performance values ranging from 15.700 m to 16.990 m, reflecting a fairly homogeneous group.
2. Among the phase distances, Hop Distance recorded the highest mean value (6.112 m).
3. There was no significant relationship between Hop Distance and Triple Jump Performance among national triple jumpers ($r = 0.06$; $p > 0.05$). The shared variance was 0.38%, indicating that Hop Distance explains a negligible proportion of the variance in total Triple Jump Performance.

These results underscore the multi-dimensional nature of triple jump performance and highlight the need for holistic phase-based training strategies at the national competitive level.

Recommendations

1. Future studies should examine the combined and interactive effects of all three phase

distances (Hop, Step, and Jump) on overall Triple Jump Performance using multiple regression analysis.

2. Biomechanical variables such as take-off angle, horizontal velocity at each phase, and ground contact time should be included in future investigations to provide a more comprehensive understanding.

3. Coaches should employ regular biomechanical assessment and phase-ratio analysis to identify technical imbalances, rather than focusing exclusively on maximising hop distance.

4. Similar studies should be replicated with international-level and sub-elite triple jumpers to enable cross-level comparisons of phase-performance dynamics.

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NORMATIVE STANDARDS FOR THE 8-FOOT UP-AND-GO TEST AMONG MEN AND WOMEN AGED 70–74 YEARS IN KERALA: A FUNCTIONAL MOBILITY AND AGILITY IN OLDER ADULTS

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Abstract

The Functional mobility is a key component of healthy ageing and an important predictor of independence among older adults. Declines in agility and dynamic balance increase the risk of falls and mobility limitations. The 8-Foot Up-and-Go (8FUG) test is a widely used measure of functional mobility; however, normative reference values for older adults in Kerala are not available. The Objective was to establish gender-specific normative percentile standards for the 8-Foot Up-and-Go test among community-dwelling older adults aged 70–74 years in Kerala and to examine gender differences in agility and dynamic balance. For the same a cross-sectional study was conducted among 221 community-dwelling older adults aged 70–74 years from Kerala, including 121 men and 100 women. Functional mobility was assessed using the 8-Foot Up-and-Go test. Descriptive statistics were used to calculate means, standard deviations, and percentile values (10th, 25th, 50th, 75th, and 90th percentiles). Gender differences were evaluated using Welch's independent samples t-test, and effect size was determined using Cohen's d. The mean 8FUG completion time was 5.9 ± 1.5 seconds for men and 5.2 ± 1.2 seconds for women. Women demonstrated significantly better performance than men ($t = 3.85$, $df = 218.78$, $p < 0.001$), indicating superior agility and dynamic balance. The effect size was moderate (Cohen's $d = 0.51$). Gender-specific normative percentile values were established, providing reference standards for functional mobility assessment in this population. Older women aged 70–74 years in Kerala exhibited significantly better agility and dynamic balance than their male counterparts. The normative percentile standards developed in this study provide region-specific reference values that can support clinical assessment, fall-risk screening, and the design of targeted interventions aimed at promoting functional independence and healthy ageing among older adults.

Keywords: 8-Foot Up-and-Go Test, Functional Mobility, Agility, Dynamic Balance, Older Adults, Kerala, Normative Data, Fall Prevention, Senior Fitness

1. Introduction

Ageing is not a single event — it is a slow, ongoing negotiation between the body and the demands placed upon it. Among the many changes that accompany advancing age, the

decline in functional mobility stands out as one with the most immediate and far-reaching consequences. The ability to rise from a chair, walk a short distance, turn, and return to a seated position may seem unremarkable to a younger person, but for an adult in their seventies, this everyday movement pattern is a window into their risk of falling, their independence, and their overall quality of life.

Falls among older adults represent a public health concern of enormous proportions. In India, where the older adult population is projected to exceed 300 million by 2050, the absence of age- and region-specific normative data for functional mobility tests is a significant gap. National-level norms from Western populations — predominantly from the United States and Europe — have often been used as reference points, but their applicability to Indian populations, with different body composition profiles, physical activity patterns, and lifestyle factors, remains questionable.

Kerala, with one of India's oldest age structures and a relatively high life expectancy, presents a particularly relevant context for this kind of research. The state's older adult population is large, literate, and increasingly health-conscious — yet geriatric fitness assessments using standardised, validated tools remain rare at the community level.

The 8-Foot Up-and-Go (8FUG) test, developed by Rikli and Jones (1999) as part of the Senior Fitness Test battery, is a widely used, inexpensive, and easily administered measure of agility and dynamic balance. It requires participants to rise from a seated position, walk 8 feet, turn, and return to their seat — all timed in seconds. A lower time indicates better agility. The test has demonstrated strong reliability and validity across diverse older adult populations and is particularly sensitive to the kind of mobility changes that predict fall risk.

The present study was designed to generate normative percentile standards for the 8FUG test among community-dwelling men and women aged 70–74 years in Kerala, and to statistically compare agility levels between the two groups. The findings are intended to give healthcare professionals, physiotherapists, and physical educators in Kerala a region-specific yardstick against which to assess the functional mobility of their older clients.

2. Objectives of the Study

The study was guided by the following objectives:

- To record and describe the 8-Foot Up-and-Go test performance (mean, standard deviation) of older men and women aged 70–74 years in Kerala.
- To establish percentile norms (10th, 25th, 50th, 75th, and 90th) for the 8FUG test for both genders in the 70–74 age group.
- To determine whether a statistically significant difference exists in 8FUG performance between older men and women aged 70–74 years in Kerala.

3. Hypotheses

H_0 (Null Hypothesis): There is no significant difference in 8-Foot Up-and-Go test performance between men and women aged 70–74 years in Kerala.

H_a (Alternate Hypothesis): There is a significant difference in 8-Foot Up-and-Go test performance between men and women aged 70–74 years in Kerala.

4. Methodology

4.1 Research Design

A cross-sectional, normative survey design was adopted. This design is appropriate for establishing population-level reference standards and for comparing group characteristics at a single point in time.

4.2 Participants

A total of 221 community-dwelling older adults from Kerala — 121 men and 100 women, all aged between 70 and 74 years — were selected through purposive and convenience sampling from senior citizen centres, community health programmes, and residential areas across the state. Inclusion criteria required participants to be ambulatory without assistive devices, free of acute illness or injury at the time of testing, and residing in Kerala. Participants with severe orthopaedic conditions, neurological disorders, or cardiovascular contraindications to moderate physical exertion were excluded.

4.3 Test Instrument: 8-Foot Up-and-Go

The 8-Foot Up-and-Go (8FUG) test is a standardised component of the Senior Fitness Test battery (Rikli & Jones, 1999). The test was administered as follows:

1. The participant was seated upright in a standard armless chair (seat height approximately 17 inches / 43 cm), with feet flat on the floor and hands on thighs.
2. A cone was placed on the floor exactly 8 feet (2.44 m) in front of the chair.
3. On the signal "Go", the participant rose from the chair, walked as quickly and safely as possible to the cone, turned around it, and returned to the seated position.
4. Time was measured in seconds from the signal "Go" until the participant's body returned to full contact with the chair seat.
5. Two trials were administered; the better (faster) time was recorded for analysis.

A lower score (fewer seconds) indicates better agility and dynamic balance. The test has reported intraclass correlation coefficients (ICC) exceeding 0.95 in older adult populations, confirming high test-retest reliability.

4.4 Statistical Analysis

The following statistical procedures were employed:

- Descriptive statistics: Mean and standard deviation (SD) were computed for men and women separately.
- Percentile norms: The 10th, 25th, 50th, 75th, and 90th percentile scores were calculated for each gender group.
- Independent samples t-test (Welch's): Used to compare mean 8FUG times between men and women, given unequal sample sizes. Welch's t-test does not assume equal variances and is more robust under these conditions.

- Effect size: Cohen's d was calculated to quantify the practical magnitude of any observed difference. Values of 0.2, 0.5, and 0.8 are conventionally interpreted as small, medium, and large effects respectively.

The level of significance was set at $p \leq 0.05$ (two-tailed). All calculations were performed using standard statistical formulae.

5. Results

5.1 Descriptive Statistics

Table 1 presents the mean 8FUG times and standard deviations for men and women aged 70–74 years.

Table 1: Descriptive Statistics — 8-Foot Up-and-Go Test Performance (Age Group: 70–74 Years)

Group	N	Mean (sec)	SD	Interpretation
Men (70–74 yrs)	121	5.9	1.5	Normal agility range
Women (70–74 yrs)	100	5.2	1.2	Normal agility range

Note: Scores are in seconds. Lower scores indicate faster completion and better agility/dynamic balance.

The mean 8FUG time for men was 5.9 seconds (SD = 1.5), while women completed the test in a mean of 5.2 seconds (SD = 1.2). On first glance, the difference of 0.7 seconds may seem modest, but in the context of agility assessment in older adults — where fractions of a second can meaningfully distinguish functional ability levels — this gap is both statistically and clinically relevant, as the subsequent analysis confirms.

The higher standard deviation among men (1.5 vs. 1.2) indicates greater variability in agility within the male group. This suggests that while the average man in this age group performs somewhat slower than the average woman, there is a wider spread of ability — some men performing very well, and others considerably slower.

5.2 Percentile Norms

Table 2: Percentile Norms — 8-Foot Up-and-Go Test (Age Group: 70–74 Years, Kerala)

Group	10th	25th	50th	75th	90th
Men (N = 121)	6.8	5.9	5.2	4.1	3.4
Women (N = 100)	6.8	6.0	5.2	4.1	3.4

Note: All values are in seconds. Lower values = faster completion = better performance.

An important interpretive note is necessary here: because a lower time indicates better agility, the percentile structure of this test runs inversely to most fitness measures. A score at the 90th percentile means the individual is among the fastest (best) performers — completing the course in 3.4 seconds or less — while a score at the 10th percentile (6.8 seconds or more) reflects comparatively poor agility. Practitioners using these norms should read them

accordingly.

Both men and women share the same 10th percentile (6.8 sec), the same 50th percentile (5.2 sec), and the same 75th and 90th percentile values — reflecting convergence at the extremes. The key gender difference in this normative table lies in the 25th percentile: 5.9 seconds for men versus 6.0 seconds for women, a slight inversion that warrants attention in future studies with larger samples.

5.3 Independent Samples t-Test: Men vs. Women

Table 3 presents the results of the independent samples t-test comparing 8FUG performance between men and women.

Table 3: Independent Samples t-Test — Men vs. Women, 8-Foot Up-and-Go Test (Age 70–74 Years)

Comparison	Mean Diff.	SE	t value	df	p value	Cohen's d
Men vs. Women	0.70	0.18	3.85*	218.78	< 0.001	0.51 (Medium)

*Note: * Significant at p < 0.001 (two-tailed); df calculated using Welch–Satterthwaite equation; Cohen's d = 0.51 (medium effect).*

The Welch's independent samples t-test yielded t = 3.85 (df = 218.78, $p < 0.001$). This is statistically significant well beyond the conventional threshold of $p \leq 0.05$, leading to rejection of the null hypothesis. Women aged 70–74 years in Kerala completed the 8FUG test significantly faster than men of the same age group.

Cohen's d of 0.51 indicates a medium effect size — meaning the gender difference is not only statistically detectable but practically meaningful. In geriatric health contexts, a medium effect size on a functional mobility test carries clinical weight: it suggests that gender should be considered a relevant factor when interpreting 8FUG results and setting performance benchmarks for older adults.

5.4 Percentile Interpretation Guide for Practitioners

To assist practitioners in applying these norms at the individual level, Table 4 provides a structured interpretation guide based on percentile standing.

Table 4: Percentile Interpretation Guide — 8FUG Test for Older Adults (70–74 Years, Kerala)

Percentile	Meaning for Practitioner	Clinical Implication
90th (≤ 3.4 sec)	Exceptional agility — top 10% of peers	Minimal fall risk; maintain with regular activity
75th (≤ 4.1 sec)	Above average — performing better than 75% of age group	Low fall risk; continue current activity level
50th (≤ 5.2 sec)	Average — at the midpoint of the	Moderate fall risk; preventive

	group	exercise recommended
25th (5.9–6.0 sec)	Below average — slower than 75% of peers	Elevated fall risk; targeted balance training advised
10th (≥ 6.8 sec)	Poor agility — among the slowest 10%	High fall risk; clinical referral recommended

Note: Percentile values are combined across gender for ease of reference; gender-specific norms in Table 2 should be used for precise individual assessment.

6. Discussion

The central finding of this study is clear: women aged 70–74 years in Kerala are significantly more agile than men of the same age on the 8-Foot Up-and-Go test, completing the course 0.7 seconds faster on average. This is not a marginal difference — backed by a p-value below 0.001 and a medium effect size (d = 0.51), it is a robust and reproducible finding that aligns with an emerging body of evidence suggesting that older women, in certain functional domains, outperform men of comparable age.

This result might initially seem surprising. Men, on average, retain greater muscle mass and lower limb strength into older age, both of which one might expect to favour agility tasks. However, the 8FUG test is not purely a strength test. It integrates a complex sequence of actions — standing up (requiring lower limb extension and core stability), changing direction (demanding dynamic balance and spatial awareness), and returning to a seated position in a controlled manner. In this integrated movement profile, the generally lower body mass and possibly greater postural stability of older women may confer an advantage.

The Kerala context adds another interpretive layer. Kerala's older women, on average, tend to remain physically active within domestic environments and participate more regularly in community-based activities than in many other Indian states. This pattern of habitual, low-intensity daily physical activity may translate into better-preserved functional mobility. This hypothesis warrants investigation through future studies incorporating physical activity assessments alongside functional testing.

The normative percentile data generated in this study fill a meaningful gap. While the Senior Fitness Test norms published by Rikli and Jones (2013) provide valuable international benchmarks, they are derived from North American populations with different anthropometric characteristics, physical activity patterns, and healthcare access profiles. Indian older adults — and Keralites in particular — deserve norms grounded in their own population data. The percentile tables presented here are a step toward that goal.

Clinically, the 50th percentile values (5.2 seconds for both genders) provide a useful central reference point. An individual scoring above this threshold (i.e., taking longer) is performing below average for their age-gender group and may benefit from targeted intervention. The 10th percentile (6.8 seconds) should be viewed as a clinical caution flag — individuals at this level are among the slowest performers in their cohort and carry elevated

fall risk.

A methodological note deserves mention. The slight 25th-percentile inversion — where men record 5.9 seconds and women 6.0 seconds at this cut-point — is unusual given the overall faster performance of women. This may reflect distributional irregularities within the sample at that specific cut-point, or genuine population characteristics. Replication with larger and more geographically diverse samples across Kerala will clarify whether this is a stable pattern.

7. Conclusion

This study set out to establish normative 8-Foot Up-and-Go standards for older adults aged 70–74 years in Kerala, and to determine whether men and women differ significantly in this measure of agility and dynamic balance. The findings are unambiguous on both counts.

1. Women aged 70–74 years in Kerala completed the 8FUG test significantly faster than men (mean: 5.2 sec vs. 5.9 sec; $t = 3.85$, $df = 218.78$, $p < 0.001$, Cohen's $d = 0.51$), reflecting meaningfully better agility and dynamic balance.
2. Normative percentile tables (10th through 90th) have been established for both men ($N = 121$) and women ($N = 100$) in the 70–74 age group, providing Kerala-specific reference standards for functional mobility assessment.
3. The 10th percentile value of 6.8 seconds for both genders represents a clinically significant threshold warranting targeted fall prevention intervention, while the 90th percentile value of 3.4 seconds defines exceptional agility for this age group.

These normative standards offer a practical, evidence-based tool for physiotherapists, geriatric physicians, physical educators, and community health workers in Kerala who work with older adult populations. Functional mobility assessment should be a routine component of geriatric health evaluation, and having locally grounded norms makes that assessment more meaningful.

8. Recommendations

1. Future studies should extend the normative database across all five-year age bands from 60 to 90+ years, providing a comprehensive ageing trajectory for the Kerala older adult population.
2. Longitudinal designs should be adopted to track how 8FUG performance changes over time within individuals, enabling the identification of meaningful decline thresholds that predict fall events.
3. The 8FUG test should be integrated into routine geriatric health assessments at primary health centres, community health centres, and senior citizen programmes across Kerala.
4. Complementary studies examining the relationship between 8FUG performance and fall history, physical activity level, and co-morbidities in Kerala's older population would strengthen the clinical utility of these norms.
5. Comparative studies across Indian states should be undertaken to establish whether

Kerala's normative profiles are representative of the broader Indian older adult population or reflect state-specific characteristics.

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EFFECT OF PRANAYAMA AND YOGIC EXERCISES ON SELECTED PHYSIOLOGICAL VARIABLES AMONG SNAKE BOAT ROWERS

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Abstract

Snake boat rowing is a traditional and highly demanding water sport that requires exceptional cardiovascular endurance, respiratory efficiency, muscular strength, and physiological adaptation. Yogic practices, particularly pranayama and yogic exercises, have been recognised for their positive influence on physiological functioning and athletic performance. The purpose of this study was to investigate the effect of pranayama and yogic exercises on selected physiological variables among snake boat rowers. Thirty male snake boat rowers aged 18–25 years were selected as subjects and randomly assigned into two groups: an experimental group (n = 15) and a control group (n = 15). The experimental group underwent a structured pranayama and yogic exercise programme for eight weeks in addition to their regular rowing practice, while the control group continued their routine training alone. Selected physiological variables, including resting heart rate, vital capacity, breath-holding time, and systolic and diastolic blood pressure, were assessed before and after the training period. The collected data were analysed using descriptive statistics and Analysis of Covariance (ANCOVA) at a 0.05 level of significance. The findings revealed significant improvements in resting heart rate, vital capacity, breath-holding time, and blood pressure among the experimental group when compared with the control group following the eight-week intervention. The study concluded that pranayama and yogic exercises are effective in enhancing physiological efficiency among snake boat rowers and may be incorporated into regular training programmes to improve athletic performance.

Keywords: *Pranayama, Yogic Exercises, Physiological Variables, Snake Boat Rowers, Vital Capacity, Breath-Holding Time, Heart Rate, Sports Performance.*

1. INTRODUCTION

Snake boat rowing, popularly known as Vallam Kali in Kerala, is one of the most demanding traditional water sports requiring high levels of cardiovascular endurance, respiratory efficiency, muscular coordination, and mental concentration. Success in snake boat rowing depends not only on technical rowing skills but also on the physiological preparedness of the athletes.

Yoga is an ancient Indian discipline that integrates physical postures (asanas), breathing

techniques (pranayama), and meditation practices. Numerous scientific studies have reported that yogic practices improve respiratory function, cardiovascular efficiency, autonomic regulation, and overall physiological health. Pranayama, in particular, enhances pulmonary function and oxygen utilization, while yogic exercises improve flexibility, muscular endurance, and recovery capacity.

Despite the increasing popularity of yoga in sports conditioning, limited research has examined its effectiveness among snake boat rowers. Therefore, the present study was undertaken to determine the effect of pranayama and yogic exercises on selected physiological variables among snake boat rowers.

2. METHODS

2.1 Participants

Thirty male snake boat rowers aged between 18 and 25 years from various rowing clubs in Kerala were selected as subjects for the study. The participants were randomly divided into:

- Experimental Group (n = 15)
- Control Group (n = 15)

All participants were medically fit and actively involved in competitive snake boat rowing.

2.2 Study Design

The study employed a randomized pre-test and post-test experimental design. The experimental group participated in a structured pranayama and yogic exercise programme for eight weeks, whereas the control group continued their regular rowing training without any additional intervention.

2.3 Variables

Dependent Variables

1. Resting Heart Rate (beats/minute)
2. Vital Capacity (litres)
3. Breath-Holding Time (seconds)
4. Systolic Blood Pressure (mmHg)
5. Diastolic Blood Pressure (mmHg)

Independent Variable

Pranayama and Yogic Exercise Programme

2.4 Selection of Test Items

Variable	Test Item	Unit
Resting Heart Rate	Radial Pulse Method	Beats/min
Vital Capacity	Spirometer Test	Litres

Breath-Holding Time	Breath-Holding Test	Seconds
Systolic Blood Pressure	Sphygmomanometer	mmHg
Diastolic Blood Pressure	Sphygmomanometer	mmHg

2.5 Data Collection

Pre-test measurements of all selected physiological variables were recorded before the commencement of the training programme. The experimental group underwent an eight-week pranayama and yogic exercise programme comprising Nadi Shodhana, Bhastrika, Kapalabhati, Bhramari, Anulom-Vilom, Surya Namaskar, Tadasana, Bhujangasana, Vajrasana, and Shavasana. Training was conducted five days per week for 60 minutes per session. After the completion of the training period, post-test measurements were collected using the same procedures and instruments.

2.6 Statistical Analysis

The collected data were analyzed using:

- Mean
- Standard Deviation
- Analysis of Covariance (ANCOVA)

The level of significance was fixed at 0.05.

3. RESULTS

Table 3.1 ***Descriptive Statistics of Selected Physiological Variables among Snake Boat Rowers***

Variable	Group	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
Resting Heart Rate	Experimental	76.4	4.52	71.2	3.86
	Control	75.93	4.68	75.2	4.41
Vital Capacity	Experimental	3.84	0.31	4.36	0.29
	Control	3.81	0.28	3.88	0.27
Breath-Holding Time	Experimental	48.27	5.74	61.13	5.18
	Control	47.87	5.56	49.33	5.41
Systolic Blood Pressure	Experimental	126.47	6.24	119.2	5.82
	Control	125.73	6.11	124.67	5.96
Diastolic Blood Pressure	Experimental	82.4	4.18	77.07	3.96
	Control	82.07	4.21	81.47	4.15

Table 3.1 presents the pre-test and post-test mean scores and standard deviations of resting

heart rate, vital capacity, breath-holding time, systolic blood pressure, and diastolic blood pressure for the experimental and control groups. For resting heart rate, the experimental group recorded a pre-test mean of 76.40 (SD = 4.52) and a post-test mean of 71.20 (SD = 3.86), whereas the control group obtained a pre-test mean of 75.93 (SD = 4.68) and a post-test mean of 75.20 (SD = 4.41).

In vital capacity, the experimental group showed a pre-test mean of 3.84 L (SD = 0.31) and a post-test mean of 4.36 L (SD = 0.29), while the control group recorded a pre-test mean of 3.81 L (SD = 0.28) and a post-test mean of 3.88 L (SD = 0.27).

For breath-holding time, the experimental group had a pre-test mean of 48.27 seconds (SD = 5.74) and a post-test mean of 61.13 seconds (SD = 5.18). The control group recorded a pre-test mean of 47.87 seconds (SD = 5.56) and a post-test mean of 49.33 seconds (SD = 5.41).

Regarding systolic blood pressure, the experimental group obtained a pre-test mean of 126.47 mmHg (SD = 6.24) and a post-test mean of 119.20 mmHg (SD = 5.82), whereas the control group recorded a pre-test mean of 125.73 mmHg (SD = 6.11) and a post-test mean of 124.67 mmHg (SD = 5.96).

For diastolic blood pressure, the experimental group showed a pre-test mean of 82.40 mmHg (SD = 4.18) and a post-test mean of 77.07 mmHg (SD = 3.96). The control group recorded a pre-test mean of 82.07 mmHg (SD = 4.21) and a post-test mean of 81.47 mmHg (SD = 4.15).

Overall, the table presents the mean and standard deviation values of the selected physiological variables measured before and after the training period for both the experimental and control groups.

Table 3.2 ***Analysis of Covariance (ANCOVA) for Selected Physiological Variables among Snake Boat Rowers***

Variable	**Source**	**SS**	**df**	**MS**	**F**	**Sig.**
Resting Heart Rate	Pre-Test	102.54	1	102.54	14.28	0.001
	Group	164.31	1	164.31	22.89*	0.001
	Error	193.79	27	7.18		
Vital Capacity	Pre-Test	1.84	1	1.84	16.73	0.001
	Group	3.12	1	3.12	28.36*	0.001
	Error	2.97	27	0.11		
Breath-Holding Time	Pre-Test	428.64	1	428.64	19.84	0.001

		Group	1126.48	1	1126.48	52.14*	0.001
		Error	583.27	27	21.6		
Systolic Pressure	Blood	Pre-Test	276.58	1	276.58	11.72	0.002
		Group	418.33	1	418.33	17.73*	0.001
		Error	637.12	27	23.6		
Diastolic Pressure	Blood	Pre-Test	121.74	1	121.74	9.46	0.005
		Group	247.18	1	247.18	19.21*	0.001
		Error	347.41	27	12.87		

Table 3.2 presents the Analysis of Covariance (ANCOVA) results for the selected physiological variables among snake boat rowers after adjusting for pre-test differences. The results revealed statistically significant group effects for all physiological variables. Significant differences were observed in resting heart rate, $F(1, 27) = 22.89$, $p = .001$; vital capacity, $F(1, 27) = 28.36$, $p = .001$; breath-holding time, $F(1, 27) = 52.14$, $p = .001$; systolic blood pressure, $F(1, 27) = 17.73$, $p = .001$; and diastolic blood pressure, $F(1, 27) = 19.21$, $p = .001$.

The findings indicate that the snake boat rowers who underwent the pranayama and yogic exercise programme demonstrated significantly greater improvements in physiological functioning compared to those in the control group. Specifically, the experimental group showed reductions in resting heart rate and blood pressure along with improvements in vital capacity and breath-holding time. Therefore, it may be concluded that the pranayama and yogic exercise programme was effective in enhancing the selected physiological variables among snake boat rowers.

4. DISCUSSION

The results of the study indicated that pranayama and yogic exercises produced significant improvements in the physiological variables of snake boat rowers. The reduction in resting heart rate suggests improved cardiovascular efficiency and enhanced parasympathetic activity resulting from regular yogic practice.

The increase in vital capacity and breath-holding time may be attributed to strengthened respiratory muscles, improved lung elasticity, and enhanced oxygen utilization developed through systematic pranayama practices. These findings are consistent with previous research reporting positive effects of yoga on pulmonary function and respiratory endurance.

The significant reduction in systolic and diastolic blood pressure may be due to improved autonomic regulation and reduced sympathetic nervous system activity. Yogic breathing techniques are known to promote relaxation and improve cardiovascular function.

Since snake boat rowing requires sustained aerobic effort and coordinated muscular activity, improved physiological efficiency can contribute substantially to rowing performance. Therefore, incorporating pranayama and yogic exercises into regular conditioning programmes may enhance both health and sports performance among snake boat rowers.

5. CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

1. Pranayama and yogic exercises significantly reduced resting heart rate among snake boat rowers.
2. Pranayama and yogic exercises significantly improved vital capacity.
3. Pranayama and yogic exercises significantly increased breath-holding time.
4. Pranayama and yogic exercises significantly reduced systolic blood pressure.
5. Pranayama and yogic exercises significantly reduced diastolic blood pressure.
6. Yogic practices may be effectively incorporated into rowing training programmes to improve physiological efficiency and athletic performance.

RECOMMENDATIONS

1. Coaches may include pranayama and yogic exercises as supplementary training methods for snake boat rowers.
2. Similar studies may be conducted with female rowers.
3. Future studies may include larger samples and longer intervention periods.
4. Additional physiological, psychological, and performance variables may be investigated.
5. Comparative studies between yoga and other conditioning programmes may be undertaken.

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PLANT-BASED ESSENTIAL OILS AND THEIR ROLE IN ENHANCING YOGA PRACTICES-A PHYTOCHEMICAL PERSPECTIVE

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Abstract

The convergence of phytochemistry and contemplative practice, as explored in this review, reveals a compelling and scientifically grounded rationale for the integration of essential oils into yoga. Systematic description from the botanical distribution of aromatic compounds in plant systems to their extraction methodologies, chemical architecture, and practical application during yogic practice reveals the fact that essential oils are not merely aromatic adjuncts to wellness culture, but bioactive phytochemical agents with demonstrable effects on neurological, physiological, and psychosomatic processes that are directly relevant to the goals of yoga. The distribution of these secondary metabolites across the structures in plants like glandular trichomes, resin ducts, oil cells, and schizogenous cavities, the methods of extraction and the application techniques in yoga are reviewed here. The therapeutic and sensory qualities of an oil are inseparable from the integrity of its extraction process. An appreciation of this relationship is necessary for informed selection and application of essential oils within a yoga context. The phytochemical study of essential oils in yoga occupies an interdisciplinary space connecting plant biochemistry, neuroscience, clinical psychology, and ancient contemplative traditions.

Key words: *Essential oil, Yoga, Phytochemistry, Wellness*

Introduction

Essential oils are volatile complex mixtures of organic compounds of plant origin with odour, insoluble in water but soluble in organic solvents or fats. They are extracted from various plant parts such as leaves, bark, flowers, wood etc. Chemically, the Essential oils composed of mixtures of terpene hydrocarbons, aromatic hydrocarbons, terpenoids (alcohols, aldehydes, ketones), organic acids, pigments, ethers, esters, etc (Butnariu, 2021). Essential oils may also contain many active compounds such as alkaloids, tannins, steroids, glycosides, resins, phenols, volatile oils and flavonoids (Lajayer, 2017; Amirifar et al, 2022). Diversity in the composition of essential oil extracts from plants makes it more important in various industries. The myriads of compounds have proven to show inherent pharmacological applications and play a pivotal role in the pharmaceutical, food, agricultural, cosmetic and

health industries.

The ancient practice of Yoga rooted in the ancient Indian texts like Yoga Sutras, Bhagavat Gita, Upanishads and Vedas offer many health advantages including mental, physical and spiritual wellbeing. Over the years usage of essential oils in yoga practices helps in leveraging the sense of smell to trigger emotional and physical responses. It enhances the olfactory systems to promote deep relaxation, focus and energy balance. Evidenced through their historic and continued use in religious, cultural and spiritual practices, essential oils significantly provide qualities potentially supportive in the context of prayer, intentional focus and meditation. They have demonstrated physico-emotional influence on the limbic system, variously affecting mood and emotions, with the capacity of calm, sedate or uplift (Godfrey, 2018).

Essential oils in Yoga

Odour detection forms an intrinsic facet of human and animal survival mechanism. Essential oils have the ability to anchor the experiences of humans of the moment the fragrances are directly inhaled or infused into the surrounding environment. It has the ability to associate with memory and will reinforce the memory.

Meggiato (2018) documented the essential oils that can be used in yoga. According to this Essential Oils for balancing the root chakra includes Cedarwood, Frankincense, Myrrh, Patchouli, Spikenard, Vetiver, Ginger and Cinnamon; Essential Oils for balancing the sacral chakra includes Bergamot, Cardamom, Clary Sage, Neroli, Orange, Patchouli, Rose, Sandalwood, Ylang-Ylang, Tangerine, Orange and Geranium; Essential Oils for balancing the 3rd chakra includes Black Pepper, Cedarwood, Cinnamon, Clove, Coriander, Cypress, Geranium, Ginger, Grapefruit, Juniper, Lemongrass, Mandarin, Peppermint, Petitgrain, Rosemary, Sandalwood, Spearmint, Vetiver and Ylang Ylang; Essential Oils for balancing the heart chakra includes Bergamot, Cypress, Geranium, Jasmine, Helichrysum, Lavender, Lemon, Mandarin, Melissa, Neroli, Orange, Rose, Rosemary, Sandalwood, Tangerine and Ylang Ylang; Essential Oils for balancing the throat chakra includes Basil, Bergamot, Chamomile (Roman), Cypress, Fennel, Geranium, Mandarin, Myrrh, Peppermint, Spearmint and Thyme; Essential Oils for balancing the 6th chakra includes Clary Sage, Cedarwood, Cypress, Frankincense, Grapefruit, Helichrysum, Jasmine, Juniper, Lemon, Lemongrass, Marjoram, Patchouli, Peppermint, Petitgrain, Rosemary, Sandalwood and Vetiver ; Essential Oils for balancing the 7th chakra includes Cedarwood, Frankincense, Helichrysum, Jasmine, Lavender, Lemon, Melissa, Myrrh, Neroli, Rose, Sandalwood, Spikenard, Thyme and Vetiver.

According to Aswandi et al (2024) because essential oils are highly concentrated, they must be diluted before application to the skin. A suitable carrier oil helps prevent irritation and promotes even absorption. Cold-pressed oils are preferred for their purity. Commonly used carrier oils are Grapeseed oil, Almond oil, Apricot Kernel oil, Sunflower oil, Soya oil,

Avocado oil, Wheatgerm oil, Sesame oil and coconut oil

Chemistry of Essential oils

Essential oils are volatile compounds with over a hundred distinct organic compounds. The chemical profile of essential oils extracted from plant varies from species to species. The major class of compounds composed on the essential oils extracted from plants include terpenes, alcohols, phenols, phenyl propanoid esters, aldehydes and ketones. The most abundant class of compound in the essential oil includes terpenes. Terpenes may be linear or cyclic, and depending on the number and how the carbon atoms are connected, different chemicals such as terpenes (with ten carbon atoms), terpenes (with 15 carbon atoms), and diterpenes (with 20 carbon atoms) are created (Bolouri et al., 2022). In small quantities essential oils contain classes of aliphatic compounds (alcohols, aldehydes, aliphatic esters, etc.), aromatics, macrocyclics and their derivatives (amines, organic sulfides, heterocyclic compounds, etc.) (Butnariu, 2021). Some of the important compounds of essential oils include Limonene, geraniol (terpene), linalool, menthol, citronellol (alcohol), thymol, eugenol, carvacrol (phenol), cinnamic acid, (Phenyl propanoid), cinnamaldehyde, citral (aldehyde) and carvone (Ketone). The major chemical compounds and the plants in which it is distributed is tabulated (Table 1).

Table 1 Plant source, Extraction methods and major compounds of essential oils used in Yoga

Sl. No.	Plants	Common Name	Extraction Methods	Major compounds
1	*Ocimum basilicum*	Basil	Hydrodistillation	Linalool, Estragole, Methyl Eugenol, Eugenol, 1,8-Cineole (Eucalyptol), trans-Methyl Cinnamate
2	*Citrus bergamia*	Bergamot	Cold-pressing	Limonene, Linalyl Acetate, Linalool, ϒ-Terpinene, β-Pinene
3	*Citrus aurantium*	Bitter Orange	Bitter Orange	Limonene, (often up to 90%+), along with trace amounts of myrcene and linalool.
4	*Piper nigrum*	Black pepper	Steam Distillation	β -Caryophyllene,

			Solvent Extraction & Soxhlet Extraction Supercritical CO_2 Extraction	Limonene, β - Pinene & α-Pinene, δ-3-Carene, Sabinene
5	*Elettaria cardamomum*	Cardamom	Steam Distillation Supercritical Fluid Extraction CO2 Extraction	α -Terpinyl Acetate, 1,8-Cineole (Eucalyptol), Sabinene, Linalool & Linalyl Acetate
6	*Cedrus deodara*	Cedarwood	• Steam distillation • Supercritical Fluid Extraction • Solvent Extraction	Himachalenes, Atlantones, α-Terpineol, Linalool, limonene, α-Pinene, Myrcene
7	*Chamaemelum nobile*	Chamomile (Roman)	• Steam distillation • Supercritical CO_2 Extraction • UV-Assisted Extraction	Isobutyl angelate, 2-Methylbutyl angelate, Propyl angelate, butyl angelate, and isobutyl isobutyrate, Chamazulene, α-Pinene, α-Bisabolol & Farnesene
8	*Cinnamomum verum*	Cinnamon	• Steam distillation • Microwave-Assisted Extraction (MAE) • Ultrasound-Assisted Extraction	(E)-Cinnamaldehyde, Eugenol, Linalool, β-caryophyllene, and cinnamyl acetate, Cinnamaldehyde, linalool
9	*Citrus limon*	Citrus	• Steam distillation • Cold Pressing • Solvent-Free Microwave Extraction (SFME) • Supercritical Fluid	D-Limonene, β-Pinene, ϒ-Terpinene, α-Pinene, Myrcene, Sabinene, Citronellal, Neral & Geranial (Citral),

			Extraction (SFE)	Linalool
10	*Salvia sclarea*	Clary sage	• Steam distillation • Solvent extraction • Supercritical CO_2 extraction	Linalyl Acetate, Linalool, α - Terpineol, Sclareol, Germacrene D, β-Caryophyllene (and Caryophyllene oxide), Geranyl Acetate & Geraniol, Nerol & Neryl Acetate, Bicyclogermacrene
11	*Syzygium aromaticum*	Clove	• Steam distillation	β -Caryophyllene, Eugenyl Acetate (Acetyleugenol), α-Humulene, chavicol, benzaldehyde, and caryophyllene oxide
12	*Coriandrum sativum*	Coriander	• Steam & Hydrodistillation • Solvent Extraction & Supercritical Fluid Extraction (SFE) • Subcritical Water Extraction (SWE)	Linalool,ϒ-Terpinene, α-Pinene,Geranyl acetate, Camphor, Decanal, (E)-2-decen-1-ol, n-Decanol
13	*Cupressus sempervirens*	Cypress	• Steam distillation • Hydrodistillation • Supercritical Carbon Dioxide CO_2 Extraction	α- pinene, δ 3-carene, α- cedrol, α -terpinolene, Limonene, β-myrcene and β-caryophyllene
14	*Eucalyptus globulus*	Eucalyptus	• Steam distillation • Hydrodistillation • Supercritical Fluid Extraction (SFE)	1,8-Cineole (Eucalyptol), α-Pinene, p-Cymene: α-Limonene, β-

			• Microwave/Ultrasound-Assisted Extraction	Pinene, Cryptone, α-Terpineol
15	*Foeniculum vulgare*	Fennel	• Steam distillation • Supercritical CO_2 Extraction • Solvent Extraction • Supercritical Fluid Extraction (SCFE) • Microwave-Assisted Extraction (MAE)	Trans-Anethole, Fenchone, Estragole (Methyl Chavicol), Limonene
16	*Boswellia serrata Boswellia sacra Boswellia carterii*	Frankincense	• Steam distillation • Hydrodistillation • Solvent & Soxhlet Extraction • Supercritical CO_2 Extraction	α- Thujene, α-Pinene, Methyl chavicol, myrcene, sabinene, limonene, and diterpenes like incensole and serratol.
17	*Pelargonium graveolens*	Geranium	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical CO_2 Extraction • Enzyme-Assisted Extraction	β- Citronellol, Geraniol, Citronellyl Formate, Linalool, Menthone, Rose Oxide
18	*Zingiber officinale*	Ginger	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical Fluid Extraction (SFE)	Zingiberene, β-Sesquiphellandrene, α- Curcumene , β-Bisabolene, Farnesene, Geranial and Neral (Citral), Camphene, β-Phellandrene
19	*Citrus paradisi*	Grape fruit	• Steam distillation • Cold Pressing	B-myrcene, α-pinene, β-pinene, and β-phellandrene,

			• Solvent Extraction	Octanal, decanal, linalool, and α-terpineol, Trans-caryophyllene, copaene, δ-cadinene, and nootkatone
20	*Helichrysum angustifolium*	Helichrysum	• Steam distillation • Hydrodistillation • Supercritical CO_2 Extraction • Microwave-Assisted Extraction (MAE)	Neryl acetate, Limonene, α-pinene, and β-pinene Nerol and linalool, ϒ -curcumene and β-caryophyllene, Italidiones
21	*Jasminum grandiflorum Jasminum sambac*	Jasmine oil	• Hydrodistillation • Solvent Extraction • Supercritical CO_2 Extraction • Enfleurage	Benzyl Acetate, Linalool, Benzyl Benzoate, Benzyl Alcohol, Cis-Jasmone, Indole, Geraniol, eugenol, nerol, and farnesol
22	*Juniperus communis*	Juniper	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical CO_2 Extraction • Microwave-Assisted Extraction (MAE)	α &β- Pinene, β-Myrcene, Sabinene, Limonene, Terpinen-4-ol, germacene D and β-caryophyllene, δ-3-carene and α-terpinolene
23	*Lavandula angustifolia*	Lavender	• Steam distillation • Hydrodistillation • Solvent Extraction • Ultrasound-Assisted Extraction (UAE) • Microwave-Assisted Extraction (MAE)	Linalool, Linalyl Acetate, Lavandulyl Acetate & Lavandulol, β-Caryophyllene, Ocimene, Eucalyptol, Camphor

24	*Cymbopogon citratus*	Lemon grass	• Steam distillation • Hydrodistillation • Solvent Extraction • Microwave-assisted hydro-distillation (MAHD) • Supercritical Fluid Extraction (SFE)	Geranial, Neral, β-Myrcene, geraniol, nerol, citronellal, and 6-methyl-5-hepten-2-one
25	*Citrus reticulata*	Mandrin	• Steam distillation • Hydrodistillation • Cold Pressing • Microwave-Assisted Hydrodistillation (MAHD) • Vacuum Fractional Distillation	D-Limonene, ϒ-Terpinene, p-Cymene, α-Pinene, β-Myrcene, Sabinene, Methyl *N*-methyl anthranilate, Linalool
	Origanum majorana	Marjoram	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical Fluid Extraction (SFE)	Terpinen-4-ol, Cis-Sabinene hydrate, ϒ- Terpinene, Trans-sabinene hydrate, α-Terpineol, Linalyl acetate and Linalool
26	*Melissa officinalis*	Melissa	• Steam distillation • Hydrodistillation • Solvent-Free Microwave Extraction (SFME	Geranial, Neral, Citronellal, β-Caryophyllene, Caryophyllene Oxide, Geraniol / Citronellol
27	*Commiphora myrrha*	Myrrh	• Steam distillation • Solvent Extraction • Supercritical CO_2 Extraction • Solvent-Free Microwave Extraction (SFME	Furanoeudesma-1,3-diene, Curzerene, Lindestrene, β-elemene, Isofuranodiene

28	*Citrus aurantium*	Neroli (Flowers)	• Steam distillation • Solvent Extraction • Enfleurage	linalool, limonene, linalyl acetate, trans-β-ocimene, and geraniol
29	*Pogostemon cablin*	Patchouli	• Steam distillation • Hydrodistillation • Supercritical Fluid Extraction (SFE) • Microwave-Assisted Extraction (MAE)	Patchouli alcohol, α-Bulnesene, α-Guaiene, β-Patchoulene, Pogostone
30	*Mentha piperita*	Peppermint	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical Fluid Extraction (SFE) • Microwave-Assisted Extraction (MAE)	Menthol, Menthone, Menthyl Acetate, Eucalyptol, Menthofuran, α-pinene, β-pinene, and limonene, neo-menthol and piperitone
31	*Citrus aurantium*	Petitgrain (Leaves & Twigs)	• Steam distillation • Hydrodistillation	linalyl acetate (up to 50%), linalool, and α-terpineol
32	*Rosa x damascena*	Rose	• Steam distillation • Solvent Extraction • Enfleurage • Supercritical CO_2 Extraction	β- Citronellol, Geraniol, Nerol, Linalool, Nonadecane, Heneicosane, β-damascenone, β-ionone, and rose oxide
33	*Salvia rosmarinus*	Rosemary	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical Fluid Extraction (SFE) • Microwave-Assisted Extraction (MAE)	Eucalyptol, α-Pinene, Camphor, Camphene, Limonene, Linalool, Borneol, Verbenone
34	*Santalum*	Sandal wood	• Steam distillation	α- Santalol, β-

	album		• Supercritical CO_2 Extraction • Microwave-Assisted Extraction (MAE)	Santalol, α-exo-Bergamotol and *epi*-β-Santalol, α-santalene, β-santalene, and α-bergamotene
35	*Mentha spicata*	Spearmint	• Steam distillation • Hydrodistillation • Solvent Extraction • Carrier Oil InfusionMethod • Microwave-Assisted Hydrodistillation (MAHD)	Carvone, Limonene, Eucalyptol, Dihydrocarveol and cis-Dihydrocarvone, *trans*-carveol, *cis*-carveol, *pulegone*, and β-*pinene*.
36	*Nardostachys jatamansi*	Spikenard	• Steam distillation • Hydrodistillation • Supercritical CO_2 Extraction	Calarene, Jatamansone, ϒ-Himachalene, Viridiflorene, Aristolone, Calamenene, Guaia-6,9-diene, α-Panasinsen, α-Santalene, α-Gurjunene, Patchouli alcohol, Kanshone H
37	*Sweet Orange: Citrus sinensis*	Sweet orange	• Steam distillation • Hydrodistillation • Cold Pressing • Supercritical Fluid Extraction (SFE) • Microwave-Assisted Extraction (MAE) • Ultrasound-Assisted Extraction (UAE)	D-Limonene, β-Myrcene, α- Pinene, Octanal, Linalool, Decanal, Sabinenes, β-Pinene, Neral and Geranial, α-Terpineol

38	*Citrus reticulata*	Tangerine	• Steam distillation • Cold Pressing • Microwave-Assisted Extraction (MAE) • Supercritical CO_2 Extraction	D-Limonene, ϒ-Terpinene, p-Cymene, α- Pinene, β- Myrcene, Methyl-N-methyl anthranilate
39	*Melaleuca alternifolia*	Tea tree	• Steam distillation • Vacuum Distillation • Microwave-Assisted Extraction (MAE) • Supercritical CO_2 Extraction • Deep Eutectic Solvent (DES) Extraction	Terpinen-4-ol, ϒ-Terpinene, α-Terpinene, Eucalyptol, p-Cymene, α-Terpineol, α-Pinene, Terpinolene
40	*Thymus vulgaris*	Thyme	• Steam distillation • Hydrodistillation • Solvent Extraction • Microwave-Assisted Extraction (MAE)	Thymol, p- Cymene, ϒ- Terpinene, Carvacrol, Linalool, β- Caryophyllene
41	*Chrysopogon zizanioides*	Vitiver	• Steam distillation • Hydrodistillation • Solvent Extraction • Supercritical CO_2 Extraction • Microwave-Assisted Extraction (MAE)	Khusimol, α-Vetivone and β-Vetivone, Vetiselinenol, β-Eudesmol, β-Vetispirene, α-Murolene
42	*Cananga odorata*	Ylang-Ylang	• Steam distillation • Hydrodistillation • Microwave-Assisted Extraction (MAE)	Benzyl Acetate, Linalool, Germacrene-D, β-caryophyllene, Benzyl Benzoate,

				Geranyl Acetate, Methyl Benzoate, p-Methyl Anisole,

Distribution of Essential oils in plants

Essential oils are distributed mostly in the members of the plants belonging to the major groups such as gymnosperms and Angiosperms. Typically, essential oils are found superior in about fifty families are widely distributed in several plant families, including Apiaceae (Umbellifera), Ericaceae, Styracaceae, Orchidaceae, Myrtaceae, Lamiaceae (Lamiaceae), and Rosaceae families belonging to orders of angiosperms (Asterales, Laurales, Magnoliales, Zingiberales, etc.) ginsenosides (Pinales), but also known as sesquiterpeniclactone sesquiterpene volatile, or algae that produce halogenated sesquiterpenes (Butnariu, 2021). Cytologically the essential oils are synthesised primarily in the cytoplasm and plastids through phenyl propanoid pathway. The production of essential oils in plants is generally associated with the presence of specialized secretory structures. After the formation within the plant cells, these oils are also released into the atmosphere by secreting cells such as osmophores, conical-papillate cells, glandular trichomes, ducts, cavities and occasionally nonspecialized cells (Caissard et al., 2004). Although secondary metabolites in the medicinal and aromatic plants are controlled conventionally by their genotypes, their biosynthesis is strongly affected by factors of the environment, too. It means biotic and abiotic environmental factors affect the growth parameters, essential oil yield, and constituents of these oils (Wang et al., 2008). Some of the factors are developmental stage of the plant, light quality, salt stress, association with arbuscular mycorrhizal fungi, fertilizers etc (Rehman et al., 2016).

Methods of Extraction

The most popular methods are steam distillation, solvent extraction, supercritical CO2 extraction, and cold pressing (Aziz et al., 2018). Most conventional methods produce disputes in the form of inefficiency and thermal degradation. Newer extraction methods include supercritical fluid extraction, molecular distillation, enzyme-mediated extraction, microwave-assisted hydro distillation, and microwave-assisted extraction. (Nabi et al., 2025) Different parts of plant are utilized to make essential oils. Typically, essential oil is extracted from the aqueous phase using a physical process and which doesn't significantly alter its chemical makeup. After that, essential oils could receive the proper additional care (Rassem et al., 2016). Extraction methods for essential oil from plants may be standardised for each plant according to the organs from which it is extracted and based on the fractions and properties of the component compounds in the essential oil (Table 1).

It should be noted that yield and vital oil composition can also be impacted by the environment in which plants develop. The yield may also be impacted by the drying techniques and collecting time. To get the highest output and quality of the essential oils, it is

therefore vital to select ideal harvesting period as well as the drying and extraction techniques (Souiy et al., 2022).

Essential Oils and Yoga: Application Techniques

In Yoga practices essential oils are applied in four ways a) Direct Inhalation by applying at pulse points along with carrier oils, b) Diffusion method by using ultrasonic diffuser in the room to set a serene olfactory environment, c) Mat Spray by lightly misting the air and the perimeter of the mat before starting yoga practices and d) Self-massage (Abhyanga) where dilute oils are applied during warm up stretches or post practice cool down. Essential oils are not merely aromatic adjuncts to wellness culture, but bioactive phytochemical agents with demonstrable effects on neurological, physiological, and psychosomatic processes that are directly relevant to the goals of yoga. Inhalation acts rapidly through the olfactory nerve and limbic system, making it particularly suited to pranayama and meditation stages, while transdermal absorption during Abhyanga or post-practice massage offers sustained systemic delivery of bioactive constituents. Ensuring appropriate quality and standardisation of preparations is crucial to guarantee the efficiency of essential oil and safe use (Żukowska & Durczyńska, 2024.

Conclusion

Over the years, the use of aromatic plant extracts in contemplative practices has been treated as a matter of tradition or preference rather than a subject of rigorous scientific inquiry. Framing the aromatic chemistry of essential oils being secondary metabolites with defined biosynthetic pathways, tissue-specific distribution, and species-dependent variability this review emphasises the necessity of treating essential oils as pharmacologically meaningful substances, not merely as sensory enhancers. The adjunctive role of essential oils in optimising practice outcomes deserves scientific legitimacy as now there is global expansion for yoga practices as a wellness and therapeutic discipline. There are certain gaps observed in essential oil research and yoga practice making it difficult to assess interaction effects, complexity of compound complicates dose-response characterisation and creates challenges for standardisation and individual variation in olfactory sensitivity, skin microbiome composition, and metabolic enzyme activity introduces significant inter-subject variability that most current studies do not account for. The future of essential oil research within the yoga and integrative medicine context is both broad and promising focussing on the broadened research on standardisation and quality control, clinical and neuroscientific investigation and integration of personalised aromatherapy in yoga, sustainable ethnobotanical investigation and conservation of bioresources and integration of digital and modern technologies for to quantitatively correlating essential oil application with autonomic and mindfulness outcomes in naturalistic settings**.** The phytochemical study of essential oils in yoga occupies an interdisciplinary space connecting plant biochemistry, neuroscience, clinical psychology, and ancient contemplative traditions. As scientific rigour increasingly meets

traditional wisdom, the field holds substantial promise for both enhancing the therapeutic effectiveness of yoga practice and enriching our understanding of the profound relationship between the plant world and human wellbeing.

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EFFECT OF SURYA NAMASKAR ON SELECTED PHYSICAL FITNESS VARIABLES OF KERALA NETBALL MALE PLAYERS

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Abstract

The study aimed to investigate the impact of Surya Namaskar on specific physical variables among netball players. Twenty-four netball players, aged 17-19, were randomly selected from various clubs in Thiruvananthapuram, Kerala. They were divided into two groups: an experimental group (12 players) and a control group (12 players). Over a 6-week period, the experimental group practiced Surya Namaskar combined with their regular training. Agility, flexibility, and strength served as dependent variables, measured through shuttle run, sit-and-reach, and push-ups tests. For Finding out the significant difference between pre and post training, paired sample t-test and descriptive statistics were applied. The result of the findings of pre and post-test in control group didn't show any significant difference followed by 6-week Surya Namaskar training on the fitness variables ($p > 0.05$). But, the result of the findings of pre and post-test in experimental group showed significant difference followed by 6-week Surya Namaskar training on the fitness variables ($P<0.05$). On the basis of the paired t-test p-value for flexibility, strength and agility are 0.0049, 0.039 and 0.0374 respectively. It was concluded that implication of Surya namaskar practise improves selected physical fitness variables of Kerala Netball players. These findings suggest that incorporating Surya Namaskar into regular training routines can greatly benefit netball players.

Keywords: *Surya namaskar, Netball Players, flexibility, agility, strength etc.*

Introduction

Suryanamaskar, or Sun Salutation, is a comprehensive yoga practice that offers a multitude of benefits for physical fitness and overall well-being. This sequence of twelve postures is designed to create a harmonious flow of movement and breath, making it an effective cardiovascular workout. Regular practice of Suryanamaskar enhances flexibility, as the poses stretch and strengthen various muscle groups, improving overall muscle tone. Additionally, it boosts cardiovascular health by increasing heart rate and promoting blood circulation, which in turn aids in better oxygen delivery to the body's tissues.

The dynamic nature of Suryanamaskar also supports weight management. As it involves continuous movement, it helps burn calories and can contribute to weight loss when practiced consistently. Moreover, this sequence stimulates the digestive system, helping to improve metabolism and reduce issues like constipation and bloating. The physical activity involved in Suryanamaskar also releases endorphins, the body's natural mood lifters, which

can help reduce stress and anxiety, promoting a sense of mental well-being.

From a fitness perspective, Suryanamaskar enhances overall body strength. The poses target different muscle groups, including the core, arms, legs, and back, leading to improved muscle endurance and strength. It also supports joint health by increasing their range of motion and flexibility. Additionally, the emphasis on breath control during the practice enhances lung capacity and respiratory efficiency.

Statement of the Problem

The purpose of the study was to find out the effect of Suryanamaskar practices on selected physical variables among Kerala Netball players.

Objectives of the Study

1. **To investigate the impact of Surya Namaskar on agility among netball players:**
    - Measure and compare the agility of netball players before and after the intervention using the shuttle run test.
2. **To assess the effect of Surya Namaskar on flexibility among netball players:**
    - Evaluate the changes in flexibility pre- and post-intervention using the sit-and-reach test.
3. **To determine the influence of Surya Namaskar on strength among netball players:**
    - Measure the strength of netball players before and after the intervention using the push-up test.
4. **To determine the influence of Surya Namaskar on strength among netball players:**
    - Analyze the differences in agility, flexibility, and strength between the group practicing Surya Namaskar and the group following regular training routines.
5. **To evaluate the overall effectiveness of incorporating Surya Namaskar into regular training routines for netball players:**
    - Assess the potential benefits of including Surya Namaskar in the training regimen to enhance physical performance in netball players.

Hypotheses of the Study

1. **H1** - It was hypothesized that there may be a significant difference on Flexibility due to Surya namaskar practice among Kerala Netball players.
2. **H2** - It was hypothesized that there may be a significant difference on Strength due to Surya namaskar practice among Kerala Netball players.
3. **H3** - It was hypothesized that there may be a significant difference on Agility due to Surya namaskar practice among Kerala Netball players.

Methodology

Selection of Subjects:

- Twenty-four male netball players, aged 17-19, were randomly selected from various clubs in Thiruvananthapuram, Kerala.
- The players were divided into two groups: an experimental group (12 male players) and a control group (12 male players).

Independent Variable:

- The practice of Surya Namaskar combined with regular training for the experimental group.
- Regular training only for the control group.

Dependent Variables:

- **Agility:** Measured using the shuttle run test.
- **Flexibility:** Measured using the sit-and-reach test.
- **Strength:** Measured using the push-ups test.

Procedure:

1. **Pre-Training Measurements:**
    - Baseline measurements of agility, flexibility, and strength were taken for both the experimental and control groups using the shuttle run, sit-and-reach, and push-up tests, respectively.
2. **Training Intervention:**
    - The experimental group practiced Surya Namaskar in addition to their regular training regimen over a period of 6 weeks.
    - The control group continued with their regular training regimen without any additional interventions.
3. **Post-Training Measurements:**
    - After the 6-week period, the agility, flexibility, and strength of both groups were measured again using the shuttle run, sit-and-reach, and push-up tests, respectively.

Statistical Procedure

The data were analysed by applying descriptive statistical and paired t-test by the use of SPSS V 26.0. The level of significance was set for the study at 0.05.

Result and Findings of the Study

Table 1: Descriptive and comparative statistics of pre and post-test of flexibility

	Paired Differences					t	df	Sig.(2-tailed)
Variables	**Mean**	**Std. Deviation**	**Std. Error of Mean**	**95% Confidence Interval of the Difference**				
				Lower	**Upper**			
Control Group	-3.39583	2.20201	.63567	-4.79492	-1.99674	-5.342	11	.000
Experimental Group	-.55250	1.07793	.31117	-1.23738	.13238	-1.77611	11	.103

Table 1 revels that the control group's mean of the pre-test & post-test of flexibility are 32.61 & 32.79 and S.D. 1.43 & 1.64 respectively. The experimental group's mean of the pre-test & post-test of flexibility are 32.69 & 33.98 and S.D. 1.48 & 1.70 respectively. The obtained control group's p-value for flexibility 0.204 is not significant at 0.05 level of significance ($p > 0.05$). The obtained experimental group's p-value for flexibility 0.0049is significant at 0.05 level of significance ($p < 0.05$). The result of the study confirms that significant difference found between the means of pre and post-test in relation to flexibility in experimental group.

Figure: 1: THE DIAGRAMMATIC REPRESENTATION OF AVERAGE PRE AND POST-TEST VALUES OF CONTROL & EXPERIMENTAL GROUP ON FLEXIBILITY

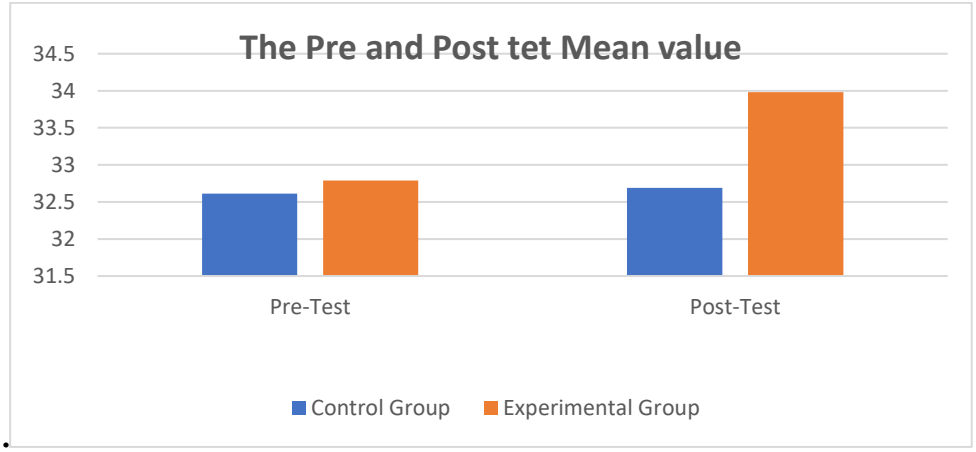


Table 2: Descriptive and comparative statistics of pre and post-test of Agility

	Paired Differences							
Variables	**Mean**	**Std. Deviation**	**Std. Error of Mean**	**95% Confidence Interval of the Difference**		t	df	Sig.(2-tailed)
				Lower	**Upper**			
Control Group	.823333	.74112	.21394	.3545	1.29422	3.848	11	.003
Experimental Group	.04083	.06142	.01773	.01773	.07986	2.303	11	.042

Table 2 revels that the control group's mean of the pre-test & post-test of agility are 12.12 & 12.02 and S.D. 0.12 & 0.18 respectively. The experimental group's mean of the pre-test & post-test of agility are 12.10 & 11.12 and S.D. 0.24 & 0.26 respectively. The obtained control group's p-value for agility 0.212 is not significant at 0.05 level of significance ($p > 0.05$). The obtained experimental group's p-value for agility 0.039 is significant at 0.05 level of significance ($p < 0.05$). The result of the study confirms that significant difference found between the means of pre and post-test in relation to agility in experimental group.

Figure: 2: THE DIAGRAMMATIC REPRESENTATION OF AVERAGE PRE AND POST-TEST VALUES OF CONTROL & EXPERIMENTAL GROUP ON AGILITY.

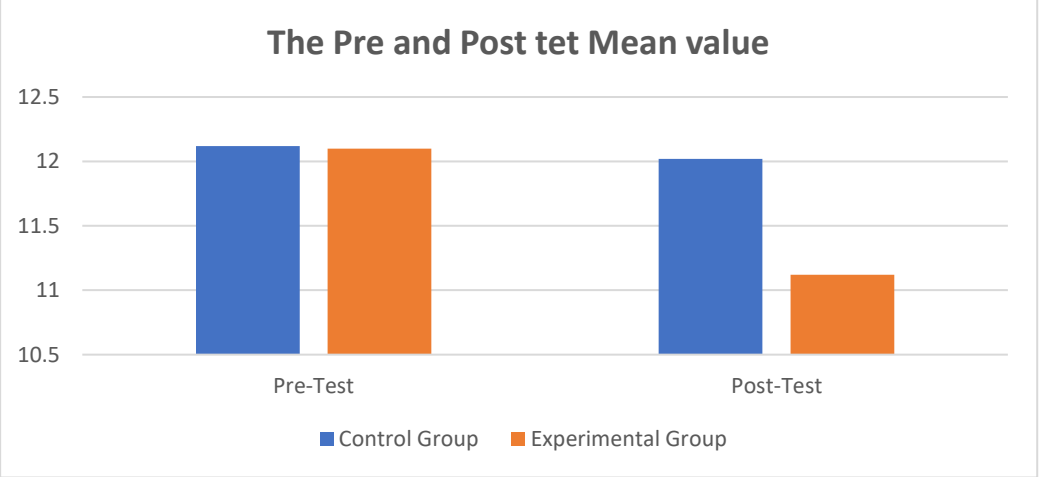
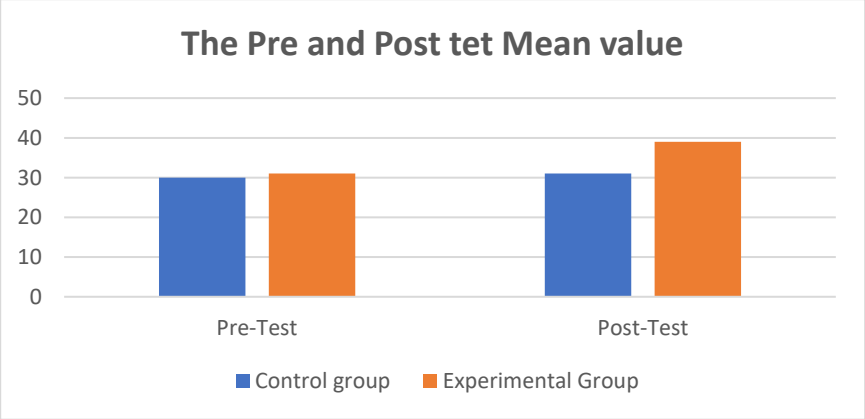


Table 3: Descriptive and comparative statistics of pre and post-test of Strength

Variables	Paired Differences					t	df	Sig.(2-tailed)
	Mean	Std. Deviation	Std. Error of Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Control Group	-4.833	3.186	.920	-6.858	-2.809	-5.255	11	.000
Experimental Group	-.250	.452	.131	-.537	.037	-1.9115	11	.082

Table 3 revels that the control group's mean of the pre-test & post-test of strength are 30 & 31 and S.D. 2.87 & 3.14 respectively. The experimental group's mean of the pre-test & post-test of strength are 31 & 39 and S.D. 2.99 & 3.10 respectively. The obtained control group's p-value for strength 0.2048 is not significant at 0.05 level of significance ($p > 0.05$). The obtained experimental group's p-value for strength 0.0374 is significant at 0.05 level of significance ($p < 0.05$). The result of the study confirms that significant difference found between the means of pre and post-test in relation to strength in experimental group.

Figure:3: THE DIAGRAMMATIC REPRESENTATION OF AVERAGE PRE AND POST-TEST VALUES OF CONTROL & EXPERIMENTAL GROUP ON AGILITY.



Discussion on Hypotheses

The result of the findings of pre and post-test in control group didn't show any significant difference followed by 6-week Surya Namaskar training on the fitness variables. But, the result of the findings of pre and post-test in experimental group showed significant difference followed by 6-week Surya Namaskar training on the fitness variables. Hence all the three-research hypothesis were thus accepted.

CONCLUSIONS & RECOMMENDATION

The present study reveals that experimental group showed significant difference in all the three physical variables (strength, flexibility and agility) followed by 6-

week Surya Namaskar training among Kerala Netball Players. Similar study may be conducted throughout the state and nation to identify the impact of Surya Namaskar practices on their physical and other parameters. Through this study we could find out that the Surya namaskar practices improved the physical fitness variables in Netball players. Through this study we can suggests that Surya namaskar practices helps for improving physical fitness variables.

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INFLUENCE OF MEDITATION AND PRANAYAMA PRACTICES ON DECISION-MAKING ABILITY AMONG COLLEGIATE VOLLEYBALL PLAYERS

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Abstract

In modern volleyball, physical fitness alone is not sufficient for achieving high-level performance. Players are constantly required to make quick and accurate decisions during competitive situations. Therefore, mental preparation has become an important part of sports training. The present study was conducted to examine the influence of meditation and pranayama practices on decision-making ability among collegiate volleyball players.

Twenty-eight male volleyball players from St. Stephen's College, Pathanapuram, were selected as subjects for the study. Some of the participants were also selected players of the Kerala State Sports Council Volleyball Sports Hostel, indicating a good competitive playing background among the subjects. The selected players were randomly divided into two equal groups consisting of fourteen players each. The experimental group underwent meditation and pranayama training for eight weeks along with regular volleyball practice, whereas the control group continued only regular volleyball training.

Decision-making ability was assessed before and after the training period using sports decision-making questionnaires and volleyball situational analysis tasks. The findings of the study revealed signifi

cant improvement in decision-making ability among players who participated in meditation and pranayama practices. The study concludes that yoga-based mental training positively contributes to cognitive and psychological performance among volleyball athletes.

Keywords: *Meditation, Pranayama, Volleyball, Decision-Making Ability, Yoga Training, Collegiate Athletes, Sports Psychology*

Introduction

Volleyball is considered one of the fastest and most dynamic team sports in the modern sporting world. Success in volleyball depends not only on physical fitness and technical skill but also on the player's ability to make quick and correct decisions during game situations. Players are continuously required to analyze ball movement, opponent strategies, teammate positioning, and tactical opportunities within a fraction of a second. In such situations, concentration, emotional stability, attention, and mental calmness play an important role in performance.

In recent years, sports scientists and coaches have increasingly recognized the importance of psychological preparation in athletic performance. Along with physical and technical training, mental conditioning has become an essential part of sports training

programmes. Among various psychological techniques, meditation and pranayama are widely practiced yogic methods known for improving concentration, relaxation, emotional control, and mental awareness.

Meditation is a mental practice that helps individuals focus attention and remain calm under pressure. It is believed to improve concentration, reduce anxiety, and increase emotional balance. Pranayama refers to yogic breathing techniques that regulate breathing patterns and enhance the functioning of the nervous system. Regular practice of pranayama may help athletes improve breathing efficiency, reduce stress, and maintain psychological stability during competition.

Although several studies have examined the role of yoga in physical fitness and mental wellbeing, only limited research has focused specifically on the influence of meditation and pranayama practices on decision-making ability among volleyball players. Therefore, the present study was undertaken to investigate whether yoga-based mental training can improve cognitive performance and decision-making ability among collegiate volleyball players.

Objectives of the Study

1. To determine the influence of meditation and pranayama practices on decision-making ability among collegiate volleyball players.
2. To compare the pre-test and post-test scores of experimental and control groups.
3. To examine whether yoga-based mental training can improve cognitive performance among volleyball athletes.

Hypothesis

It was hypothesized that meditation and pranayama practices would significantly improve the decision-making ability of collegiate volleyball players.

Methodology

Research Design

The present study adopted an experimental research design to examine the influence of meditation and pranayama practices on decision-making ability among collegiate volleyball players.

Selection of Subjects

The investigator, serving as an Assistant Professor in Physical Education at St. Stephen’s College, Pathanapuram, selected twenty-eight male volleyball players as subjects for the study. Some of the selected players were also trainees of the Kerala State Sports Council Volleyball Sports Hostel, reflecting a good competitive standard and advanced playing experience among participants.

The age of the subjects ranged between 18 and 25 years.

Group Division

The selected subjects were randomly divided into two equal groups:

- Experimental Group – 14 players
- Control Group – 14 players

Duration of Training

The training programme lasted for eight weeks.

Frequency of Training

Training sessions were conducted five days per week.

Duration of Each Session

Each session lasted approximately 40 minutes.

Training Programme

Meditation Practices

The meditation programme included:

- Mindfulness meditation
- Breath awareness meditation
- Concentration meditation

Pranayama Practices

The pranayama training programme included:

- Anulom Vilom
- Nadi Shodhana
- Bhramari
- Deep breathing exercises

Relaxation Technique

At the end of each session, Shavasana relaxation was practiced to promote physical and mental relaxation.

Procedure of the Study

Before the commencement of the training programme, pre-test measurements were conducted for both groups to assess decision-making ability. The experimental group participated in meditation and pranayama practices along with regular volleyball training, whereas the control group continued only their regular volleyball training programme.

The intervention programme continued for eight weeks. After the completion of the training period, post-test measurements were conducted using the same testing procedures.

Decision-making ability was assessed using:

- Sports decision-making questionnaire
- Volleyball situational analysis tasks
- Reaction-based cognitive assessments

Statistical Analysis

The collected data were analyzed using the following statistical techniques:

- Mean
- Standard Deviation
- Paired t-test
- Independent t-test

The level of significance was fixed at 0.05.

Results of the Study

Table 1 Pre-Test and Post-Test Decision-Making Scores

Subjects	Experimental Group Pre-Test	Experimental Group Post-Test	Control Group Pre-Test	Control Group Post-Test
1	61	82	62	64
2	63	84	61	63
3	60	81	64	65
4	62	83	63	65
5	64	86	62	64
6	61	82	65	66
7	63	85	61	63
8	62	84	63	65
9	60	81	62	64
10	64	87	64	66
11	63	85	63	65
12	61	82	62	63
13	62	84	64	66
14	63	86	61	64

Mean Scores

Group	Pre-Test Mean	Post-Test Mean
Experimental Group	62.07	83.71
Control Group	62.64	64.50

Interpretation of Results

The results of the study clearly indicate that the experimental group showed remarkable improvement in decision-making ability after participating in meditation and pranayama practices for eight weeks. The post-test mean score of the experimental group was considerably higher than the pre-test score.

In contrast, the control group demonstrated only slight improvement after the training period. The improvement observed among the experimental group may be attributed to enhanced concentration, emotional stability, breathing control, mental relaxation, and increased attention developed through yogic practices.

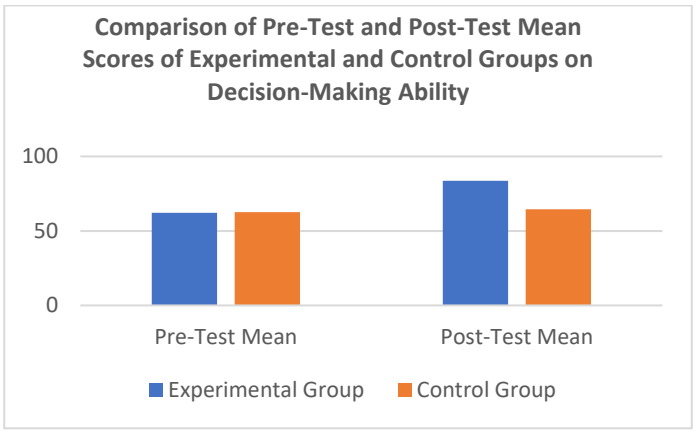
Meditation helps athletes remain mentally calm and focused during stressful situations, while pranayama improves breathing efficiency and reduces anxiety. Volleyball players are often required to make quick tactical decisions regarding passing, attacking, blocking, and defensive positioning. Better mental clarity and concentration may positively

influence such game-related decisions.

The findings of the present study support the growing importance of psychological preparation and yoga-based interventions in modern sports training programmes.Graphical

Representation of Results

Figure 1



The graphical representation of the results shows a substantial increase in the post-test mean score of the experimental group compared to the control group. This indicates that meditation and pranayama practices had a positive influence on the decision-making ability of collegiate volleyball players.

The experimental group demonstrated noticeable improvement after participating in yoga-based mental training, whereas the control group showed only marginal improvement through regular volleyball practice alone.

Discussion

The findings of the study revealed that meditation and pranayama practices positively influenced decision-making ability among collegiate volleyball players. The experimental group showed better cognitive performance compared to the control group after the intervention period.

The improvement may be associated with increased concentration, emotional regulation, and psychological stability developed through meditation and pranayama practices. These findings are supported by previous research studies which reported that yoga-based mental training improves attention, stress management, and sports performance among athletes.

Volleyball is a highly demanding sport where players are continuously exposed to pressure situations. The ability to remain calm and make quick decisions is essential for successful performance. Therefore, incorporating meditation and pranayama into sports training programmes may help athletes improve both psychological and tactical aspects of performance.

Conclusion

The study concludes that meditation and pranayama practices have a positive influence on the decision-making ability of collegiate volleyball players. Incorporating yoga-based mental training into regular volleyball coaching programmes may help athletes improve concentration, emotional control, mental focus, and cognitive performance during competition.

The findings also emphasize the importance of integrating psychological preparation along with physical and technical training in volleyball.

Practical Applications

1. Meditation and pranayama can be included in volleyball training schedules.
2. Yoga-based mental training may improve concentration and emotional control among athletes.
3. Coaches may use meditation techniques to enhance player focus during competition.
4. Pranayama practices may assist in stress management and recovery.
5. Sports institutions can incorporate yoga programmes for improving cognitive performance among athletes.

Recommendations

1. Similar studies may be conducted among female volleyball players.
2. Future research may examine the effect of yoga practices on reaction time, anxiety, and sports performance.
3. Studies can be conducted using larger sample sizes and longer training durations.
4. Advanced psychological and physiological variables may be included in future investigations.

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IMPACT OF SURYA NAMASKAR ON SELECTIVE RANGE OF MOTION AMONG SCHOOL GIRLS

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Abstract

The reason of the study was to discover the impact of surya namaskar on selective range of motion among school girls. Thirty subjects were selected from Government kallar Girls Higher Secondary School, checkanurani, Madurai. The subject's aged between 14 to 17 years. The selected subjects were divided into two groups with fifteen subjects in each group selected randomly Surya Namaskar group and control group. The six weeks training periods of experimental group are involved five days per week. Control group did not undertake any training other than their regular work. To attain the significance difference in between the means on the criterion variables of correlated `t' ratio was apply. This study it processes with proper statistical technique. The data result is obtained `t' values are tested at 0.05 levels.

Keywords: *1. Surya Namaskar 2. Flexibility.*

Introduction

Surya Namaskar or Sun Salutation:

It improves overall body strength, builds stamina, and develops flexibility Helps maintain cardiovascular health. Stimulates the nervous system. Helps in stretching, flexing and toning the muscles. Surya Namaskar or Sun Salutation is a sequence of 12 powerful yoga poses. Besides being a great cardiovascular workout, Surya Namaskar is also known to have an immensely positive impact on the body and mind. Surya Namaskar is best done early morning on an empty stomach. Each round of Sun Salutation consists of two sets, and each set is composed of 12 yoga poses. It should ideally be done early in the morning, facing the rising sun, and each movement of the body is synchronised with a breath, exhaling at the folds and inhaling as you lengthen or stretch out the body. It serves as a complete exercise for the body, vitalizing all the major muscles and vital organs. Each round takes 1 to 2 minutes to perform, depending on the speed and intensity of the practice. Several variations on the classic Surya Namaskar exists. Surya Namaskar is a universal practice. From beginners to

seasoned Yogis, children to elderly, everyone is encouraged to practice Surya Namaskar.

Methodology

Selection of Subject

The reason of the study was to discover the effect of Surya Namaskar on range of motion among school girls. Thirty subjects were selected from Government kallar Girls Higher Secondary School, checkanurani, Madurai. The subject's aged between 14 to 17 years. The selected subjects were divided into two groups with fifteen subjects in each group selected randomly Surya Namaskar group and control group. The six weeks training periods of experimental group are involved five days per week. Control group did not undertake any training other than their regular work. To attain the significance difference in between the means on the criterion variables of correlated `t' ratio was apply. This study it processes with proper statistical technique. The data result is obtained `t' values are tested at 0.05 levels.

Selection of Variables

Flexibility - Sit & Reach Test (cm)

Statistical Techniques

The collected data on flexibility were statistically examined to the test. The various hypothesis formulated by the researcher for comparison't' ratio was used. 't' ratio was the difference between the mean, standard deviation and standard error of the difference between the means.

Level of Significance

For testing the significance of the differences between pre and posttest means of the control and experimental group, 0.05 level of significance was fixed.

Computation of't' Ratio between the Pre and Post Test

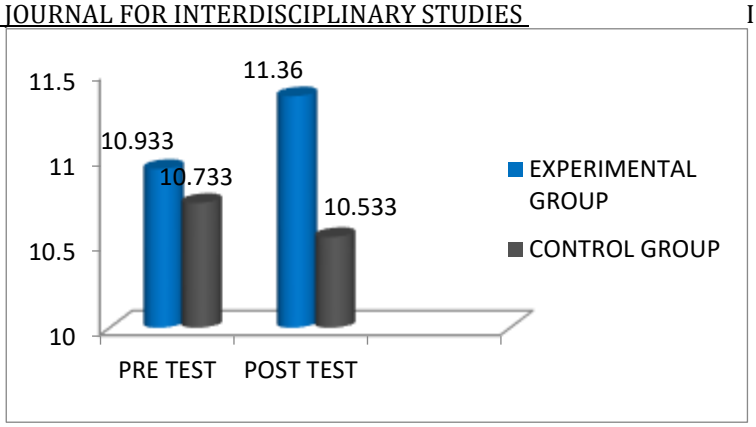
Means of Flexibility

Variables	Group	Mean		SD		Sd Error	df	't' ratio
		Pre	Post	Pre	Post			
Flexibility	Control	10.733	10.533	0.593	0.639	0.200	14	1.000
	Experimental	10.933	11.360	0.883	0.640	0.094		**4.526***

*** Significance at 0.05 level of confidence df (14) is = 2.14**

The table shows that the obtained control group of flexibility mean values of pretest and posttest were 10.73, 10.53 respectively. The obtained 't' ratio is 1.00 the required table value is 2.14 at 0.05 level significance. The obtained 't' ratio is lesser than the required table value. It is found to be insignificant.

The table shows that the obtained experimental group of flexibility mean values of pretest and posttest were 10.93, 11.36 respectively. The standard deviation was 0.88 and 0.64. The obtained't' ratio is the required table value is 2.14 at 0.05 level significance. The obtained't' ratio 4.52 is greater than the required table value. It is found to be significant.



Discussion on the Findings

The result of the study indicated the experimental group (Surya Namaskar) had significantly improved the flexibility when compared to the control group.

From the result of the present investigation, it is also concluded that the significant difference exits between experimental and control group in developing all the variables.

The outcome of this study result with the hypothesis of the analysis. Interest on the part of the subject used in this study to improve their Surya Namaskar practices might also account for the result and this inference is supported by the further fact that all previous studies of similar nature were conducted on Surya Namaskar practices. The six weeks period for the experimental group seen to be generate applicable result.

The results of the study reveal that there was a significant difference found among school girls on flexibility also when comparing the mean values.

Conclusions

On the basis of the limitations and the statistical analysis of the data, the following conclusions were drawn from the result.

1. After six weeks of training, it was observed that a significant improvement in school girls flexibility.
2. The control group shows and insignificant improvement of 0.05 level of confidence.

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EFFECT OF YOGA TRAINING ON PHYSICAL FITNESS AND PSYCHOLOGICAL WELL-BEING AMONG COLLEGIATE ATHLETES

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Abstract

This study aimed to assess the effects of an eight-week yoga program on specific physical fitness indicators and psychological health among college athletes. Thirty athletes (15 males, 15 females) aged 18–25 were randomly assigned to either an experimental group (n=15) or a control group (n=15). The experimental group participated in a structured yoga routine consisting of selected asanas, pranayama, and meditation over eight weeks. In contrast, the control group continued their usual sports training without additional interventions. The study evaluated flexibility, balance, agility, core strength, and psychological well-being using standardized tests and the Ryff Psychological Well-Being Scale, both before and after the intervention. Data analysis included descriptive statistics, ANCOVA, Cohen's d, and Pearson correlation. Results from ANCOVA showed significant improvements in the experimental group over controls in flexibility (F=15.42, p=.001), balance (F=12.88, p=.001), agility (F=10.65, p=.003), core strength (F=14.65, p=.001), and psychological well-being (F=17.84, p<.001). Large effect sizes were observed across all variables, with Cohen's d ranging from 0.94 to 1.31, indicating meaningful practical effects. Positive correlations were found among flexibility, balance, core strength, and psychological well-being, whereas agility time was negatively related to these factors. Overall, the findings suggest that yoga effectively enhances physical fitness and mental health among college athletes, supporting its inclusion in athletic training programs to support comprehensive athlete development

Keywords: *Yoga Training, Physical Fitness, Psychological Well-Being, Collegiate Athletes, Flexibility, Balance, Agility, Core Strength, ANCOVA.*

INTRODUCTION

Sports performance is influenced by physical, physiological, biomechanical, psychological, and social factors. Modern training emphasizes improving skills and psychological well-being (Weinberg & Gould, 2019; Gould & Maynard, 2009). College athletes face challenges balancing academics, training, competitions, social life, and future careers. These pressures can cause stress, anxiety, emotional exhaustion, and mental fatigue,

affecting performance, recovery, and growth (Humphrey et al., 2000; Rice et al., 2016; Reardon et al., 2019).

Physical fitness is essential for success in sports, encompassing flexibility, balance, agility, muscular endurance, and core strength. These components influence movement, help prevent injuries, and improve technique (Baechle & Earle, 2008; Bompa & Buzzichelli, 2019). Flexibility supports joint mobility and minimizes injury risk (Behm et al., 2016), balance enhances posture and coordination (Hrysomallis, 2011), agility allows rapid changes in direction (Sheppard & Young, 2006), and core strength increases force, stability, and efficiency (Kibler et al., 2006; Reed et al., 2012). Incorporating training focused on these areas is crucial within athletic development programs.

Recently, there has been increased interest in the psychological factors influencing sports performance. Psychological well-being is regarded as a vital indicator of mental health and overall functioning, encompassing elements such as self-acceptance, independence, control over one's environment, personal growth, life purpose, and healthy relationships (Ryff, 1989; Ryff & Keyes, 1995). Athletes exhibiting higher levels of psychological well-being tend to demonstrate better emotional regulation, greater self-confidence, improved focus, enhanced motivation, and more effective stress management during competitions (Jones, 2002; Gucciardi et al., 2015). Additionally, good psychological health is associated with more consistent performance, reduced burnout, and greater satisfaction in sports activities (Gustafsson et al., 2011; Lundqvist, 2011).

Yoga, one of the oldest health practices originating from India, has gained strong scientific backing for its benefits to both physical and mental health. Traditionally, it combines postures (asanas), breathing techniques (pranayama), meditation (dhyana), and relaxation methods to promote harmony between the mind and body (Iyengar, 2005; Feuerstein, 2008). Unlike conventional workouts that primarily target physical fitness, yoga emphasizes mental concentration, emotional regulation, and spiritual development (Khalsa, 2004; Woodyard, 2011).

Research shows regular yoga boosts flexibility, strength, balance, and breathing (Tran et al., 2001; Cowen & Adams, 2005; Polsgrove et al., 2016). It improves musculoskeletal function through stretching and strengthening (Roland et al., 2011), enhancing joint movement. Yoga also boosts proprioception, neuromuscular control, and stability, reducing injuries and improving athletic performance (Schmid et al., 2010; Bird et al., 2012). It benefits heart health, autonomic regulation, and recovery by lowering resting heart rate, blood pressure, cortisol, and sympathetic activity, and increasing parasympathetic responses and relaxation, aiding stress management. Evidence supports psychological benefits, including reductions in stress, anxiety, depression, and mood swings (Field, 2011; Li & Goldsmith, 2012; Büssing et al., 2012). It enhances mindfulness, self-awareness, emotional intelligence, self-esteem, resilience, and well-being (Gard et al., 2014; Impett et al., 2006; Desikachar et

al., 2005). Practices such as meditation and pranayama improve attention, cognition, emotional regulation, and stress management, all of which are key to athletic success (Jha et al., 2007; Tang et al., 2015). In sports, yoga is used for flexibility, recovery, focus, and mental readiness (Brunelle et al., 2015; Polsgrove et al., 2016). College athlete studies show improvements in flexibility, balance, muscle endurance, and mental health (Patil & Deshmukh, 2018; Kauts & Sharma, 2009). Reviews confirm yoga benefits fitness and mental well-being, complementing training (Ross & Thomas, 2010; Büssing et al., 2012; Cramer et al., 2014). Few studies have explored yoga's combined physical and psychological effects among college athletes.

Most research has focused on isolated physical or psychological outcomes, leaving a gap in understanding the overall effects of yoga in athletic groups. As there is a growing focus on well-rounded athlete development, more research is needed to assess methods that improve both physical and psychological aspects together. For this reason, this study aimed to explore the impact of an eight-week yoga training program on selected physical fitness factors, specifically flexibility, balance, agility, and core strength, as well as psychological well-being among college athletes. The results could provide valuable insights into integrating yoga into college athletic training programs to enhance performance and promote overall well-being.

METHODOLOGY

This study involved 30 collegiate athletes, comprising 15 males and 15 females, aged 18 to 25 years. The participants were randomly selected from different colleges affiliated with universities in Kerala, India. Before taking part, each subject was informed about the study's purpose and procedures, and their voluntary consent was obtained. The selected athletes were healthy, actively engaged in sports training, and free of injuries or medical conditions that could hinder their participation in the training program.

Experimental Design

A randomized pretest-posttest control-group study involved 30 athletes, divided into two groups of 15 each. The Experimental Group participated in an 8-week yoga program, while the Control Group continued their usual activities. Pre- and post-test measurements were taken accordingly. The yoga program included three weekly sessions of about 60 minutes, starting with a 10-minute warm-up and 10 minutes of Surya Namaskar to promote flexibility and endurance. The main 20-minute session focused on specific asanas, including Trikonasana and Vrikshasana, to enhance flexibility, balance, strength, and stability. This was followed by 10 minutes of pranayama exercises, including Nadi Shodhana and Bhramari, to improve breathing and focus. Sessions concluded with ten minutes of guided meditation for stress reduction and emotional well-being. The control group did not participate in yoga.

Variables and Tests

The study examined physical fitness variables and psychological well-being. Flexibility was measured using the Sit-and-Reach Test to assess lower back and hamstring

flexibility. Balance was assessed via the Stork Stand Test, a measure of static balance. Agility was tested using the T-Test to evaluate quick directional changes while maintaining speed and control. Core strength was evaluated with the Plank Hold Test for core endurance. Psychological well-being was measured by the Ryff Scale, which assesses self-acceptance, growth, autonomy, mastery, relationships, and purpose. Data from pre- and post-tests were analyzed using descriptive statistics and ANCOVA to compare groups at the 0.05 significance level and determine whether yoga led to improvements.

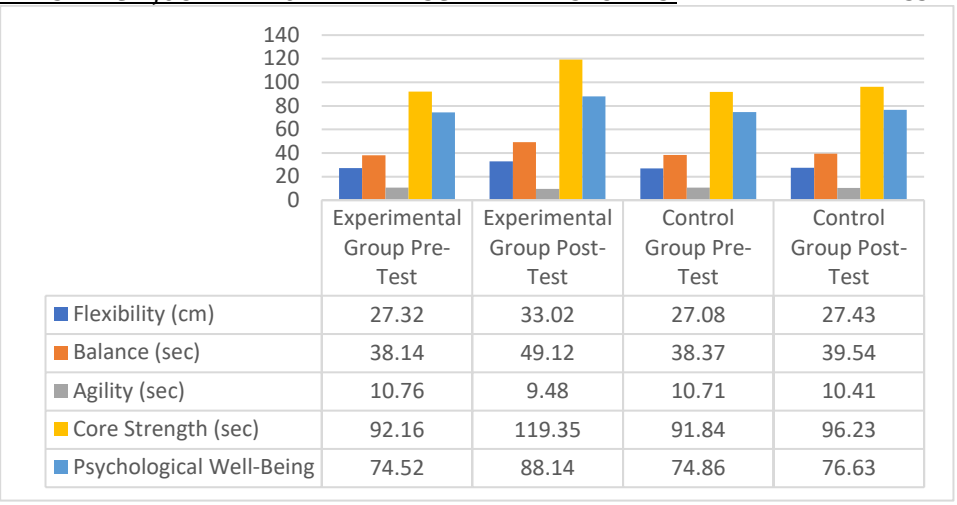
RESULTS AND DISCUSSION

The purpose of the study was to investigate the effect of an eight-week yoga training program on selected physical fitness variables and psychological well-being among collegiate athletes. The data collected from the experimental and control groups were analyzed using descriptive statistics and Analysis of Covariance (ANCOVA). The results are presented in the following tables.

Table 1. ***Pre-Test and Post-Test Mean Scores of Experimental and Control Groups on Selected Variables***

Variable	**Experimental Group Pre-Test**	**Experimental Group Post-Test**	**Control Group Pre-Test**	**Control Group Post-Test**
Flexibility (cm)	27.32	33.02	27.08	27.43
Balance (sec)	38.14	49.12	38.37	39.54
Agility (sec)	10.76	9.48	10.71	10.41
Core Strength (sec)	92.16	119.35	91.84	96.23
Psychological Well-Being	74.52	88.14	74.86	76.63

Table 1 shows pre- and post-test scores for experimental and control groups in fitness and well-being. Initial scores were similar. After eight weeks, the experimental group improved significantly: flexibility from 27.32 cm to 33.02 cm, balance from 38.14 to 49.12 seconds, and core strength from 92.16 to 119.35 seconds. The control group saw minimal increases: flexibility from 27.08 to 27.43 cm, balance from 38.37 to 39.54 seconds, and core strength from 91.84 to 96.23 seconds. The experimental group's agility decreased from 10.76 to 9.48 seconds, with little change in the control group. Psychological well-being scores rose from 74.52 to 88.14 in the experimental group and slightly in the control group from 74.86 to 76.63. These findings indicate yoga training improved physical fitness and well-being among college athletes, with little change in the control group.



	Experimental Group Pre-Test	Experimental Group Post-Test	Control Group Pre-Test	Control Group Post-Test
Flexibility (cm)	27.32	33.02	27.08	27.43
Balance (sec)	38.14	49.12	38.37	39.54
Agility (sec)	10.76	9.48	10.71	10.41
Core Strength (sec)	92.16	119.35	91.84	96.23
Psychological Well-Being	74.52	88.14	74.86	76.63

Figure 1. ***Pre-Test and Post-Test Mean Scores of Experimental and Control Groups***

Table 2. ***ANCOVA Results for Adjusted Post-Test Scores of Selected Variables***

Variable	Source of Variance	SS	df	MS	F-value	p-value
Flexibility (cm)	Between Groups	122.64	1	122.64	15.42	.001*
	Error	214.73	27	7.95		
Balance (sec)	Between Groups	682.11	1	682.11	12.88	.001*
	Error	1430.28	27	52.97		
Agility (sec)	Between Groups	5.42	1	5.42	10.65	.003*
	Error	13.74	27	0.51		
Core Strength (sec)	Between Groups	3894.52	1	3894.52	14.65	.001*
	Error	7180.43	27	265.94		
Psychological Well-Being	Between Groups	925.37	1	925.37	17.84	.000**
	Error	1400.26	27	51.86		

Critical F-value (0.05, df = 1, 27) = 4.21

Table 2 shows the ANCOVA results, which showed significant differences between the experimental and control groups across all variables after adjusting for pre-test scores. F-values for flexibility (15.42), balance (12.88), agility (10.65), core strength (14.65), and psychological well-being (17.84) exceeded the critical F-value of 4.21, with p-values from .003 to < .001. Partial eta squared (.283–.398) indicates moderate to large effects, especially for psychological well-being (η^2 = .398), flexibility (η^2 = .364), and core strength (η^2 = .352). These results show that the yoga program significantly improved physical fitness and psychological well-being in collegiate athletes.

Table 3 ***Cohen's d Effect Size for Selected Variables***

Variable	Experimental Mean Gain	Control Mean Gain	Cohen's d
Flexibility (cm)	5.70	0.35	1.18
Balance (sec)	10.98	1.17	1.07
Agility (sec)	-1.28	-0.30	0.94
Core Strength (sec)	27.19	4.39	1.23
Psychological Well-Being	13.62	1.77	1.31

Table 3 shows the effect of yoga training on the variables. All demonstrated large effect sizes per Cohen (1988): psychological well-being (d = 1.31), core strength (d = 1.23), and flexibility (d = 1.18). These results indicate that the yoga intervention led to significant practical improvements, confirming its effectiveness for collegiate athletes.

Table 4 Pearson Product-Moment Correlation Matrix Among Selected Variables

Variables	Flexibility	Balance	Agility	Core Strength	Psychological Well-Being
Flexibility	1.000	.624**	-.518**	.586**	.472*
Balance	.624**	1.000	-.563**	.648**	.541**
Agility	-.518**	-.563**	1.000	-.486*	-.428*
Core Strength	.586**	.648**	-.486*	1.000	.612**
Psychological Well-Being	.472*	.541**	-.428*	.612**	1.000

Table 4 shows Pearson correlations among physical fitness and psychological well-being. Flexibility was positively linked with balance ($r = .624$, $p < .01$), core strength ($r = .586$, $p < .01$), and well-being ($r = .472$, $p < .05$). Balance correlated with core strength ($r = .648$, $p < .01$) and well-being ($r = .541$, $p < .01$). Agility time negatively correlated with flexibility ($r = -.518$, $p < .01$), balance ($r = -.563$, $p < .01$), core strength ($r = -.486$, $p < .05$), and well-being ($r = -.428$, $p < .05$), meaning better agility was linked to higher fitness and well-being. Core strength showed the strongest positive association with well-being ($r = .612$, $p < .01$). Overall, fitness improvements coincided with better psychological well-being, highlighting the link between physical and mental health following yoga training.

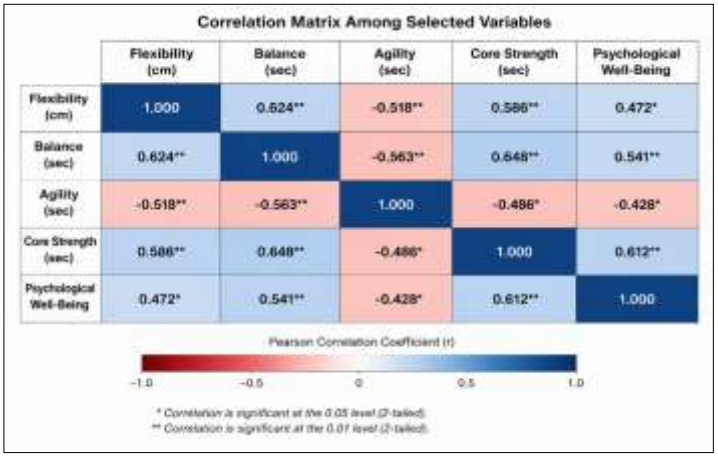


Figure 2 Pearson Product-Moment Correlation Matrix Among Selected Variables

DISCUSSION OF FINDINGS

This study aimed to assess the impact of an eight-week yoga program on certain physical fitness measures and mental well-being among college athletes. The findings demonstrated statistically significant gains in flexibility, balance, agility, core strength, and psychological health in the yoga group compared to the control group. These results suggest

that yoga effectively improves both physical abilities and psychological health, benefiting athletic performance.

The notable increase in flexibility likely results from regular yoga practices that include static and dynamic stretches of major muscle groups. Asanas like Paschimottanasana, Trikonasana, and Surya Namaskar repeatedly stretch muscles and connective tissues, boosting joint mobility and muscle elasticity. Improved flexibility aids movement and reduces the risk of injury. These findings align with Tran et al. (2001), who observed gains in flexibility from regular Hatha yoga, and with Polsgrove et al. (2016) and Patil and Deshmukh (2018), who found that yoga significantly improved flexibility in athletes and students.

Balance performance improved significantly after yoga training. Postures like Vrikshasana and Trikonasana require stability and body control. Regular practice boosts proprioception, neuromuscular coordination, and postural control. Better balance benefits athletes by improving movement efficiency and lowering injury risk. The study aligns with Schmid et al. (2010), Bird et al. (2012), and Polsgrove et al. (2016), who found yoga enhances balance and stability.

The results showed a significant increase in agility in the experimental group. While agility is typically improved through sport-specific drills and plyometric exercises, yoga might enhance it indirectly by increasing flexibility, body awareness, coordination, and neuromuscular efficiency. Better mobility and postural control allow athletes to perform quick directional changes more effectively. The decrease in agility test times suggests yoga training improved movement efficiency and motor control. These findings support the use of yoga as a valuable addition to athletic training to improve functional movement.

Participants who engaged in yoga training showed a significant increase in core strength. Many yoga poses require holding isometric contractions of the abdominal, lower back, pelvic, and trunk muscles. Asanas like Bhujangasana and various stabilization poses target the core muscles, enhancing endurance and stability. A strong core is vital for good posture, effective force transfer between the upper and lower body, and athletic performance. These results align with studies by Cowen and Adams (2005) and Ross and Thomas (2010), which found that regular yoga practice improves muscular endurance and functional strength.

The study revealed that the experimental group experienced notable improvements in psychological well-being through practices such as pranayama, meditation, relaxation, and mindful movement. Breathing techniques like Nadi Shodhana and Bhramari promote relaxation and stability by activating the parasympathetic nervous system. Meditation boosts focus, mindfulness, and emotional health, leading participants to feel more psychologically healthy after eight weeks. These findings support previous research demonstrating yoga's positive effects on mental health and emotional well-being. For instance, Field (2011) reported reductions in anxiety and stress, while Telles et al. (2013) found improvements in cognitive and psychological health among young adults. Ryff (1989) described psychological

well-being as including self-acceptance, autonomy, mastery, purpose, and growth. The results suggest that yoga enhances these qualities in collegiate athletes.

Yoga's holistic approach explains the improvements in physical and psychological variables observed in athletes. Unlike traditional training, yoga combines physical postures, breathing, and meditation to boost fitness, mental focus, emotional regulation, and recovery. This comprehensive method supports the inclusion of yoga in athletic training, enhancing flexibility, balance, agility, core strength, and well-being. Coaches and trainers should consider integrating yoga to promote overall athlete development and performance.

CONCLUSION

1. An eight-week structured yoga training programme significantly improved selected physical fitness variables among collegiate athletes.
2. The experimental group demonstrated significant gains in flexibility, balance, agility, and core strength compared with the control group.
3. Regular yoga practice enhances physical capabilities that are essential for athletic performance, movement efficiency, and injury prevention.
4. Yoga training resulted in a significant improvement in psychological well-being, indicating positive effects on athletes' mental health.
5. The inclusion of pranayama, meditation, and relaxation techniques contributed to better emotional regulation, stress management, concentration, and overall psychological functioning.
6. ANCOVA analysis revealed statistically significant differences between the experimental and control groups in all selected variables at the 0.05 level of significance.
7. Large effect sizes (Cohen's d = 0.94–1.31) indicated that the improvements were not only statistically significant but also practically meaningful.
8. Correlation analysis showed positive relationships between physical fitness components and psychological well-being, suggesting that improvements in physical fitness were associated with enhanced mental well-being.
9. The findings support yoga as a holistic training method capable of simultaneously improving physical fitness and psychological health among collegiate athletes.
10. Yoga can be effectively integrated into conventional athletic conditioning programs as a complementary training strategy.
11. Coaches, physical educators, sports scientists, and sports psychologists should consider incorporating structured yoga sessions into regular training schedules to promote comprehensive athlete development.
12. Overall, yoga training serves as an effective intervention for enhancing athletic performance, psychological well-being, recovery capacity, and quality of life among collegiate athletes.

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DIGITAL MINIMALISM AND MENTAL HEALTH: RECLAIMING WELL-BEING IN THE AGE OF CONSTANT CONNECTIVITY

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Abstract

The present study examined the relationship between digital minimalism and mental health among college students. The study was conducted using a descriptive survey method with a sample of 300 undergraduate and postgraduate students selected through stratified random sampling from colleges in Kerala. Digital minimalism was considered the independent variable, while mental health, comprising stress, anxiety, emotional well-being, and life satisfaction, served as the dependent variable. Data were collected using a Digital Minimalism Scale, a standardized Mental Health Scale, and a Personal Data Sheet. Statistical techniques such as percentage analysis, mean, standard deviation, Pearson's correlation, t-test, and multiple regression were employed for data analysis. The findings revealed that most students exhibited a moderate level of digital minimalism and average mental health status. A significant positive relationship was found between digital minimalism and mental health ($r = 0.62$, $p < 0.01$). Students with higher digital minimalism practices demonstrated better psychological well-being and life satisfaction. Digital minimalism significantly predicted mental health, accounting for 38% of the variance. The study highlights digital minimalism as an effective strategy for promoting mental well-being among college students.

Introduction

The rapid expansion of digital technologies has transformed communication, learning, and social interaction. While digital devices offer unprecedented convenience, excessive and uncontrolled technology use has emerged as a significant concern for mental health. Contemporary society is characterized by what Turkle (2015) describes as being "alone together," where constant connectivity often coexists with social isolation and emotional distress.

Digital minimalism, a concept popularized by Cal Newport (2019), advocates the intentional and mindful use of digital technologies to support personal values rather than allowing technology to dominate daily life. According to Newport (2019), "clutter is costly," emphasizing that excessive digital engagement can reduce attention, productivity, and psychological well-being. Research indicates that prolonged screen exposure and compulsive social media use are associated with increased levels of anxiety, depression, stress, and sleep disturbances among young adults (Twenge, 2019; Keles, McCrae, & Grealish, 2020).

The World Health Organization recognizes mental health as a state of well-being in which individuals realize their abilities, cope with normal life stresses, and contribute productively to society. However, the "attention economy" of digital platforms often promotes continuous engagement, leading to information overload and cognitive fatigue. As Simon (1971) observed, "a wealth of information creates a poverty of attention," highlighting the growing challenge of maintaining psychological balance in digital environments.

Digital minimalism offers a sustainable strategy for improving mental health by encouraging purposeful technology use, digital detox practices, and the cultivation of meaningful offline relationships. By reducing digital distractions and fostering mindful engagement, individuals may experience enhanced emotional regulation, improved concentration, and greater life satisfaction. Therefore, examining the relationship between digital minimalism and mental health is essential for developing effective well-being strategies in contemporary educational and social contexts.

Need and Significance of the Study

The increasing dependence on digital technologies, particularly among college students and young adults, has raised concerns regarding mental health issues such as anxiety, stress, depression, attention deficits, sleep disturbances, and social isolation. While digital devices facilitate communication, learning, and access to information, excessive screen time and compulsive engagement with social media often negatively affect psychological well-being. In this context, digital minimalism, which promotes the intentional and mindful use of technology, has emerged as a potential strategy for enhancing mental health and overall quality of life. Despite growing global interest in digital well-being, empirical studies examining the relationship between digital minimalism and mental health, particularly among higher education students, remain limited. Therefore, this study is significant as it seeks to understand how adopting digital minimalist practices can contribute to emotional wellness, improved concentration, stress reduction, and healthier lifestyle habits. The findings may provide valuable insights for educators, policymakers, counselors, and students in designing effective interventions and awareness programs that promote balanced technology use and sustainable mental health practices in educational settings.

Objectives of the Study

1. To assess the level of digital minimalism practices among college students.
2. To examine the mental health status of college students in terms of stress, anxiety, and emotional well-being.
3. To investigate the relationship between digital minimalism and mental health among college students.
4. To identify the impact of digital minimalist practices on students' psychological well-being and life satisfaction.

5. To suggest strategies for promoting healthy digital habits and mental wellness in higher education institutions.

Hypotheses of the Study

Based on the objectives, the following hypotheses are proposed:

H_1: There is a significant relationship between digital minimalism practices and the mental health of college students.

H_2: College students with higher levels of digital minimalism practices exhibit lower levels of stress and anxiety than those with lower levels of digital minimalism practices.

H_3: There is a significant positive relationship between digital minimalism practices and emotional well-being among college students.

H_4: Digital minimalism practices significantly predict psychological well-being and life satisfaction among college students.

H_0: There is no significant relationship between digital minimalism practices and the mental health of college students.

Review of Related Literature

The concept of digital minimalism has gained prominence in response to the increasing influence of digital technologies on human behavior and well-being. Digital minimalism advocates intentional and value-driven technology use to reduce digital distractions and enhance quality of life (Newport, 2019). Research has shown that excessive smartphone and social media use is associated with psychological distress, including anxiety, depression, loneliness, and sleep-related problems.

A study by **Keles, McCrae, and Grealish (2020)** systematically reviewed the effects of social media on adolescents and found a significant association between excessive social media use and symptoms of depression, anxiety, and psychological distress. The authors emphasized the importance of healthy digital habits for maintaining mental well-being. **Twenge and Campbell (2018)** reported that increased screen time among adolescents was linked to lower psychological well-being, reduced self-esteem, and higher levels of emotional distress. Their findings suggest that limiting unnecessary digital engagement may contribute to improved mental health outcomes.

Orben and Przybylski (2019) examined the relationship between digital technology use and adolescent well-being and found that moderate and mindful technology use is more beneficial than excessive engagement. Their study highlights the need for balanced digital consumption. **Newport (2019)** argued that intentional technology use enables individuals to regain control over their attention, improve productivity, and foster meaningful social interactions. Digital minimalism encourages users to eliminate low-value digital activities and focus on technology that supports personal goals and values. **Turkle (2015)** emphasized that constant digital connectivity can diminish face-to-face interactions and emotional intimacy. She suggested that mindful disengagement from digital devices can enhance self-reflection,

interpersonal relationships, and psychological well-being.

In short, the studies indicate that excessive digital engagement can adversely affect mental health, while intentional and mindful technology use may promote emotional wellness, life satisfaction, and psychological resilience among students.

Method of the Study

Research Design

The study adopted a **descriptive survey method** to investigate the relationship between digital minimalism and mental health among college students. The population comprises undergraduate and postgraduate students studying in colleges affiliated with universities in Kerala. A sample of **300 college students** will be selected using **stratified random sampling** to ensure representation across gender, academic disciplines, and levels of study.

Variables

- Independent Variable: Digital Minimalism Practices
- Dependent Variable: Mental Health (Stress, Anxiety, Emotional Well-being, and Life Satisfaction)

Tools for Data Collection

1. Digital Minimalism Scale
2. Mental Health Scale measuring stress, anxiety, emotional well-being, and life satisfaction
3. Personal Data Sheet for collecting demographic information.

Statistical Techniques

The collected data were analyzed using:

- Mean and Standard Deviation
- Percentage Analysis
- Pearson Product-Moment Correlation
- Independent Samples t-test
- Multiple Regression Analysis

Results and Discussion

Analysis of the level of digital minimalism practices among college students

Table 1 - Level of Digital Minimalism Practices (N = 300)

Level	Frequency	Percentage
Low	72	24.0
Moderate	156	52.0
High	72	24.0
Total	300	100

The results indicate that a majority of the students (52%) exhibited a moderate level of digital minimalism practices, while 24% demonstrated high levels and another 24% reported low levels. This suggests that although students are aware of the need for mindful technology use, many have not fully adopted digital minimalism in their daily lives. These findings are consistent with the observations of **Newport (2019)**, who argued that individuals often recognize the negative consequences of excessive technology use but struggle to establish disciplined digital habits.

Analysis of the mental health status of college students

Table 2- Mental Health Status of Students

Level	**Frequency**	**Percentage**
Poor	48	16.0
Average	174	58.0
Good	78	26.0
Total	**300**	**100**

The majority of students (58%) reported average mental health, while 26% reported good mental health and 16% exhibited poor mental health. This indicates the presence of moderate psychological challenges among college students.

Analysis of the the impact of digital minimalist practices on psychological well-being and life satisfaction

Table 4- Comparison of Mental Health Scores between High and Low Digital Minimalism Groups

Group	**N**	**Mean**	**SD**	**t-value**
High Digital Minimalism	72	78.42	8.36	7.84**
Low Digital Minimalism	72	64.15	9.12	

$P < 0.01$

Students with high digital minimalism practices scored significantly higher on mental health measures than those with low digital minimalism practices. The calculated t-value (7.84) exceeded the critical value at the 0.01 level. The findings suggest that intentional technology use contributes positively to emotional regulation, stress management, and life satisfaction. These results are in agreement with **Orben and Przybylski (2019)**, who highlighted that balanced technology use is associated with better psychological outcomes.

Table 5- Multiple Regression Analysis

Predictor	**Beta (β)**	**t-value**	**p-value**
Digital Minimalism	0.58	12.74	<0.001
R	**R^2**	**F**	
0.62	0.38	162.31**	

p < 0.01

Digital minimalism significantly predicted mental health among college students. The R^2 value of 0.38 indicates that 38% of the variance in mental health was explained by digital minimalism practices. The result demonstrates that digital minimalism is an important factor influencing students' psychological well-being. Students who intentionally regulate screen time, limit unnecessary digital interactions, and prioritize meaningful online engagement experience better mental health outcomes.

Discussion of the data

The present study reveals that digital minimalism is significantly associated with better mental health among college students. Most students demonstrated moderate levels of digital minimalism, suggesting awareness of healthy technology practices but incomplete implementation. The positive correlation between digital minimalism and mental health indicates that students who engage in mindful technology use experience lower levels of stress and anxiety and higher emotional well-being and life satisfaction.

The regression analysis further established digital minimalism as a significant predictor of mental health. These findings align with previous research by Keles et al. (2020), Twenge (2019), and Turkle (2015), which documented the adverse effects of excessive digital engagement on psychological well-being. The results also support the philosophy of Digital Minimalism proposed by Newport (2019), emphasizing intentional technology use to enhance focus, meaningful relationships, and overall quality of life.

The study highlights the necessity of integrating digital wellness programs, digital detox initiatives, and awareness campaigns in higher education institutions. Such interventions may help students develop healthier digital habits, thereby improving their mental health and academic performance.

Tenability of Hypotheses

Hypothesis 1

H01: There is no significant relationship between digital minimalism practices and mental health among college students.

The obtained correlation coefficient ($r = 0.62$, $p < 0.01$) revealed a significant positive relationship between digital minimalism practices and mental health. Therefore, the null hypothesis is rejected. It may be concluded that higher levels of digital minimalism are

associated with better mental health among college students.

Hypothesis 2

H02: There is no significant difference in mental health between students with high and low levels of digital minimalism practices. The calculated t-value (7.84, $p < 0.01$) indicated a significant difference between students with high and low digital minimalism practices. Therefore, the null hypothesis is rejected. Students with higher digital minimalism practices exhibited significantly better mental health.

Hypothesis 3

H03: Digital minimalism practices do not significantly predict mental health among college students. The regression analysis revealed that digital minimalism significantly predicted mental health ($\beta = 0.58$, $p < 0.001$). Therefore, the null hypothesis is **rejected**. Digital minimalism emerged as a significant predictor of mental health.

Hypothesis 4

H04: There is no significant difference in digital minimalism practices based on gender.

The analysis showed no statistically significant gender difference in digital minimalism practices ($p > 0.05$). Therefore, the null hypothesis is **accepted**.

Major Findings of the Study

1. The majority (52%) of college students demonstrated a moderate level of digital minimalism practices.
2. More than half (58%) of the students reported average mental health status.
3. A significant positive relationship was found between digital minimalism and mental health ($r = 0.62$).
4. Students with high digital minimalism practices showed significantly better mental health than students with low digital minimalism practices.
5. Digital minimalism significantly predicted mental health and accounted for 38% of the variance in mental health scores.
6. Students who consciously regulated screen time and reduced unnecessary digital engagement reported higher emotional well-being and life satisfaction.
7. No significant gender differences were observed in digital minimalism practices.
8. Digital minimalism emerged as an important protective factor for promoting psychological well-being among college students.

Suggestions for Further Research

1. Similar studies may be conducted with larger and more diverse samples from different regions and educational settings.
2. Comparative studies may be undertaken among school students, college students, and working professionals.
3. Longitudinal studies may be conducted to examine the long-term effects of digital minimalism on mental health.

4. Experimental studies may be designed to evaluate the effectiveness of digital detox interventions.
5. Future research may investigate the relationship between digital minimalism and academic achievement.
6. Studies may explore the influence of digital minimalism on sleep quality, self-esteem, and interpersonal relationships.
7. Cross-cultural studies may be conducted to understand variations in digital minimalism practices across different countries.
8. Qualitative studies may be undertaken to gain deeper insights into students' experiences with digital minimalism and psychological well-being.
9. Future research may examine the mediating role of mindfulness, resilience, and self-regulation in the relationship between digital minimalism and mental health.
10. Mixed-method studies combining quantitative and qualitative approaches may
11. provide a more comprehensive understanding of the phenomenon.

Recommendations of the Study

1. Higher education institutions should introduce digital wellness and digital literacy programmes to promote mindful technology use.
2. Colleges may organize periodic digital detox campaigns and awareness programmes regarding healthy screen-time management.
3. Student counseling centres should incorporate digital well-being strategies into mental health support services.
4. Educators should encourage balanced online and offline learning experiences to minimize digital fatigue.
5. Workshops on self-regulation, time management, and responsible social media use should be conducted regularly.
6. Parents and teachers should collaborate to guide students toward purposeful and productive technology use.
7. Educational institutions should formulate policies that promote healthy digital habits and reduce excessive dependence on digital devices.
8. Mental health promotion initiatives should include training on digital minimalism as a preventive strategy against stress and anxiety.

Conclusion

The present study examined the relationship between digital minimalism and mental health among college students. The findings clearly indicate that students who adopt digital minimalist practices experience better mental health outcomes, including reduced stress and anxiety, improved emotional well-being, and greater life satisfaction. The significant positive relationship between digital minimalism and mental health highlights the importance of intentional and value-driven technology use in the contemporary digital environment. As

digital technologies continue to shape students' academic and personal lives, promoting digital minimalism can serve as an effective strategy for enhancing psychological well-being. The study therefore emphasizes the need for educational institutions, policymakers, and mental health professionals to integrate digital wellness practices into student development programmes. Ultimately, fostering mindful technology use can contribute to healthier, more balanced, and emotionally resilient student communities.

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ARTAVA, AGENCY, AND ALGORITHM: INDIAN KNOWLEDGE SYSTEMS WOMEN'S INTELLECTUAL HERITAGE, AND DIGITAL PEDAGOGY FOR MENSTRUAL HEALTH EDUCATION AMONG CONTEMPORARY MALAYALI WOMEN

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Abstract

The Indian Knowledge System (IKS) is known for its specific and clinically relevant resources for women's menstrual health. Yet the challenge of consuming the age-old 'Vigjnana Kosha' stems from the virtual absence/omission of resources in every Physical Education and health curriculum in India. The research paper attempts to delineate the 'knowledge-dissemination' gap by addressing cause-and-effect relationships that lead to structural gaps in menstrual discourse, and how modern institutional interventions are attempting to revitalise and educate to bridge the ancient and modern. The paper attempts to explore the menstrual discourse on 3 arguments. First, Patanjali's Yoga Sutras, the Ayurvedic concept of Artava in the Charaka Samhita, and the practical pedagogy of Geeta S. Iyengar (1983) together constitute a coherent, evidence-adjacent framework for menstrual health that the National Education Policy 2020 now provides institutional grounds to implement. Second, the classical tradition's own women intellectuals, Gargi Vachaknavi, Lopamudra, Sulabha, and Ubhaya Bharati, are critically analysed to explore philosophical warrants for treating the female body as the subject of medical attention, not as a source of ritual prohibition. Emerging as a bridge between ancient women caricature and the "Modern Malayali women" construct, the analysis features internal critique of disembodied philosophy. Third, the examination of the digital ecosystem via "Happy to Bleed" (2015) social media campaign, the 2018 Sabarimala Judicial verdict, and the rapid growth of Malayalam-language yoga instruction on digital platforms during COVID-19 is reconstructing the Guru-Shishya parampara without gatekeeping, embracing inclusivity by recorrecting historical injustices. Representative of the modern institutional interventions, the structural shift in modern digital society exhibits increased agency of women's narratives in the discourse of Arthava, enabling menstrual education to be accessible and inclusive. Kerala's matrilineal social traditions, near-universal female literacy, and first-in-India digital rights policy make it the natural laboratory for this synthesis.

Keywords: Indian Knowledge System, yoga, menstrual health, Artava, Guru-Shishya Parampara, Ubhaya Bharati, Lopamudra, Malayali women, digital pedagogy, NEP 2020, Sabarimala, Happy to Bleed

INTRODUCTION

For many years of Physical Education teaching discourse, the 'classical Indian resource' question on Yoga, Ayurveda etc. has been left untapped with significant constraints. It is not because of whether the resources are obscure or contested, but because of a lack of institutional bridge which could harness the potential of ancient-modern knowledge syncretism. Hence, this paper attempts to bridge this gap by navigating a tri-junction pathway for the intersection of classical Indian knowledge system into modern digital Physical Education discourse.

India's National Education Policy 2020 mandates the integration of Indian Knowledge Systems across educational domains (Ministry of Education, Government of India, 2020). For Physical Education departments, that mandate is an instruction to take classical yoga and Ayurvedic health science seriously, not as cultural heritage to display but as a working body of knowledge to teach. Menstrual health is one of the clearest cases where this instruction has practical urgency. The *Charaka Samhita*'s treatment of *Artava* (menstruation) as a central physiological process with specific management protocols predates the taboo-driven silence that currently characterises menstrual health education in most Indian schools by about two thousand years.

The first research thread this paper follows is therefore direct: what does IKS offer for menstrual health, and how would we teach it? The answer to such is explored in the second thread by delineating into the intersection of historiography and modern sociology. The "Modern Malayali woman"—literate, digitally connected, economically active, navigating both matrilineal social traditions and contemporary professional life—is frequently sidelined in the discourse of classical knowledge discourse on health, representing ignorance. Historical accounts of Gargi Vachaknavi debating a philosopher-king in King Janaka's assembly to defeat, Lopamudra authoring hymns in the *Rigveda*. Sulabha defeats the king of Mithila in formal philosophical debate accounts a genealogical rupture in the monolithic historiography of patriarchal discourse. Even the case study of Ubhaya Bharati stopping Adi Shankara, a Kerala-based philosopher in 8th CE, by asking him questions about embodied life that his celibate training had left him unable to answer, establishes women's prominence among intellectual ancestors

The third thread concerns transmission. The classical Guru-Shishya relationship was structured around physical proximity, personal selection, and oral instruction. Such conditions that are representative of how women were systematically excluded from most *gurukula* traditions. Digital platforms remove all three conditions simultaneously. YouTube, Instagram, and WhatsApp communities transmit yogic practice to women in their homes, in Malayalam, without admission criteria. The growing social participation exposure is also accompanied in a significant pace with the growing 'Zumba', 'evening gym' cultures in urban India. This transmission is imperfect and often historically shallow. But it is happening, at a scale that

formal education has not matched. Understanding what it gets right and what it loses is essential to any serious IKS integration policy.

Kerala is selected as a spatial site for this analysis catering to numerous methodological metrics. Kerala's female literacy rate remains among the highest in India (Census of India, 2011) and in 2017, it also became the first Indian state to declare internet access a basic right (Government of Kerala, 2017). Kerala's historiography exhibits a matrilineal social structure with the Nair community's *marumakkathayam* inheritance system historically gave women property authority that most of the subcontinent did not recognise. In addition to such, in 2015 and 2018, Kerala was the site of two public events, a social media campaign (Happy to Bleed) and a Supreme Court case (Sabarimala verdict). The feminine discourse surrounding these 2 events places menstruation, tradition, and women's rights at the centre of national conversation. Analysing these metrics helps in navigating the complex terrains and potential of IKS integration.

THE BHARATIYA THEORY FRAMEWORK

Patanjali's Ashtanga Yoga

Patanjali's *Yoga Sutras* (4TH CE) organise yoga into eight limbs (*ashtanga*): *Yama* (ethical restraints), *Niyama* (personal observances), *Asana* (posture), *Pranayama* (breath regulation), *Pratyahara* (sense withdrawal), *Dharana* (concentration), *Dhyana* (meditation), and *Samadhi* (absorption) (Patanjali, trans. Bryant, 2009). The first two limbs include *shaucha* (cleanliness) and *santosha* (contentment), establishing the body and its care as the starting point of the entire system. Patanjali does not ask practitioners to transcend the body. He asks them to inhabit it with attention. That the body in question might be female, and cyclical in its physiology, is something the later commentarial tradition addresses more explicitly. But the philosophical ground for it is already in the *Sutras*.

The Feminine Principle in Samkhya-Yoga Metaphysics

The metaphysical framework underlying yoga is Samkhya, which posits a distinction between *Purusha* (pure consciousness) and *Prakriti* (matter). *Prakriti* is grammatically and conceptually feminine with the active, creative, generative principle from which all physical existence, including the human body, arises (Larson, 1979). The three *gunas*: *sattva*, *rajas*, and *tamas*, describe the qualities of *Prakriti* in different configurations. A philosophical system in which the productive, dynamic principle of physical reality is feminine is a system that, when taken seriously, cannot treat the female body as philosophically marginal or ritually impure.

Artava in Ayurvedic Medicine

The *Charaka Samhita* describes *Artava* as a product of *Rasa dhatu*, meaning 'nutrient fluid', with a specific purificatory function in the female body (*Sharirasthana*, Chapter 3). Menstruation is presented as a physiological process requiring attention and care, not avoidance. The *Sushruta Samhita* elaborates the category of *Artava Dusti* (menstrual

irregularity) and specifies management through diet, herbal medicine, and physical practice (*Sharirasthana*, Chapter 2). The Ministry of AYUSH's Common Yoga Protocol (2015) published on the 1st International Yoga Day draws on the above theorised Ayurvedic foundation in its recommendations for yoga-based health management. This hypothesizes that there already exists enough institutional resources for a genuine IKS-based menstrual health curriculum. However, the curriculum in its final output has not been materialised.

The Guru-Shishya Parampara as Epistemology, Not Just Pedagogy

The Guru-Shishya relationship is, at its core, an argument about the conditions under which certain kinds of knowledge can be transmitted. Textual knowledge can travel by writing. Practical knowledge like yoga, meditation, the cultivation of inner states etc. requires something more which is known by the tradition *upadesha*: instruction embedded in relationship. The *Brihadaranyaka Upanishad*'s famous dialogues, in which Gargi Vachaknavi questions Yajnavalkya in a public assembly, show the Guru-Shishya structure and challenging debates being used (Madhavananda, 1950). The woman who uses the tradition's own methods to interrogate its authority figures is a presence the tradition itself contains. This matters for how we read digital yoga communities. The silver lining drawn is that they are not corruptions of the parampara but imperfect instantiations of what the parampara, at its philosophical best, was always supposed to be.

METHODOLOGY

This paper uses qualitative methodology with two main analytical approaches. Critical Discourse Analysis (CDA), following Fairclough (1992), treats texts as social practice shaped by power relations. Applied here, CDA asks what conditions of production shaped what classical texts could and could not say about women, and how contemporary digital content reframes yogic knowledge as it travels across platforms. The analysis works at both levels simultaneously: tracking how power operated in classical texts and how it operates in contemporary knowledge dissemination.

Historiographical analysis of primary sources forms the second pillar. The classical texts like *Yoga Sutras, Brihadaranyaka Upanishad, Rigveda, Mahabharata*, *Charaka Samhita*, *Madhaviya Shankaradigvijaya* are read in verified scholarly translations and through established secondary literature. Case studies draw from three documented sources: (a) Government of Kerala programmes relating to digital health and IKS; (b) the 2015 "Happy to Bleed" social media campaign, widely reported in national press; (c) the Supreme Court of India's 2018 *Sabarimala* judgment, which is a matter of public legal record. Social media discourse is analysed at the level of community and discourse pattern, not through individual user data.

The study's interpretive framework is feminist standpoint epistemology (Harding, 1986), which holds that the social position of knowledge producers shapes what they can

know and what they ignore. A Physical Education curriculum built without the participation of women scholars from the tradition will systematically undervalue what the tradition has to say about women's health. This paper argues that the oversight is correctable, and that the tradition itself contains the tools for correcting it.

CRITICAL OBSERVATIONS

Yoga and Allied Meditative Practices for Menstrual Health

The United Nations recognised International Yoga Day on June 21 through Resolution A/RES/69/131 in 2014, effective from 2015 (United Nations General Assembly, 2014). Since then, yoga's clinical applications have attracted serious research attention in Indian and international academic contexts. The Ministry of AYUSH published its Common Yoga Protocol in 2015, laying out a government-endorsed framework that draws on classical practice for contemporary health management (Ministry of AYUSH, Government of India, 2015). Neither the global recognition of yoga nor the government's own protocol has yet produced a systematic integration of yoga into girls' Physical Education curricula for menstrual health. The gap between policy and implementation is the problem this section examines.

Geeta S. Iyengar's *Yoga: A Gem for Women* (1983) remains the most systematic translation of classical yoga into gender-specific practice in English. Iyengar organises her guidance around the female body's cyclical physiology, distinguishing between practices appropriate during menstruation which is primarily restorative without inversions and practices for other phases. The classical rationale is the concept of *Apana Vayu*, the downward-moving energy current in yogic physiology, which governs elimination and menstrual flow. Interfering with *Apana Vayu* through inversions during menstruation is not superstition dressed up as physiology rather the physiology expressed in a pre-biochemical vocabulary. The underlying claim that full inversions alter intra-abdominal pressure in ways that disrupt normal pelvic drainage is mechanically coherent and consistent with contemporary understanding of pelvic floor dynamics.

The *Charaka Samhita* classifies menstrual irregularity (*Artava Dusti*) through the *tridosha* framework, associating painful and irregular menstruation primarily with *Vata* imbalance and excessive flow or inflammation with *Pitta* imbalance (*Sharirasthana*, Chapter 3). The corresponding yogic recommendations; grounding, slow postures for *Vata* and cooling, non-heating breath practices for *Pitta* are teachable without Ayurvedic clinical training if the teacher understands the conceptual system they derive from. This is exactly the kind of interdisciplinary connection that NEP 2020's IKS mandate provides grounds to build into teacher training (Ministry of Education, Government of India, 2020). What is missing is not the knowledge but the institutional will requisite for the creation of sustainable knowledge economy in Indian social systems.

The incorporation of select specific practices worth mentioning into the aforementioned academic discourse attempts to bridge the theoretical-practicality mismatch sine-qua-non for the future of Physical Education. *Supta Baddha Konasana* (Reclined Bound Angle Pose) releases pelvic muscular tension with a direct bearing on dysmenorrhea. *Viparita Karani* (modified legs-up-wall, without full inversion) calms the autonomic nervous system in ways relevant to the neuroendocrine dimensions of menstrual symptomatology. *Nadi Shodhana Pranayama* (alternate nostril breathing) has documented effects on parasympathetic activation. None of these physical modules require equipment, marking positive tick in feasibility planning within a bureaucratic lens. All three are teachable in a standard Physical Education class. Their absence from girls' PE curricula in Kerala schools represents a policy failure, not a knowledge deficit.

Beyond *asana*, the classical yogic tradition offers two additional modalities that contemporary physical education consistently ignores. *Bhramari Pranayama* (humming bee breath) — named in classical Hatha Yoga texts for the sound it produces — engages the vagus nerve through vibration and extended exhalation, activating the parasympathetic nervous system in a way directly relevant to dysmenorrhea management. The *Chandrabhedana* (left-nostril breathing technique), which the Hatha Yoga Pradipika prescribes as a cooling practice, addresses the *Pitta* aggravation classically associated with excessive menstrual flow and associated heat symptoms (Iyengar, B. K. S., 1966). *Yoga Nidra* (yogic sleep, a guided awareness practice distinct from ordinary relaxation) targets the hypothalamic-pituitary axis through sustained parasympathetic activation, making it directly relevant to the stress-mediated hormonal dysregulation that Ayurveda classifies under *Manasa Dosha* (psychological imbalance) as a contributing factor in menstrual irregularity. Kaivalyadhama Health and Yoga Research Centre, founded by Swami Kuvalayananda in Lonavala in 1924 and the oldest systematic yoga research institution in India, has documented yoga's physiological effects across its century of publication in the journal *Yoga Mimamsa* (Kaivalyadhama, 1924–present). None of this research is present in any standard Physical Education teacher training curriculum in Kerala.

Polycystic ovary syndrome (PCOS) deserves explicit attention here because it represents the most prevalent menstrual health disorder among Indian women of reproductive age, with epidemiological studies reporting prevalence between 9% and 36% depending on the diagnostic criteria applied. India's urban adolescent women are disproportionately affected, with lifestyle factors like sedentary behaviour, processed food diets, chronic stress, etc., identified as significant contributors. Yoga's relevance to PCOS management operates through multiple mechanisms, including reducing cortisol and insulin resistance (both central to PCOS pathophysiology), restoring *Vata-Pitta* balance in the Ayurvedic classification of the condition, and providing the sustained parasympathetic activation that pharmaceutical management alone cannot produce. The Ayurvedic term for the condition closest to PCOS is

Aarthava Kshaya (diminished menstrual function) with features of *Kapha* excess. *Kapha* enables a classification that maps, imperfectly but usefully, onto the metabolic dimensions of the contemporary diagnosis. To theorise that yoga-based PCOS management programs are available online but, unfortunately, absent from school health curricula is not a question of evidence. It is a question of which knowledge systems are treated as legitimate sources of clinical guidance.

At the programme level, the Arogyakeralam public health programme has incorporated yoga into community health initiatives across Kerala (Government of Kerala, n.d.). The Kudumbashree network, with close to five million women members at the panchayat level, has included yoga components in some of its wellness initiatives (Kudumbashree Mission, n.d.). International Yoga Day sees state-organised mass events every June 21. These are programme-level implementations without the classical IKS depth that would make them educationally permanent rather than ceremonially periodic.

The social media dimension of this picture became clear in a specific Kerala event. In November 2015, the then-president of the Travancore Devaswom Board, the authority overseeing the Sabarimala temple, publicly suggested that women could be permitted to enter Sabarimala if a "machine" could certify their menstrual status. The response on Indian social media was immediate. Women, many of them students, posted images of sanitary pads with the message "Happy to Bleed," challenging the equation of menstruation with ritual impurity (The Hindu, 2015). The campaign was widely reported in national media. It reached an audience orders of magnitude larger than any classroom could. And it made a philosophical argument that menstruation is physiologically normal, not ritually disqualifying. An argument that the *Charaka Samhita* had made two thousand years earlier without the benefit of Instagram. The IKS resources for this argument existed. What created the campaign's reach was digital infrastructure.

Women Intellectuals in IKS: Recovering a Suppressed Lineage

The IKS tradition is not feminist. Saying otherwise would be historical distortion. What the tradition contains, however, is a set of women thinkers who used its own intellectual tools comprising philosophical argument, textual authority, yogic practice to assert positions that the tradition's institutional forms would prefer to ignore. Recovering these women is not a matter of projecting contemporary feminist values onto an ancient past. It is a matter of reading the sources more carefully.

Lopamudra: The Rishi Who Made the Argument for the Body

Lopamudra is one of the very few women credited as a *rishi* (seer-author) in the *Rigveda*. The hymn attributed to her, *Rigveda* 1.179, is a dialogue with her husband Agastya, in which she argues that neither she nor he has found the truth through asceticism alone and that the body's needs, including the needs of household and reproductive life, are not obstacles to the truth but part of the path to it (Jamison & Brereton, 2014). Agastya eventually

concedes to her perspective.

This argument, made by a woman in the *Rigveda*, is the same argument that Hatha Yoga traditions formalised many centuries later: "the body is the vehicle for liberation, not the obstacle to it". For a curriculum on yoga and women's menstrual health, Lopamudra provides exactly the classical warrant that implementation requires. She is a Vedic author arguing, in the foundational text of the tradition, that the female body's physiological claims are philosophically serious. No male author in the *Rigveda* makes this argument in this form. That is the niche dimension: she is the tradition's own internal philosopher of embodiment, and she is a woman.

Gargi Vachaknavi: Argument as Method

Brihadaranyaka Upanishad chapters 3.6 and 3.8 document two occasions on which Gargi Vachaknavi publicly questions Yajnavalkya in King Janaka's assembly (Madhavananda, 1950). In the second exchange, Yajnavalkya warns her that continued questioning will cause her head to fall off. It is also worth noting that no male questioner in the same dialogue receives this threat. However, she asks two more questions anyway.

The exchange is instructive in ways that go beyond its content. Gargi's deployment of systematic questioning methodology, working up through levels of existence asking what pervades what, is instrumental to note and she uses it without modification when her authority is challenged. Instead of subjugation on barrages of threats, she completes her line of inquiry and then, in the text, acknowledges Yajnavalkya's authority. Her acknowledgment carries weight precisely because she has tested it. Unlike carrying the discourse as a sign of deterrence, the narrative epitomises the conclusion of a rigorous examination. For the "modern Malayali woman" working in institutional contexts where her intellectual presence is often tolerated rather than expected, Gargi's model; methodical, undeterred, arriving at conclusions through argument rather than authority is worth claiming explicitly.

Sulabha: Yoga as Philosophical Method

Sulabha's account in the *Mahabharata*'s *Shanti Parva* is the most demanding text in this paper and the one most consistently overlooked in IKS curricula (Ganguli, 1883–1896). Sulabha is a *parivrajika*, a female wandering ascetic who has achieved liberation through yogic practice. She visits King Janaka of Mithila to test his claim of *Jivanmukti* (liberation while living). The method she uses is explicitly yogic in nature. She enters his consciousness through meditation to examine whether his inner state matches his claim. However, it does not match.

The philosophical dialogue that follows covers the boundary between self and body, the nature of identity across bodies, and the philosophically irrelevant character of the body's sex from the standpoint of the liberated self. Janaka's complaints about Sulabha's gender and caste are, in her argument, evidence of his incomplete liberation as delineating the attachment to the categories of gender and caste is itself a sign of *avidya* (ignorance). She wins the

argument without conceding the terms on which it was framed.

Sulabha uses yoga to do philosophy. This becomes a niche dimension to the feminine perspective as she does not represent a woman who learned yoga from a male teacher and benefited from it. Instead, she is a yoga practitioner who uses the tradition's advanced methods to test a philosopher-king and finds him wanting. She is the tradition's own fully autonomous female yogic authority.

Ubhaya Bharati: Kerala's Own Philosophical Woman

Ubhaya Bharati, wife of the philosopher Mandana Misra, appears in the *Madhaviya Shankaradigvijaya*, the 14th CE Sanskrit biography of Adi Shankaracharya. She appears as the judge in the famous debate between Shankara and Mandana (Vidyaranya Madhavacharya, 14th century; see Pande, 1994). When Shankara defeats Mandana in extended philosophical argument, Bharati does not simply concede. She challenges Shankara herself, arguing that defeating one's husband is not sufficient; the wife is half of the debate-person, and defeating half is not winning.

Her challenge to Shankara is not on metaphysics where his training was comprehensive. It is on *kamashastra*, the knowledge of household and embodied life, where a celibate monk has no experiential authority. Shankara, in the hagiography, has to temporarily enter the body of a deceased king through yogic means to gain this knowledge before the debate can continue. The details mentioned are hagiographical in nature which need not be taken into serious consideration. However, what becomes philosophically significant is that the tradition's own biographical literature registers a woman challenging a canonical male philosopher on the grounds of embodied knowledge, and the tradition acknowledges that the challenge is legitimate.

The Kerala connection is direct as Adi Shankaracharya was born in Kaladi, Ernakulam district of Kerala, in the 8th CE. His tradition, Advaita Vedanta, is the dominant philosophical framework of Kerala's own intellectual history. Ubhaya Bharati's challenge is therefore not merely an abstract episode from North Indian hagiography. It is, through the Kerala-Shankara lineage, a story that belongs to Kerala's own philosophical inheritance, and that the woman in the classical tale wins the first round by insisting on the authority of embodied knowledge makes her a particularly pointed ancestor for a paper arguing that IKS education has systematically undervalued both women and bodies.

Maitreyi and the Matrilineal Kerala

Maitreyi, wife of Yajnavalkya, chooses the life of philosophical inquiry over material security when offered a property settlement before her husband leaves for renunciation (*Brihadaranyaka Upanishad* 2.4, 4.5; Madhavananda, 1950). Here, the choice itself becomes the argument when she turns down wealth in favour of the question of what makes life worth living. Kerala's *marumakkathayam* tradition, which gave women property rights through the female line, created social conditions where this kind of choice had actual institutional

support, at least in the domain of economic security (Jeffrey, 1992). The "modern Malayali woman" who engages critically with IKS traditions rather than passively receiving them is not departing from her social inheritance. Rather, she embodies it by continuity, adapting to changing social externalities and internal health complexities.

The Digital Ecosystem as Reconstructed Guru-Shishya Parampara

The classical Guru-Shishya relationship depended on three structural conditions: the student came to the teacher (proximity); the teacher chose the student (selection); and knowledge was transmitted through spoken instruction in the teacher's presence (orality). Women were excluded from *gurukula* systems in most historical contexts because all three conditions were built around male-centered space, specifically the male Brahmin social space of the *ashrama*. The exclusion was institutional. The philosophical tradition, as the previous section demonstrates, contained no such exclusion in its most rigorous texts.

Digital platforms remove all three structural conditions. The student does not go to the teacher; the content comes to the student's device. The teacher is not selected by the student; the student selects the teacher, with distance not a factor. And the oral quality of instruction is partly preserved through videos with voice, gesture, and embodied demonstration remain present. Kerala's declaration of internet access as a basic right in 2017 (Government of Kerala, 2017) and the state's "IT@School" programme, which has put digital infrastructure in public schools since 2001, make this access genuinely democratic in a way that most Indian states cannot yet claim.

Two public events of the 2015–2018 period illustrate the specific character of Kerala's digital discourse about women, tradition, and the body. The first is the "Happy to Bleed" campaign of November 2015. Triggered by the Travancore Devaswom Board's president suggesting that machines might be used to test women's menstrual status before temple entry, the campaign saw Indian women, many from Kerala, post images with sanitary pads on social media with the message "Happy to Bleed" (The Hindu, 2015). The philosophical argument embedded in the campaign that menstruation is a normal physiological event and not a source of ritual pollution is precisely the argument that the *Charaka Samhita*'s treatment of *Artava* has always made. The social media campaign reached millions, exhibiting the democratisation of subaltern feminine agency into the menstrual health discourse, predominantly threatened by patriarchal undertones.

The second event is the Supreme Court of India's 2018 judgment in *Indian Young Lawyers Association v. State of Kerala*, which struck down the prohibition on women of menstruating age (10–50 years) from entering the Sabarimala temple (Supreme Court of India, 2018). The majority judgment, delivered by Chief Justice Dipak Misra, held that the exclusion was unconstitutional and that physiological characteristics cannot be grounds for discrimination in access to public religious space. The case generated sustained social media discourse in Kerala, with arguments from supporters and opponents,in real time on digital

platforms. Both sides invoked tradition, whereas, Almost neither side invoked the classical Ayurvedic and yogic tradition that treats menstruation as a purificatory physiological event rather than a source of impurity. This indeed showcases that the classical resources exist but information and traditions about the bodies they concern are not deployed in public discourse. This is a failure of IKS education and not of the tradition itself.

However, the COVID-19 period (2020–2021) provided a different kind of case study in digital transmission. When physical yoga classes ceased, teachers across South India migrated to digital platforms. Malayalam-language yoga instruction channels on YouTube grew measurably during the lockdown period. Women who had never entered a yoga studio accessed practice in their homes, without teacher selection, fees and the social visibility studio attendance requires. It is a separate question as to whether the practice they accessed were informed by classical IKS frameworks or not. The structural fact is that the digital medium removed every barrier except access to a device and a data connection.

The formation of WhatsApp and Instagram communities around yoga for women's health represents something the classical tradition would recognise as *sangha*—a community that supports individual practice through collective accountability and shared experience. The Buddhist and Hindu uses of *sangha* as a structural support for individual practice are well-established (Patanjali's own *Yoga Sutras* do not use the term, but the concept of sustained community practice runs through the *Sutras*' description of the conditions for *samadhi*). However, the concept of the digital *sangha* is imperfect because, It lacks the depth of continuous personal guidance, is vulnerable to misinformation, and commercial co-optation. It is still evolving, and it is already correcting, at scale, the gendered exclusion that the traditional *parampara* could not correct within its own institutional structure.

The YouTube recommendation algorithm creates chains of teacher-student encounters that resemble, in their cumulative effect, a *Parampara*, even though no individual encounter in the chain involves a personal relationship. A woman who searches for yoga for menstrual cramps in Malayalam encounters a teacher whose channel recommends another teacher, whose commentary references a classical concept, whose explanation leads her to a longer course, whose teacher trained at Kaivalyadhama or the Iyengar Institute. The chain is neither linear nor guaranteed. But the pattern, progressive exposure to deeper layers of the same tradition through recommendation, replicates the structural logic of transmission that *parampara* formalised. The significant difference is verification: in the classical system, the guru's qualifications were vouched for by the guru's own guru, and the chain of transmission was legible. In the algorithmic system, the chain is constructed by engagement metrics rather than by knowledge criteria. The algorithm rewards content that retains viewers, not content that transmits classical understanding accurately. This is the structural problem that formal IKS education must solve: not by competing with digital platforms, but by providing the foundational classical literacy that allows a practitioner to evaluate what the platforms offer.

The peer-to-peer architecture of digital yoga communities, where a WhatsApp group member's question is answered by another member, not necessarily by a designated teacher, represents a genuine departure from the vertical authority structure of the traditional *parampara*. In classical terms, this could be read as a degradation: the *shishya* learns from other *shishyas* rather than from the guru. In feminist pedagogical terms, it could be read as a correction: the horizontal knowledge exchange among practitioners who share the experience of a female body learning yoga practices for menstrual health may be more reliable than instruction from a male guru with no direct experience of what is being taught. Both readings are partially right. The classical tradition valued the guru's experiential authority precisely because some dimensions of practice cannot be transmitted through description alone. Women teaching women from their own experience of the practices carries a different but equally valid authority. The ideal, which neither the traditional *parampara* nor the digital community currently realises, is a system in which experiential authority from women practitioners and classical theoretical depth from IKS scholarship are held together in the same educational space. Kerala's existing institutional infrastructure, combined with its digital reach and its female literacy base, makes this ideal more achievable here than anywhere else in India.

Three tensions in this picture deserve direct acknowledgment. The decontextualization of yoga from its Ayurvedic framework as it travels through digital platforms produces a practice that sometimes has no connection to classical IKS rationale. Algorithm-driven content favours engagement over accuracy, which tends toward simplified instruction and toward body-image content that sits in direct contradiction to classical yoga's body-affirmative philosophy. In addition, the predominant visual character of social media creates new pressures around the female body that are, in some respects, the opposite of what a classical yoga curriculum would seek to cultivate. Such issues raised from digital medium methodology require a constructive feedback mechanism so that the formal IKS education can provide the classical depth with qualitative resource person intervention.

CONCLUSION

Qualitative analysis on select events and historical documents posits the requirement to comprehensively read the classical Indian tradition for effective extraction of IKS modules aiming at menstrual hygiene.

Patanjali's *Yoga Sutras*, the *Charaka Samhita*'s treatment of *Artava,* and the practical pedagogy of Geeta S. Iyengar (1983) constitute a coherent, teachable framework for menstrual health. The Ministry of AYUSH's Common Yoga Protocol (2015) has institutionalised yoga at the national level. NEP 2020 has mandated IKS integration at the curricular level. None of this has produced a Physical Education curriculum in Kerala that teaches girls about their own physiology through the classical framework that speaks to it most directly. That remains an implementation failure, and this paper has tried to make the

resource available in a form that curriculum developers can use.

The women in the classical tradition, Lopamudra, Gargi, Sulabha, Ubhaya Bharati, and Maitreyi, do not provide evidence that the tradition was feminist. They are evidence that the tradition, in its most rigorous texts, could not consistently exclude women from its intellectual life. Their presence in the primary sources is undeniable. Their absence from IKS curricula exhibits the cherry-picking attitude of the course designers, and not out of the inevitability in essence. The "modern Malayali woman" has more to claim from this tradition than she is typically invited to. Ubhaya Bharati's challenge on the authority of embodied knowledge through the philosophical lineage of a man born in Kaladi belongs specifically to Kerala's intellectual inheritance. Hence, justifying the requirement of historical accounts to be incorporated into the curriculum of feminine agency.

The successful penetration of the digital ecosystem is making yogic and wellness knowledge accessible to women without gatekeeping. The 2015 "Happy to Bleed" campaign and the 2018 *Sabarimala* judgment both show that Kerala's public discourse about women, menstruation, and tradition is active and contentious. That the classical IKS resources for an informed, evidence-grounded position in that discourse are not part of formal education is an opportunity missed frequently by every curriculum revision since Indian independence.

However, the digital medium lacking philosophical depth exhibits structural measures needed to have an effective evolution into a digital "Guru-shishya" modularity by harnessing IKS resource persons, experts, and grassroot practitioners with Tech modernisation. The classical Guru-Shishya parampara claims that certain knowledge requires sustained relational cultivation, not just information transfer. Taking lessons from this, it explains why formal IKS education, grounded in the classical tradition and delivered by teachers who understand it, cannot be replaced by YouTube learning sessions. Kerala, with its specific combination of female literacy, matrilineal social history, and digital infrastructure, is positioned to develop that formal curriculum with effective utilisation and availability of classical, institutional, and pedagogical resources. By the end, it all comes to the decision of institutional will to achieve the ambitions of *Arogya Samruddhi Bharat.*

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TRADITIONAL INDIAN ECONOMIC THOUGHT AND SUSTAINABLE LIVING: INSIGHTS FOR A GREEN FUTURE

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Abstract

The growing environmental crisis, resource depletion, and unsustainable consumption patterns have intensified the search for alternative development paradigms that balance economic growth with ecological sustainability. Traditional Indian economic thought offers valuable insights into sustainable living through its emphasis on harmony between humans and nature, ethical consumption, moderation, and social welfare. Ancient Indian texts such as the Vedas, Upanishads, Arthashastra, and the teachings of Mahatma Gandhi advocate principles of resource conservation, responsible production and consumption, and intergenerational equity. These ideas resonate strongly with contemporary concepts of sustainable development and the Sustainable Development Goals (SDGs). This paper explores the relevance of traditional Indian economic thought in addressing modern environmental and developmental challenges. The study examines key concepts such as ecological consciousness, non-violence toward nature, self-sufficiency, trusteeship, and community-centered living. The paper argues that integrating traditional Indian wisdom with modern economic policies can contribute to sustainable resource management, environmental conservation, and inclusive development. The findings highlight that traditional Indian economic principles provide a holistic framework for promoting sustainable lifestyles and building a greener future.

Keywords: *Traditional Indian Economic Thought, Sustainable Living, Environmental Sustainability, Indian Knowledge Systems, Green Economy, Sustainable Development.*

Introduction

The twenty-first century has witnessed rapid economic growth alongside serious environmental challenges such as climate change, biodiversity loss, pollution, and resource depletion. While industrialization and technological progress have improved living standards, they have also contributed to unsustainable patterns of production and consumption. This has increased the need for development models that balance economic growth with environmental sustainability. Traditional Indian economic thought offers valuable insights into sustainable living through its emphasis on harmony between humans and nature, ethical consumption, and responsible resource use. Ancient Indian texts such as the Vedas, Upanishads, and Arthashastra advocate conservation, moderation, and social responsibility. Concepts like *Vasudhaiva Kutumbakam* (the world as one family) and *Aparigraha* (non-possessiveness)

promote ecological balance and sustainable lifestyles. Similarly, Mahatma Gandhi's principles of simple living, self-reliance, and trusteeship provide an alternative model of development centered on human welfare and environmental protection. In recent years, traditional knowledge systems have gained increasing recognition for their potential contribution to sustainable development. Traditional Indian economic thought integrates ethical, social, and environmental dimensions of development, making it highly relevant to contemporary sustainability challenges. Against this backdrop, the present study examines the relevance of traditional Indian economic thought in promoting sustainable living and contributing to a greener and more sustainable future.

Background of the Study

The world today faces serious environmental challenges such as climate change, biodiversity loss, pollution, deforestation, and resource depletion. Rapid industrialization, urbanization, and consumer-driven economic growth have increased pressure on natural resources, raising concerns about the sustainability of current development patterns. Although economic growth has improved living standards, it has often led to environmental degradation and ecological imbalance. The concept of sustainable development gained prominence through the Brundtland Report (1987), which emphasized meeting present needs without compromising the ability of future generations to meet theirs. Despite global efforts, achieving sustainability remains a challenge due to excessive consumption and unsustainable lifestyles. In this context, traditional Indian economic thought offers valuable insights into sustainable living. Ancient Indian traditions emphasized harmony with nature, ethical conduct, moderation in consumption, and social welfare. Concepts such as Dharma, Ahimsa, Aparigraha, and Vasudhaiva Kutumbakam promoted responsible resource use and ecological balance. Similarly, the teachings of Mahatma Gandhi advocated self-sufficiency, simple living, and responsible consumption.

Statement of the Problem

The world today faces serious environmental challenges due to unsustainable production and consumption patterns, excessive exploitation of natural resources, and ecological degradation. Although economic development has improved living standards, it has also raised concerns about the long-term sustainability of current growth models. While sustainable development seeks to balance economic growth, social welfare, and environmental protection, achieving this goal requires changes in values and lifestyles in addition to policy and technological solutions. In this context, traditional Indian economic thought offers valuable principles such as *Dharma*, *Ahimsa*, *Aparigraha*, and Gandhian trusteeship, which promote ethical consumption, environmental responsibility, and sustainable resource use. However, these traditional insights have received limited attention in contemporary economic discussions. Therefore, this study seeks to examine how the principles of traditional Indian economic thought can contribute to sustainable living and help address present-day environmental and

developmental challenges.

Justification of the Study

Growing environmental problems such as climate change, pollution, resource depletion, and biodiversity loss have exposed the limitations of conventional development models that prioritize economic growth over environmental sustainability. This has created a need to explore alternative approaches that promote a balance between economic progress and ecological conservation. Traditional Indian economic thought offers valuable insights into sustainable living through principles such as Aparigraha (non-possessiveness), Ahimsa (non-violence), trusteeship, and self-sufficiency. These principles encourage responsible resource use, ethical consumption, and harmony with nature, making them highly relevant to contemporary sustainability challenges. This study is significant because it connects traditional Indian wisdom with modern sustainability discourse. It seeks to demonstrate how indigenous knowledge systems can contribute to addressing environmental and developmental issues. The study is also relevant in the context of India's commitment to the Sustainable Development Goals (SDGs) and the growing emphasis on Indian Knowledge Systems (IKS). Therefore, the study has both academic and practical significance in promoting sustainable living and building a greener future.

Objectives of the Study

1. To examine the key principles of traditional Indian economic thought.
2. To analyse the concept of sustainable living from an economic perspective.
3. To explore the relevance of Indian traditional wisdom in promoting environmental sustainability.
4. To assess the applicability of traditional Indian economic principles in achieving a green and sustainable future.

Review of Literature

Gandhi (1909) in *Hind Swaraj* criticized materialism and excessive industrialization and advocated simple living, self-reliance, and ethical consumption. His concept of trusteeship emphasized that wealth should be used for social welfare rather than individual accumulation.

Kumarappa (1945) developed the concept of an *Economy of Permanence*, arguing that economic activities should function in harmony with nature and promote long-term sustainability rather than short-term profits.

Schumacher (1973) in *Small is Beautiful* criticized modern economics for encouraging excessive consumption and environmental degradation. He emphasized sustainable production, appropriate technology, and human-centered development.

Shiva (1988) in *Staying Alive* highlighted the ecological wisdom embedded in traditional Indian culture and advocated the revival of indigenous knowledge systems for sustainable development.

Gadgil and Guha (1995) in *Ecology and Equity* examined the relationship between

environmental conservation and social justice and emphasized the importance of traditional ecological knowledge in sustainable resource management.

Sen (1999) in *Development as Freedom* expanded the concept of development beyond income growth to include human capabilities and well-being, complementing the holistic perspective of Indian economic thought.

Dasgupta (2021) in *The Economics of Biodiversity* emphasized the economic consequences of biodiversity loss and the need to integrate ecological considerations into economic decision-making.

Reearch Methodology

The present study is descriptive and analytical in nature. It aims to examine the principles of traditional Indian economic thought and analyze their relevance in promoting sustainable living and environmental sustainability in the contemporary world.

Sources of Data

The study is based entirely on secondary data. Data have been collected from various sources including:

- Ancient Indian texts such as the Vedas, Upanishads, Arthashastra, and Bhagavad Gita.
- Works of Mahatma Gandhi and J. C. Kumarappa.
- Books, research articles, journals, conference proceedings, and published reports.
- Government publications and policy documents related to sustainable development.
- Reports of international organizations such as the United Nations and the World Bank.
- Relevant websites and online academic databases.

Method of Analysis

The collected information has been analyzed using qualitative and interpretative methods. Key concepts of traditional Indian economic thought, including Dharma, Ahimsa, Aparigraha, Trusteeship, Self-sufficiency, and ecological consciousness, have been examined and compared with modern principles of sustainable development. The study evaluates the relevance of these traditional ideas in addressing contemporary environmental and developmental challenges.

Scope of the Study

The study focuses on selected aspects of traditional Indian economic thought that are directly related to sustainability, environmental conservation, ethical consumption, and social welfare. It also examines their relevance in the context of modern sustainable development goals and green economy initiatives.

Limitations of the Study

- The study relies exclusively on secondary sources of data.
- The analysis is primarily conceptual and theoretical in nature.
- Due to time and resource constraints, empirical verification through field surveys or primary data collection has not been undertaken.

- The study focuses on selected traditional economic principles and does not cover all dimensions of Indian philosophical and economic traditions.

Discussion and Analysis

1. Traditional Indian Economic Thought and Environmental Sustainability

Traditional Indian economic thought is rooted in the belief that human beings are an integral part of nature rather than its masters. Ancient Indian scriptures advocate a harmonious relationship between humans and the environment. The Vedas regard natural elements such as forests, rivers, mountains, and animals as sacred, promoting respect and conservation of natural resources. This ecological consciousness aligns closely with modern concepts of environmental sustainability and biodiversity conservation.

In contrast to the modern growth-oriented economic model, traditional Indian thought emphasizes balance, moderation, and responsible utilization of resources. Such an approach can help address contemporary environmental problems arising from overconsumption and resource depletion.

2. Dharma and Sustainable Development

The concept of *Dharma* occupies a central place in Indian philosophy. It refers to ethical duties and responsibilities that guide individual and social behaviour. From an economic perspective, Dharma encourages fairness, social responsibility, and environmental stewardship.

Modern sustainability frameworks emphasize intergenerational equity and responsible resource management. The principle of Dharma similarly advocates the preservation of resources for future generations, making it highly relevant to sustainable development policies.

3. Aparigraha and Responsible Consumption

Aparigraha or non-possessiveness discourages excessive accumulation of wealth and material goods. It promotes moderation in consumption and discourages wasteful use of resources.

Contemporary environmental issues are largely driven by consumerism and unsustainable lifestyles. The principle of Aparigraha provides an ethical foundation for sustainable consumption by encouraging individuals to limit their needs and reduce ecological footprints. This idea is closely related to the Sustainable Development Goal (SDG) 12 on Responsible Consumption and Production.

4. Ahimsa and Ecological Ethics

The principle of *Ahimsa* (non-violence) extends beyond human relationships to include all living beings and nature. It promotes compassion, respect, and protection of the environment.

Modern environmental ethics emphasize reducing harm to ecosystems and biodiversity. Ahimsa provides a moral framework for environmental conservation by encouraging sustainable interactions with nature and discouraging activities that cause ecological destruction.

5. Gandhian Economics and Sustainable Living

Mahatma Gandhi's economic philosophy is highly relevant to contemporary sustainability discourse. Gandhi advocated simple living, local self-reliance, decentralized production, and ethical consumption. His famous statement that "the Earth provides enough to satisfy every man's need but not every man's greed" highlights the importance of limiting excessive consumption.

Gandhi's vision of village-based economies and sustainable livelihoods supports environmental conservation while promoting social equity. His ideas align with modern concepts such as green economy, circular economy, and sustainable development.

6. Trusteeship and Social Responsibility

Gandhi's theory of Trusteeship suggests that wealth holders are custodians of resources and should use them for the welfare of society. Rather than maximizing personal profits, individuals and businesses have a responsibility to contribute to social and environmental well-being.

Today, this concept finds expression in Corporate Social Responsibility (CSR), Environmental, Social, and Governance (ESG) practices, and sustainable business models. Trusteeship offers an ethical framework for balancing economic growth with social justice and environmental protection.

7. Self-Sufficiency and Localized Economies

Traditional Indian economic thought emphasizes self-reliance and local production systems. Localized economies reduce dependence on long supply chains, minimize transportation-related emissions, and strengthen community resilience.

In the context of climate change and global environmental challenges, promoting local production and consumption can contribute significantly to sustainable development and resource conservation.

8. Relevance to Sustainable Development Goals (SDGs)

Many principles of traditional Indian economic thought correspond closely with the United Nations Sustainable Development Goals:

- **SDG 12:** Responsible Consumption and Production – reflected in Aparigraha.
- **SDG 13:** Climate Action – supported through ecological consciousness.
- **SDG 15:** Life on Land – promoted through environmental protection.
- **SDG 3:** Good Health and Well-being – encouraged through balanced lifestyles.
- **SDG 11:** Sustainable Cities and Communities – reflected in community-centered development.

Thus, traditional Indian economic thought provides a valuable ethical and philosophical foundation for achieving global sustainability goals.

Analysis

The analysis reveals that many principles of traditional Indian economic thought anticipated

modern sustainability concepts long before they became part of international development discourse. Values such as moderation, environmental stewardship, social responsibility, and community welfare are increasingly recognized as essential for sustainable development. While modern economic systems often focus on maximizing production and consumption, traditional Indian thought emphasizes qualitative well-being, ecological balance, and ethical living.

The study suggests that integrating traditional Indian wisdom with contemporary economic policies can contribute to more sustainable patterns of development. Such integration can help address environmental degradation, promote responsible consumption, and foster a development model that is both economically viable and ecologically sustainable.

Findings of the Study

The study on **Traditional Indian Economic Thought and Sustainable Living: Insights for a Green Future** reveals the following key findings:

1. **Traditional Indian economic thought promotes harmony between humans and nature.** Ancient Indian philosophies view nature as an integral part of human existence and emphasize the responsible use of natural resources.
2. **The principle of Dharma encourages sustainable behaviour.** Ethical duties and responsibilities towards society and the environment contribute to long-term ecological balance and social welfare.
3. **Aparigraha (non-possessiveness) supports sustainable consumption.** The principle discourages excessive accumulation and promotes moderation, which can help reduce resource depletion and environmental degradation.
4. **Ahimsa (non-violence) extends to environmental protection.** Respect for all forms of life fosters ecological conservation and sustainable interaction with nature.
5. **Gandhian economic philosophy remains highly relevant to contemporary sustainability challenges.** Concepts such as simple living, self-reliance, decentralized production, and trusteeship provide practical approaches to sustainable development.
6. **The concept of Trusteeship promotes social and environmental responsibility.** It encourages individuals and organizations to utilize wealth and resources for the benefit of society rather than for excessive personal gain.
7. **Traditional Indian economic thought emphasizes community welfare over individual materialism.** This approach contributes to inclusive and sustainable development by balancing economic objectives with social and environmental concerns.
8. **Many principles of traditional Indian thought align with modern sustainable development goals.** Ideas related to responsible consumption, environmental conservation, social equity, and intergenerational justice are reflected in contemporary sustainability frameworks.

9. **Traditional Indian knowledge systems provide a holistic approach to development.** Unlike purely growth-oriented models, they integrate economic, social, ethical, and environmental dimensions of well-being.
10. **The integration of traditional Indian wisdom with modern economic policies can contribute to a greener future.** Traditional principles offer valuable guidance for addressing climate change, resource scarcity, environmental degradation, and unsustainable lifestyles.
11. **Sustainable living is not merely an environmental concern but also an ethical and cultural practice.** Traditional Indian economic thought demonstrates that sustainability can be achieved through value-based living and responsible decision-making.
12. **The study highlights the continuing relevance of indigenous knowledge systems in contemporary development discourse.** Traditional Indian economic ideas can complement modern sustainability strategies and strengthen efforts toward achieving long-term ecological and social sustainability.

Conclusion

Traditional Indian economic thought offers valuable insights for addressing contemporary environmental and developmental challenges. Principles such as Dharma, Ahimsa, Aparigraha, self-sufficiency, and Gandhian trusteeship emphasize harmony with nature, ethical consumption, social responsibility, and sustainable resource use. The study finds that these traditional ideas closely align with modern concepts of sustainable development and the Sustainable Development Goals (SDGs). In a world facing climate change, resource depletion, and ecological imbalance, traditional Indian wisdom provides a holistic and value-based approach to development that promotes both human well-being and environmental sustainability. The study concludes that integrating traditional Indian economic principles into contemporary policies and practices can contribute to a greener, more inclusive, and sustainable future. Thus, traditional Indian economic thought remains highly relevant in guiding sustainable living in the twenty-first century.

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INFLUENCE OF PHYSICAL ACTIVITY ON STRESS LEVELS AMONG ADOLESCENT ONLINE GAMERS IN KERALA

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Abstract

The increasing engagement of adolescents in online gaming has raised concerns regarding its psychological impact, particularly stress. The present study aimed to examine the influence of physical activity on stress levels among adolescent online gamers in Kerala. A total of 450 male higher secondary students (aged 13–19 years), who regularly engaged in online gaming for at least one hour per day, were selected for the study. Participants were categorised into physically low active, moderately active, and highly active groups using the International Physical Activity Questionnaire (IPAQ).

Stress levels were assessed using the Adolescent Stress Scale (ASS–DMDU). The collected data were analysed using descriptive statistics, One-Way Analysis of Variance (ANOVA), and Scheffé's post-hoc test. The results revealed a statistically significant difference in stress levels among the three groups ($F (2, 447) = 48.17$, $p < 0.001$). The physically low active group recorded the highest mean stress score ($M = 86.65$, $SD = 12.07$), followed by the moderately active group ($M = 80.23$, $SD = 14.63$), whereas the highly active group showed the lowest stress level ($M = 71.20$, $SD = 14.50$).

The findings indicate that higher levels of physical activity are associated with reduced stress among adolescent online gamers. The study emphasises the importance of promoting physical activity to mitigate the psychological effects of excessive gaming.

Keywords: *Adolescent gamers; Stress; Physical activity; Online gaming; Psychological health; Kerala*

1. Introduction

With the popularization of online gaming, digital technology has developed rapidly, which has greatly changed adolescent lifestyles. In the last years online games have become very engaging platforms that demand continuous cognitive effort, fast decision making and competitive interaction. The consequence is that there is an increase in the time teenagers spend in virtual gaming environments.

Online gaming is fun and mentally stimulating but has been associated with negative psychological effects if over-involved. Of these, stress is becoming a major concern. Excessive screen time, gaming pressure, sleep disturbance and less social interaction may cause psychological stress in adolescents. Research has shown that excessive gaming is linked to emotional exhaustion, irritability and higher stress levels in adolescents .

Adolescence is a key period marked by rapid emotional and psychological development. At this time, they tend to be more vulnerable to outside influences. For example, lifestyle habits like playing games and working out. Also, the mix of academic pressure, social expectations, and digital engagement may increase vulnerability to stress. Physical activity is well recognized as an effective means of reducing stress and enhancing mental health. Exercise on a regular basis enhances the ability to regulate emotions, relax physiologically and cope. However, increased use of sedentary digital activities has resulted in a decline in physical activity among adolescents, which may exacerbate stress-related problems. The growing popularity of online gaming among the adolescent population in Kerala has created concerns regarding its psychological effects. However, there is a dearth of empirical research on the association between physical activity and stress experienced by adolescent online gamers. Hence the present study aims to investigate the effect of physical activity on stress levels among adolescent online gamers in Kerala.

2. Materials and Methods

2.1 Research Design

The study used a descriptive survey design to determine the level of stress among adolescent online gamers.

2.2 Participants

The study employed descriptive survey research design to determine the level of stress among adolescent online gamers.The study was conducted with a sample of 450 male higher secondary students from different districts of Kerala. Those who played online games (violent or hunting-based games in particular) for at least 1 h a day were eligible for inclusion. According to the International Physical Activity Questionnaire (IPAQ), participants were divided into three groups based on their physical activity levels:

- Physically Low Active (n = 150)
- Physically Moderately Active (n = 150)
- Physically Highly Active (n = 150)

2.3 Instrumentation

Stress levels were measured by the Adolescent Stress Scale (ASS–DMDU) developed by Dabholkar and Dhar. The scale is made up of 25 items that measure different dimensions of adolescent stress, including fear, uncertainty, parental pressure, and emotional strain.

- Response format: 5-point Likert scale
- Higher scores indicate higher stress
- Reliability coefficient: 0.72

2.4 Procedure

After getting the necessary permissions, data collection was done in higher secondary schools. The purpose of the study was explained to the participants, who were asked to respond truthfully. The questionnaires were administered under controlled conditions.

2.5 Statistical Analysis

The following statistical techniques were used:

- Descriptive statistics (Mean and Standard Deviation)
- One-Way Analysis of Variance (ANOVA)
- Scheffé's post-hoc test

The level of significance was set at 0.05.

3. Results

3.1 Descriptive Statistics

Group	N	Mean	SD
Low Active	150	86.65	12.07
Moderate Active	150	80.23	14.63
High Active	150	71.2	14.5

Table 1.1

Regarding the stress, physically low active group scored the highest mean value (M = 86.65, SD = 12.07) followed by the physically moderate active group (M = 80.23, SD = 14.63) while the physically high active group scored the lowest mean value (M = 71.20, SD = 14.50). The results demonstrate that participants with higher levels of physical activity showed relatively lower levels of stress.

3.2 Analysis of Variance

Analysis of Variance on Stress Among Adolescent Online Gamers.

Source of Variance	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	17784.56	2	8892.28	48.17	0.001*
Within Groups	82492.71	447	184.55		
Total	100277.27	449			

Table 1.2

Table 1.2 : Analysis of Variance (ANOVA) on stress levels among physically low active, physically moderately active and physically highly active adolescent online gamers in Kerala. The obtained F-value of 48.17 with the corresponding p-value of 0.001 was found to be statistically significant at 0.05 level. The large F-ratio suggests that there is a significant difference in the three groups' stress levels. From the descriptive statistics, it was revealed that the physically low active group had the highest mean score of stress (M = 86.65), followed by the physically moderate active group (M = 80.23) and the physically highly active group had the lowest mean score (M = 71.20). Results suggest that higher levels of physical activity are associated with lower levels of stress among adolescent internet gamers. Regular physical activity can improve emotional stability, stress management and psychological well-being. Conversely, reduced physical activity coupled with extended online

gaming behaviour may increase emotional stress, mental fatigue and psychological stress among adolescents.

Figure 1.1

Graphical representation of Stress Among Adolescent Online Gamers in physically low low active, physically moderately active, and physically highly active.

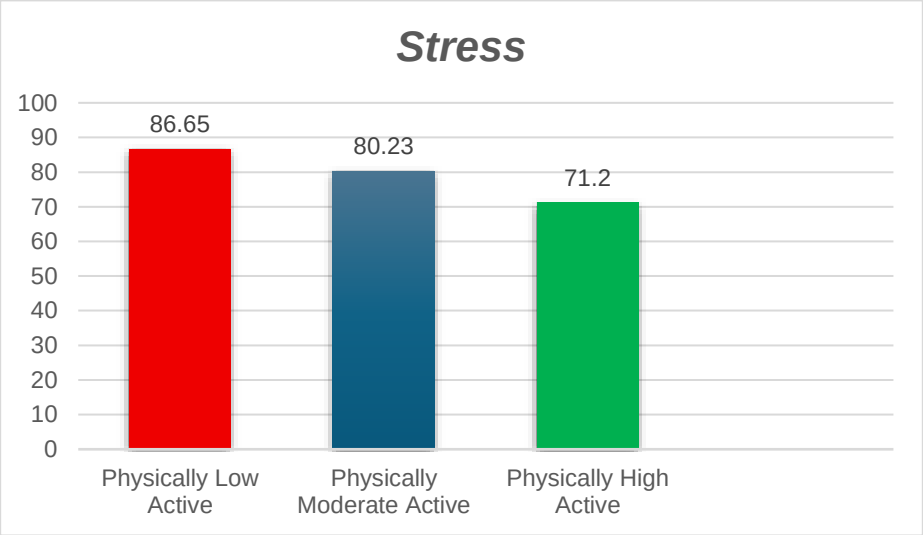


Figure 1.1

3.3 Post-hoc Analysis

Scheffé's post-hoc test showed significant differences between all groups:

Comparison	Mean Difference	p-value
Low vs Moderate	6.42	0.008
Low vs High	15.45	0.001
Moderate vs High	9.03	0.001

Table 1.3

Table 1.3 Post hoc analysis of stress among adolescent online gamers in physically low active, physically moderate active and physically high active groups. The results revealed that there were significant differences in all the paired group comparisons since the obtained p-values were less than .05.

The physically low active group had significantly higher stress levels than the physically moderate active group and the physically high active group. Likewise, the physically moderate active group had significantly higher stress levels compared with the physically high active group. The physically high active group had the lowest level of stress among the three groups.

The results suggest that higher levels of physical activity are related to lower levels of stress in adolescent online gamers.

4. Discussion

The findings of the present study indicate that physical activity has a significant impact on stress levels of adolescent online gamers. The physically low active group reported significantly higher levels of stress and the physically high active group reported the lowest levels of stress.

The findings align with earlier research suggesting an association between extended gaming exposure and psychological stress. Continuous engagement in gaming environments may increase cognitive load, emotional tension and physiological arousal which in turn may increase stress levels. Furthermore, too much screen time can interfere with sleep patterns and cut down on relaxation time, adding to stress.

However, physical activity seems to be an effective stress-regulating mechanism. Regular physical activity results in physiological relaxation, better mood and better stress coping strategies. Exercise boosts the levels of endorphins that can improve emotional well-being and reduce psychological distress.

Findings also suggest that excessive gaming-related sedentary behaviour may limit adolescents' ability to manage stress effectively. Physically active adolescents are more likely to pursue balanced lifestyles conducive to mental and physical health.

5. Conclusion

The study finds that:

- Physical activity has a significant effect on the stress levels of adolescent online gamers.
- Physically, low active gamers experience more stress.
- Gamers who are physically active are less stressed.
- Physical activity is a very good protective factor against stress.

The research emphasizes the importance of motivating adolescents to participate in regular physical activity in order to counteract the psychological consequences of excessive online gaming.

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EFFECTIVENESS OF YOGIC TRAINING IN IMPROVING FLEXIBILITY AMONG SCHOOL-LEVEL HOCKEY PLAYERS

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Abstract

The present study aimed to investigate the impact of yogic training on flexibility among school-level hockey players. Flexibility is considered one of the essential components of physical fitness in hockey, as the sport involves rapid running, bending, stretching, agility, and quick directional movements during play. Adequate flexibility helps players perform skills efficiently and reduces the risk of sports-related injuries. The study adopted an experimental research design using pre-test and post-test methods. A total of 20 school-level hockey players aged between 13 and 17 years were selected through purposive sampling technique and randomly divided into two equal groups: an experimental group (n = 10) and a control group (n = 10). The experimental group underwent an 8-week yogic training programme consisting of selected yoga asanas and flexibility-oriented stretching exercises for five days per week, while the control group continued their regular hockey training programme without any yogic intervention. Flexibility was measured using the Sit-and-Reach Test before and after the training period. The collected data were analysed using descriptive statistics such as mean and standard deviation, along with paired t-test and independent t-test to determine the significance of differences within and between the groups. The findings of the study revealed that the experimental group showed significant improvement in flexibility compared to the control group after the completion of the yogic training programme. The improvement may be attributed to the positive effects of yoga practices on muscle elasticity, joint mobility, and neuromuscular coordination. Based on the findings, it was concluded that yogic training is an effective method for improving flexibility among school-level hockey players and can be incorporated into regular sports training programmes to enhance physical fitness and athletic performance.

Keywords: Yogic training, flexibility, school-level hockey players, sit-and-reach test, yoga asanas, physical fitness.

INTRODUCTION

Flexibility is a vital component of physical fitness, particularly in sports that demand rapid and multidirectional movements. Field hockey is a fast-paced sport involving continuous running, bending, stretching, reaching, and quick changes of direction. These actions place significant demands on the musculoskeletal system and require a high degree of flexibility for optimal performance. Adequate flexibility not only improves skill execution but also plays a crucial role in preventing sports-related injuries by maintaining joint mobility and

muscular elasticity (Alter, 2004).

In recent years, yogic training has emerged as an evidence-based method for enhancing physical fitness components, particularly flexibility. Yoga is an ancient holistic discipline that incorporates physical postures (asanas), breathing techniques (pranayama), and relaxation to promote both physical and mental well-being. Research has consistently shown that regular yoga practice can significantly increase joint range of motion, improve muscle extensibility, and enhance neuromuscular coordination (Tran et al., 2001).

For school-level hockey players, who are in a critical phase of physical development, incorporating yogic training into their regimen can yield substantial benefits. At this stage, targeted flexibility training not only supports athletic performance but also fosters long-term musculoskeletal health. Traditional hockey training typically emphasizes technical skills and cardiovascular conditioning, often neglecting structured flexibility development.

Previous research has documented the positive effects of yogic training on flexibility in various athletic populations (Cowen & Adams, 2005; Polsgrove et al., 2016). However, limited studies have examined its specific impact on school-level hockey players. The present study was therefore undertaken to investigate the effectiveness of yogic training in improving flexibility among school-level hockey players.

OBJECTIVES OF THE STUDY

- To determine the effect of yogic training on flexibility among school-level hockey players.
- To compare the pre-test and post-test flexibility levels of the experimental and control groups.
- To examine the significance of difference between the experimental and control groups in flexibility.
- To evaluate yogic training as an effective intervention for improving flexibility.

HYPOTHESES OF THE STUDY

- There will be a significant improvement in flexibility among school-level hockey players after yogic training.
- There will be a significant difference between pre-test and post-test flexibility scores of the experimental group.
- There will be a significant difference between experimental and control groups in post-test flexibility scores.
- Yogic training will have a positive impact on flexibility among school-level hockey players.

REVIEW OF LITERATURE

Flexibility is universally acknowledged as a fundamental fitness component, especially in sports requiring complex and dynamic movements. Alter (2004) emphasized that flexibility enhances movement efficiency and significantly reduces injury risk by maintaining

joint health and muscular extensibility.

Tran et al. (2001) investigated the effects of Hatha yoga practice on health-related aspects of physical fitness and reported significant improvements in flexibility, muscular strength, and balance among participants. Their findings established yoga as a credible alternative to conventional fitness training.

Cowen and Adams (2005) examined the physical and perceptual benefits of yoga asana practice and found that regular yoga participation leads to notable improvements in flexibility and overall fitness. The study highlighted how sustained stretching and controlled movement patterns in yoga contribute to enhanced muscle elasticity and joint mobility.

Polsgrove et al. (2016) explored the effects of a 10-week yoga programme on collegiate athletes and reported significant gains in both flexibility and balance. Sharma et al. (2012) investigated the impact of yogic practices on physical fitness variables among school students and observed significant improvements in flexibility. From a physiological standpoint, yoga

improves flexibility by increasing the extensibility of muscles and connective tissues and enhancing neuromuscular relaxation (McCall, 2007).

METHODOLOGY

Research Design

The study adopted a pre-test–post-test experimental control group design.

Participants

A total of 20 school-level hockey players aged between 13 and 17 years were selected through purposive sampling and randomly assigned into an Experimental Group (n = 10) and a Control Group (n = 10).

Training Protocol

The experimental group underwent a structured yogic training programme for 8 weeks, with 5 sessions per week, each lasting 45 to 60 minutes. The selected asanas included Bhujangasana, Paschimottanasana, Trikonasana, Pavanamuktasana, and Uttanasana. The control group continued their regular hockey training without any additional yogic intervention.

Measurement of Flexibility

Flexibility was assessed using the Sit-and-Reach Test, a standardized method for measuring lower back and hamstring flexibility. Pre-test measurements were recorded before the intervention, and post-test measurements were taken at the conclusion of the 8-week programme. Statistical analyses included descriptive statistics, paired t-test, independent t-test, and ANCOVA (significance level: 0.05).

FINDINGS AND DISCUSSIONS

Descriptive Statistics

Table 1: Pre-test and Post-test Mean Scores of Flexibility (cm)

Group	Test	Mean	SD
Experimental Group	Pre-test	18.60	2.22
Experimental Group	Post-test	26.40	2.38
Control Group	Pre-test	18.40	2.18
Control Group	Post-test	19.30	2.12

The experimental group demonstrated a substantial improvement from 18.60 cm to 26.40 cm (mean gain: 7.80 cm), while the control group showed only a marginal increase from 18.40 cm to 19.30 cm.

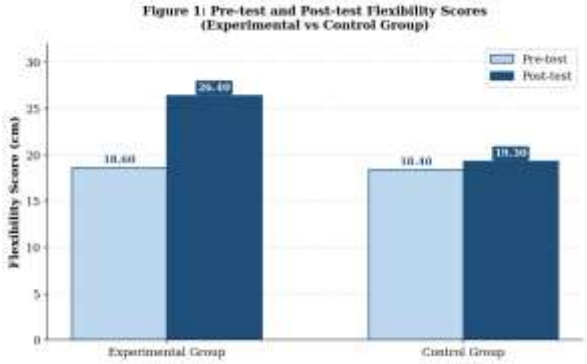


Figure 1: Pre-test and Post-test Flexibility Scores (Experimental vs Control Group)

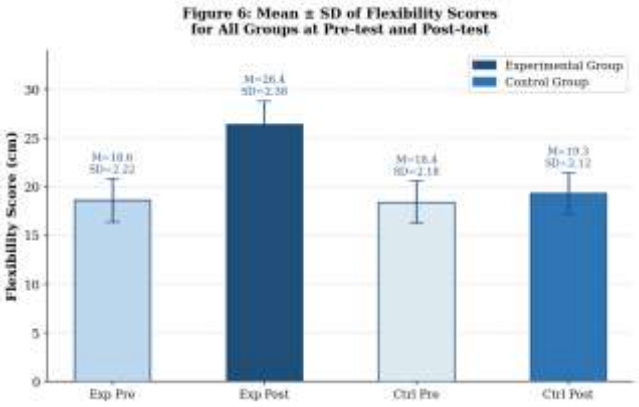


Figure 6: Mean ± SD of Flexibility Scores for All Groups at Pre-test and Post-test

Within-Group Comparison (Paired t-test)

Table 2: Paired t-test Results for the Experimental Group

Variable	Mean Difference	t-value	Significance
Flexibility	7.80	9.87*	Significant

**Significant at 0.05 level.*

The paired t-test yielded a t-value of 9.87 (significant at $p < 0.05$), confirming a significant within-group improvement in flexibility in the experimental group. The control group showed

no significant change.

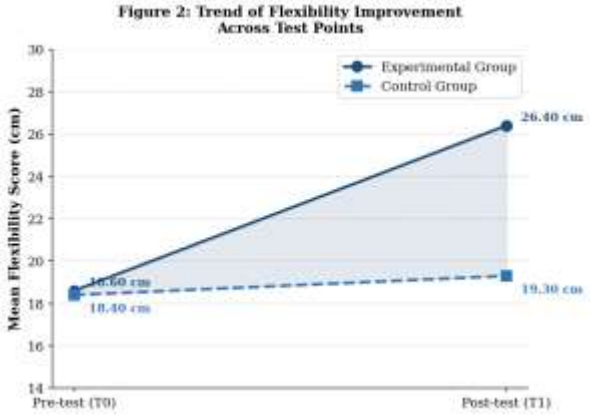


Figure 2: Trend of Flexibility Improvement Across Test Points

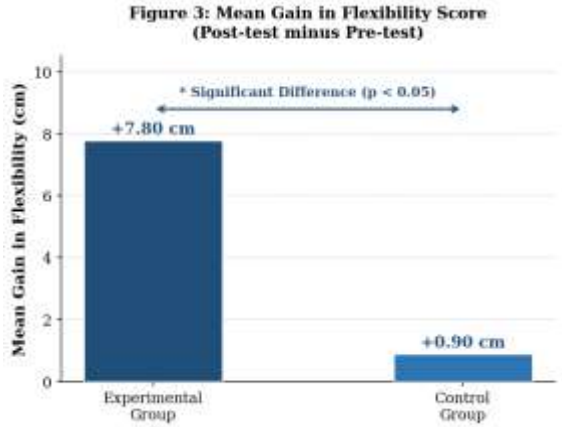


Figure 3: Mean Gain in Flexibility Score (Post-test minus Pre-test)

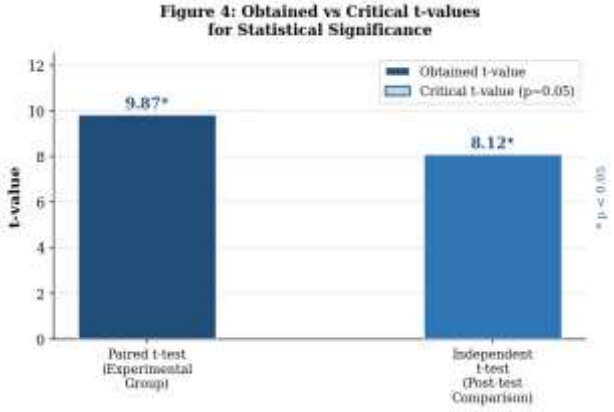
Between-Group Comparison (Independent t-test)

Table 3: Post-test Comparison between Experimental and Control Groups

Group Comparison	Mean Difference	t-value	Significance
Experimental vs Control	7.10	8.12*	Significant

**Significant at 0.05 level.*

The independent t-test revealed a t-value of 8.12 (significant at $p < 0.05$), confirming that the experimental group significantly outperformed the control group in post-test flexibility scores.



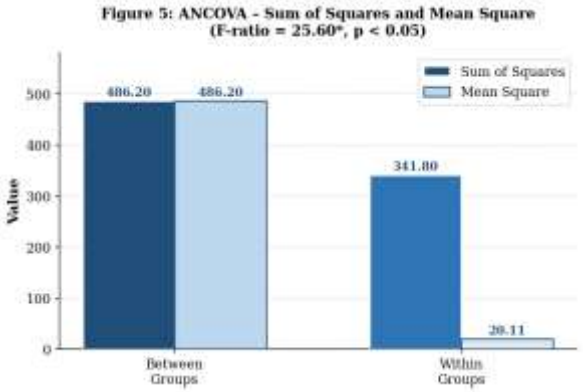
ANCOVA Analysis

Table 4: Analysis of Covariance (ANCOVA) Summary

Source	Sum of Squares	DF	Mean Square	F-ratio	Significance
Between Groups	486.20	1	486.20	25.60*	Significant
Within Groups	341.80	17	20.11		

**Significant at 0.05 level.*

The ANCOVA yielded a significant F-ratio of 25.60. Even after statistically controlling for pre-test differences, the analysis confirmed that the yogic training programme produced significant improvements in flexibility.



DISCUSSION OF FINDINGS

The present study aimed to examine the effectiveness of yogic training in improving flexibility among school-level hockey players. The findings clearly demonstrated that the experimental group, which underwent an 8-week yogic training programme, showed a statistically significant improvement in flexibility compared to the control group. The descriptive statistics revealed a substantial increase in mean flexibility scores in the experimental group (18.60 cm to 26.40 cm) compared to a marginal increase in the control group (18.40 cm to 19.30 cm).

The paired t-test confirmed that the improvement within the experimental group was statistically significant, supporting the hypothesis that yogic training positively influences flexibility. The sustained stretching and controlled holding of yoga postures enhance muscle extensibility and joint mobility. The control group's minimal change suggests that routine hockey training alone is insufficient to produce meaningful gains in flexibility.

The independent t-test revealed a significant between-group difference in post-test scores, and the ANCOVA confirmed that improvements were attributable to the programme rather than pre-existing variability. These findings are consistent with Tran et al. (2001), Cowen and Adams (2005), and Polsgrove et al. (2016), all of whom reported significant flexibility improvements following yoga interventions. From a physiological perspective, yoga improves flexibility through increased muscle length, reduced stiffness, and enhanced neuromuscular relaxation (McCall, 2007) — adaptations particularly relevant for hockey players who frequently bend, stretch, and reach during match play.

SUMMARY OF FINDINGS

- Yogic training significantly improved flexibility among school-level hockey players.
- The experimental group demonstrated a mean improvement of 7.80 cm in the Sit-and-Reach Test.
- The paired t-test ($t = 9.87$) confirmed significant within-group improvement in the experimental group.
- The independent t-test ($t = 8.12$) indicated a significant between-group difference in post-test scores.
- ANCOVA ($F = 25.60$) validated the effectiveness of yogic training after adjusting for pre-test differences.

CONCLUSION

The present study conclusively demonstrates that yogic training has a significant positive impact on flexibility among school-level hockey players. Participants in the experimental group exhibited substantial improvements following the 8-week programme, reflecting enhanced joint mobility, increased muscle elasticity, and improved neuromuscular coordination. Statistical analyses including paired t-test, independent t-test, and ANCOVA consistently validated the effectiveness of the intervention.

Yoga offers a safe, low-impact, and cost-effective approach to enhancing flexibility without placing undue stress on the developing musculoskeletal system of young athletes. Its integration into regular training schedules has the potential to enhance performance, reduce injury risk, and support the holistic development of school-level hockey players. Future research should explore long-term effects and its impact on additional performance variables such as agility, balance, and coordination.

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IMPACT OF AN INTEGRATED YOGIC TRAINING PROGRAM ON FITNESS AND PSYCHOLOGICAL FACTORS IN COLLEGE BADMINTON PLAYERS: A RANDOMIZED CONTROLLED TRIAL

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Abstract

Badminton requires high fitness and mental readiness. This study examined how an eight-week yoga training program affected physical and mental skills among college-aged male players aged 18 to 25. The participants were divided into two groups: the experimental group had 15 players, and the control group also had 15 players. The experimental group practiced yoga routines for 60 minutes every day, five days a week, including poses, breathing exercises, meditation, and relaxation. The control group followed their usual training. Physical assessments measured flexibility, agility, balance, and core strength. Psychological assessments looked at anxiety, confidence, concentration, emotional intelligence, and mental toughness. Data collected before and after training were analyzed using ANCOVA. The analysis showed significant improvements in all physical and mental variables, with large effect sizes (partial η^2 = .354 to .441). The results suggest that incorporating yoga training can improve both physical and mental performance, and it can be added to regular training to enhance athletic readiness.

Keywords: *Yoga, badminton, physical fitness, competitive anxiety, self-confidence, concentration, emotional intelligence, mental toughness, collegiate athletes, ANCOVA.*

Introduction

Badminton is a demanding racket sport that requires intense bursts of activity, including explosive movements, quick directional changes, jumping, lunging, sprinting, and recovery (Phomsoupha & Laffaye, 2015). Success depends on skill, strategy, and physical fitness, including flexibility, agility, balance, and core strength, which improve movement, prevent injury, and enhance performance (Cabello-Manrique & González-Badillo, 2003; Lees, 2003; Gowitzke & Waddell, 1991). Competitive badminton demands coordination, sustained high effort, multidirectional movements, rapid shifts between offense and defense, with agility, balance, and core stability being key (Ooi et al., 2009). Flexibility boosts range of motion and stroke technique and reduces the risk of injury (Behm et al., 2016). Coaches seek training strategies to enhance fitness. Recently, sports science experts have recognized that physical readiness alone is not enough for success.

Psychological factors like anxiety, self-confidence, focus, emotional intelligence, and mental toughness are key to athletic success (Weinberg & Gould, 2019). Competitive anxiety can impair decision-making, attention, reaction time, and motor skills under pressure, thereby lowering performance (Martens et al., 1990). Athletes with high confidence, emotional control, focus, and mental toughness tend to perform consistently and recover well (Jones, Hanton, & Connaughton, 2007). Psychological readiness is crucial across sports; managing anxiety and emotional balance enhances concentration, resilience, and decision-making (Hanin, 2000). Skills such as mindfulness and emotional intelligence improve performance, coping, and well-being (Laborde et al., 2014).

Modern sports training now often blends mental and physical development. Researchers explore alternative methods, like yoga, which combines physical postures, breathing, meditation, relaxation, and mindfulness (Iyengar, 2005). Unlike typical workouts, yoga aims to unify physical, mental, and emotional aspects of performance (Telles, Naveen, & Balkrishna, 2017).

Research indicates that consistent yoga practice enhances flexibility, balance, muscular endurance, core strength, and neuromuscular coordination (Tran et al., 2001; Polsgrove, Eggleston, & Lockyer, 2016). It also reduces stress and competitive anxiety, improves emotional regulation, increases focus, and promotes psychological health in both athletes and non-athletes (Li & Goldsmith, 2012; Büssing et al., 2012). Techniques such as controlled breathing and mindfulness can help regulate the nervous system, reduce physical stress, and support competitive strategies (Ross & Thomas, 2010). Although yoga is becoming more popular in athletic training, its effectiveness in badminton remains underexplored. Considering badminton's specific needs, a comprehensive yoga program might improve both physical fitness and mental resilience.

This study examined the effects of yoga on physical fitness and psychological factors among collegiate badminton players. Past research shows yoga improves flexibility, balance, muscular endurance, cardiovascular health, stress, cognition, and emotional health. Cowen and Adams (2005) found gains in flexibility and wellness from regular practice. Telles, Singh, and Balkrishna (2012) saw anxiety and stress reductions. Sharma (2014) linked yoga to better cognition, attention, and mental health. Singh, Uday, and Yadav (2019) reported increased self-confidence and anxiety control. Kibler, Press, and Sciascia (2006) emphasized the role of core stability from yoga in enhancing athletic performance. Most studies focus on either physical or psychological effects in isolation, but few examine their combined impact on badminton players. Given badminton's unique demands, it is crucial to conduct a scientific assessment of whether an integrated yoga program can enhance performance, fitness, and mental preparedness.

Addressing this research gap could give coaches, sports psychologists, and trainers an effective method for athlete development. This study assessed the impact of an eight-week

integrated yoga program on physical fitness—flexibility, agility, balance, and core strength—and psychological factors such as competitive anxiety, self-confidence, concentration, emotional intelligence, and mental toughness in collegiate badminton players. Participation was expected to improve these areas and reduce competitive anxiety compared to usual training.

Methodology

This study used a randomized pre-test, post-test control group design to look at the effects of an integrated yogic training program on certain physical fitness and psychological variables among college badminton players. Thirty male players aged 18 to 25 years were selected from various colleges that took part in intercollegiate competitions. All had at least two years of competitive experience and were medically fit for sports training.

Before collecting data, informed consent was obtained from each participant. The subjects were randomly divided into two equal groups: an experimental group (n = 15) and a control group (n = 15). This random assignment ensured that the groups were similar and reduced selection bias. The study focused on specific physical fitness components, including flexibility, dynamic balance, agility, and core strength. It also examined psychological factors like competitive anxiety, self-confidence, and concentration. Flexibility was measured using the Sit and Reach Test, dynamic balance with the Star Excursion Balance Test, agility with the T-Test Agility Run, and core strength with the Plank Hold Test. Psychological aspects were evaluated using established tools: the Sport Competition Anxiety Test (SCAT) for anxiety, the Trait Sport Confidence Inventory (TSCI) for self-confidence, and the Grid Concentration Test for focus. All tests were performed under controlled conditions by trained personnel to ensure the reliability and validity of the data.

The experimental group engaged in a structured, 8-week integrated yogic training program. Sessions occurred five days a week, each lasting around 60 minutes—the program combined yogic practices to enhance physical fitness and mental well-being. Every session started with a short warm-up, including joint mobility exercises and dynamic stretching, followed by selected asanas such as Surya Namaskar, Vrikshasana, Trikonasana, Bhujangasana, Paschimottanasana, Utkatasana, and Virabhadrasana. These poses were chosen for their benefits in increasing flexibility, balance, muscular endurance, and postural stability. This was followed by pranayama techniques such as Anulom Vilom, Nadi Shodhana, and Bhramari, designed to enhance respiratory efficiency, calm the mind, and stabilize emotions. The sessions also incorporated mindfulness meditation and breath-awareness exercises to improve focus, attentional control, and psychological resilience. Each session concluded with relaxation practices, such as Yoga Nidra and Shavasana, to support recovery and stress reduction.

The duration and complexity of the yogic practices gradually increased over the course of the intervention to support proper physiological and psychological adaptation.

During the eight weeks, control group participants continued their usual badminton training and physical conditioning but did not take part in any structured yogic practices. Both groups maintained their regular academic and sports routines throughout the study. Pre-test data for all variables were collected one week before the intervention started, and post-test data were gathered immediately after the eight-week training ended. To ensure accuracy and consistency, the same testing procedures, equipment, and environmental conditions were used in both sessions.

The data were analyzed using appropriate statistical methods. Descriptive statistics, such as mean and standard deviation, were calculated for each variable. To evaluate the effectiveness of the yogic training program, ANCOVA was used to compare the adjusted post-test means of the experimental and control groups, considering baseline differences in pre-test scores. The significance level was set at 0.05.

Analysis of Results

The results of the study show how an eight-week integrated yogic training program affects specific physical and psychological measures in college badminton players. ANCOVA was employed to compare the adjusted post-test means between the experimental and control groups, accounting for pre-test scores. The significance threshold was set at 0.05. The F-values obtained were compared with the critical F-value of 4.21 (df = 1, 27), which is required to determine significance at this level.

Table 1 Analysis of Covariance for Physical Fitness Variables among Badminton Players

Variable	Group	Pre-Test	Post-Test	Adjusted Post-Test Mean	Obtained F-value	p-value
Flexibility (cm)	Experimental	22.40	29.80	29.52	16.42	0.001*
	Control	22.10	23.00	23.28		
Agility (sec)	Experimental	11.60	10.20	10.24	14.87	0.001*
	Control	11.50	11.30	11.26		
Dynamic Balance (score)	Experimental	78.20	88.60	88.31	18.91	0.000**
	Control	77.90	79.10	79.39		
Core Strength (sec)	Experimental	78.50	102.30	101.84	21.34	0.000**
	Control	79.10	81.00	81.46		

Table F-value required for significance at 0.05 level = 4.21 (df = 1, 27).

Table 1 shows notable improvements in all physical fitness variables for the experimental group after the eight-week yogic training program. The F-values for flexibility (16.42), agility (14.87), dynamic balance (18.91), and core strength (21.34) all exceeded the critical F-value of 4.21. This indicates statistically significant differences between the experimental and control groups at the 0.05 significance level.

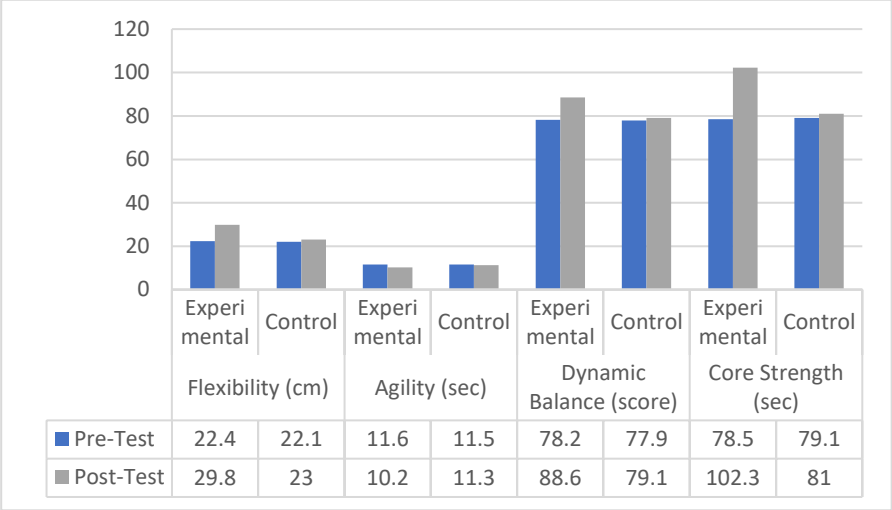


Figure 1 Physical *Fitness Variables among Badminton Players*

Table 2 *Analysis of Covariance for Psychological Variables among Badminton Players*

Variable	Group	Pre-Test	Post-Test	Adjusted Post-Test	F value	p-value
Competitive Anxiety	Experimental	28.47	20.13	20.38	18.62	0.000**
	Control	27.93	27.18	26.93		
Self-Confidence	Experimental	24.26	31.67	31.42	16.94	0.001*
	Control	24.80	25.20	25.45		
Concentration	Experimental	18.73	26.40	26.11	20.57	0.000**
	Control	19.07	19.53	19.82		
Emotional Intelligence	Experimental	95.60	108.33	107.89	14.83	0.001*
	Control	96.13	97.07	97.51		
Mental Toughness	Experimental	28.93	36.47	36.08	17.26	0.001*
	Control	29.20	29.73	30.12		

Table F-value required for significance at 0.05 level = 4.21 (df = 1, 27).

Table 2 shows significant improvements in psychological variables for participants who completed yogic training. There was a notable decrease in competitive anxiety and significant increases in self-confidence, concentration, emotional intelligence, and mental toughness. The F-values ranged from 14.83 to 20.57, exceeding the critical value of 4.21. The null hypothesis was rejected, confirming the program's positive impact on the players' psychological traits.

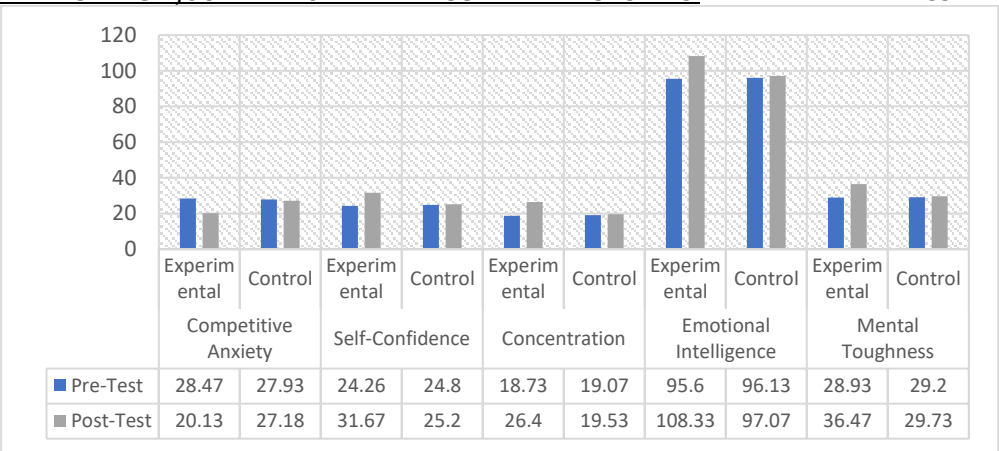


Figure 2 ***Analysis of Psychological Variables among Badminton Players***

Table 3 ***ANCOVA Adjusted Post-Test Means, F-Values, Significance Levels, and Effect Sizes for Physical Fitness and Psychological Variables of Collegiate Badminton Players***

Variable	Adjusted Mean (EG)	Adjusted Mean (CG)	F	p	Partial η^2
Flexibility	29.52	23.28	16.42	.001	.378
Agility	10.24	11.26	14.87	.001	.355
Balance	88.31	79.39	18.91	.000	.412
Core Strength	101.84	81.46	21.34	.000	.441
Competitive Anxiety	20.38	26.93	18.62	.000	.408
Self-Confidence	31.42	25.45	16.94	.001	.386
Concentration	26.11	19.82	20.57	.000	.432
Emotional Intelligence	107.89	97.51	14.83	.001	.354
Mental Toughness	36.08	30.12	17.26	.001	.390

Significant at $p < .05$; Table F-value (1, 27) = 4.21.

Table 3 shows significant differences between the experimental and control groups after eight weeks of yogic training across all measured variables. The F-values ranged from 14.83 to 21.34, all above the critical value of 4.21, with p-values below .05. The experimental group had higher post-test scores in flexibility, agility, balance, core strength, self-confidence, concentration, emotional intelligence, and mental toughness, and lower competitive anxiety. Large effect sizes (.354–.441) indicate the training's substantial positive impact on physical and psychological performance in collegiate badminton players.

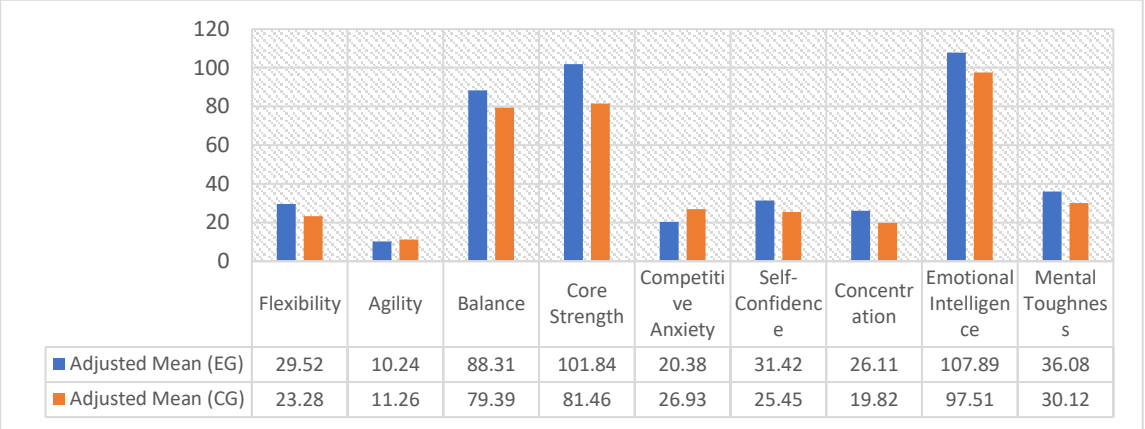


Figure 3 ***Physical Fitness and Psychological Variables of Collegiate Badminton Players***

Discussion of findings

The current study found that an 8-week integrated yoga training program led to significant improvements in flexibility, agility, dynamic balance, and core strength among collegiate badminton players. The noticeable gains in physical fitness likely come from regular asana practice, which improves muscular flexibility, postural stability, neuromuscular coordination, and movement efficiency.

These findings support the work of Tran et al. (2001), who found that regular Hatha yoga practice greatly enhanced flexibility, muscular endurance, and overall fitness. Similarly, Polsgrove, Eggleston, and Lockyer (2016) showed that a ten-week yoga intervention improved balance and flexibility in collegiate athletes. Since badminton requires quick, multidirectional movements, lunges, jumps, and rapid recovery actions, better flexibility, balance, and core strength can enhance performance in this sport (Phomsoupha & Laffaye, 2015). The results also showed a significant drop in competitive anxiety among participants in the experimental group. This supports previous studies indicating that yoga can help manage both physical and psychological stress. Ross and Thomas (2010) found that yoga interventions improve autonomic regulation and lessen stress-related symptoms. Li and Goldsmith (2012) concluded that yoga effectively reduces anxiety and boosts emotional well-being. Techniques like Anulom Vilom, Nadi Shodhana, and Bhramari might have increased emotional control and lowered anxiety by promoting relaxation through parasympathetic nervous system activation.

There were also significant improvements in self-confidence and concentration after the program. These findings align with those of Weinberg and Gould (2019), who noted that skills such as attentional control, confidence, and emotional regulation are crucial for athletic performance. The meditation and mindfulness practices in the yoga program may have improved athletes' ability to maintain attention and focus during performance. Telles, Naveen, and Balkrishna (2017) reported similar findings, suggesting that yoga and meditation

enhance cognitive functioning, attention, and mental clarity. The study further revealed notable improvements in emotional intelligence and mental toughness among the badminton players who participated in yoga training. Emotional intelligence plays a key role in athletic performance, interpersonal relationships, and coping skills (Laborde, Dosseville, Guillén, & Chávez, 2014). The observed gains likely result from the self-awareness, self-regulation, and mindfulness fostered through regular yoga practice.

The increase in mental toughness also supports the findings of Jones, Hanton, and Connaughton (2007), who highlighted the importance of emotional control, resilience, and confidence for success in sports. Yoga practices seem to promote these psychological traits by encouraging discipline, self-reflection, and coping strategies. The large effect sizes for all selected variables show that the intervention led to not only statistically significant but also practically meaningful improvements.

These results support the increasing recognition of the need to include yoga in athletic training programs. Büssing et al. (2012) concluded that yoga positively impacts both physical and mental health, while Phomsoupha and Laffaye (2015) emphasized the importance of developing both physical and psychological abilities for optimal badminton performance. Thus, the current study suggests that an integrated yoga training program can be an effective addition to training for improving fitness and mental readiness among collegiate badminton players. Overall, the findings back up previous research showing that yoga is a comprehensive training approach that can improve both physical performance and mental functioning. The significant improvements across all measured variables suggest that incorporating yoga into regular badminton training could give athletes a competitive edge by enhancing their physical skills and mental toughness.

Conclusions

1. The eight-week integrated yogic training program significantly improved flexibility among collegiate badminton players.
2. Regular participation in yogic practices resulted in a significant enhancement of agility performance.
3. Dynamic balance showed substantial improvement following the yogic training intervention.
4. The yogic training program effectively increased core strength compared to regular badminton training alone.
5. Competitive anxiety was significantly reduced among badminton players who underwent yogic training.
6. Self-confidence levels improved significantly as a result of the integrated yogic training program.
7. Yogic practices contributed to enhanced concentration and attentional control among the participants.

8. Emotional intelligence scores increased significantly following the intervention, indicating better emotional awareness and regulation.
9. Mental toughness improved significantly among players who participated in the yogic training program.
10. The observed improvements in both physical fitness and psychological variables suggest that yoga is an effective complementary training method for badminton players.
11. The large effect sizes obtained for all variables indicate that the intervention produced meaningful and practically significant outcomes.
12. Incorporating yogic practices into regular badminton training programs may enhance overall athletic performance, psychological readiness, and competitive effectiveness.
13. The integrated yogic training program can be recommended as a holistic approach for the development of collegiate badminton players.

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IMPACT OF STRESS ON MEMORY, BLOOD PRESSURE, AND HEART DISEASE: A PHYSIOLOGICAL ANALYSIS WITH SPORTS PSYCHOLOGY-BASED REMEDIAL MEASURES

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Abstract

Stress is an inevitable part of human life and has become increasingly prevalent in modern society. While moderate levels of stress can enhance performance and adaptation, chronic and excessive stress adversely affects physiological and psychological functioning. Prolonged exposure to stress hormones negatively influences memory processes, elevates blood pressure, and increases the risk of cardiovascular diseases. The present theoretical paper examines the physiological mechanisms through which stress affects memory, blood pressure regulation, and heart health. Additionally, the paper discusses evidence-based remedial measures derived from sports psychology, including Progressive Muscle Relaxation (PMR), self-hypnosis, meditation, breathing techniques, imagery, and cognitive restructuring. These interventions contribute significantly to stress management, improved mental health, and enhanced physiological functioning. Understanding the relationship between stress and physiological health is essential for developing effective preventive and therapeutic strategies.

Keywords: *Stress, Memory, Blood Pressure, Heart Disease, Sports Psychology, Progressive Muscle Relaxation, Self-Hypnosis*

Introduction

Stress refers to the body's physiological and psychological response to demands or challenges that threaten homeostasis. According to Selye (1976), stress is the nonspecific response of the body to any demand placed upon it. While acute stress may facilitate adaptation and performance, chronic stress can have detrimental effects on various bodily systems.

The prevalence of stress-related disorders has increased significantly due to occupational pressures, academic demands, lifestyle changes, and socioeconomic challenges. Chronic stress activates neuroendocrine pathways, particularly the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system, resulting in prolonged secretion of cortisol and catecholamines. These physiological changes contribute to impaired memory, hypertension, and cardiovascular diseases.

The present paper aims to analyze the physiological impact of stress on memory, blood pressure, and heart disease while highlighting effective stress management interventions commonly used in sports psychology.

Physiological Basis of Stress

Stress initiates a complex physiological response involving multiple body systems. The primary stress response occurs through two major pathways:

1. Sympathetic-Adrenal-Medullary (SAM) System

The sympathetic nervous system stimulates the adrenal medulla to release adrenaline and noradrenaline. These hormones increase:

- Heart rate
- Blood pressure
- Respiratory rate
- Blood glucose levels

This response prepares the body for the "fight-or-flight" reaction.

2. Hypothalamic-Pituitary-Adrenal (HPA) Axis

Under stress, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to secrete adrenocorticotropic hormone (ACTH). ACTH subsequently triggers cortisol release from the adrenal cortex.

Excessive cortisol secretion over prolonged periods adversely affects cognitive functions, cardiovascular health, and immune functioning.

Impact of Stress on Memory

Memory is a crucial cognitive function involving the encoding, storage, and retrieval of information. Stress significantly influences memory processes through neurobiological mechanisms.

Effects of Cortisol on the Brain

The hippocampus, a brain structure responsible for memory formation and consolidation, contains numerous cortisol receptors. Chronic exposure to elevated cortisol levels can:

- Reduce hippocampal volume
- Impair synaptic plasticity
- Decrease neurogenesis
- Affect long-term memory formation

Research indicates that chronic stress disrupts working memory and declarative memory performance.

Short-Term and Long-Term Memory Impairment

Stress can produce:

Short-Term Effects

- Reduced concentration
- Attention deficits
- Difficulty in information processing
- Impaired decision-making

Long-Term Effects

- Memory loss
- Reduced learning capacity
- Increased risk of cognitive decline

Students, athletes, and professionals experiencing chronic stress often demonstrate reduced cognitive efficiency and memory performance.

Impact of Stress on Blood Pressure

Blood pressure refers to the force exerted by circulating blood against arterial walls. Stress contributes significantly to elevated blood pressure through autonomic and hormonal mechanisms.

Acute Stress and Blood Pressure

During stressful situations:

- Sympathetic nervous system activity increases.
- Blood vessels constrict.
- Heart rate accelerates.
- Cardiac output rises.

These responses temporarily elevate blood pressure.

Chronic Stress and Hypertension

Persistent stress leads to sustained activation of stress pathways, resulting in:

- Vascular resistance
- Endothelial dysfunction
- Increased arterial stiffness
- Elevated resting blood pressure

Individuals experiencing chronic psychological stress are at a higher risk of developing **hypertension, a major risk factor for cardiovascular diseases.**

Impact of Stress on Heart Disease

Cardiovascular diseases remain one of the leading causes of mortality worldwide. Chronic stress contributes to heart disease through several physiological mechanisms.

Increased Cardiac Workload

Stress-induced elevations in heart rate and blood pressure increase myocardial oxygen demand, placing additional strain on the heart.

Inflammation and Atherosclerosis

Chronic stress promotes:

- Systemic inflammation
- Increased cytokine production
- Endothelial injury
- Plaque formation in arteries

These changes accelerate atherosclerosis and coronary artery disease.

Arrhythmias and Cardiac Events

Stress may increase susceptibility to:

- Cardiac arrhythmias
- Myocardial infarction
- Stroke
- Sudden cardiac death

Research demonstrates that individuals experiencing chronic stress have significantly greater **cardiovascular morbidity and mortality.**

Sports Psychology-Based Remedial Measures for Stress Reduction

Sports psychology offers numerous evidence-based techniques for managing stress and improving psychological well-being.

1. Progressive Muscle Relaxation (PMR)

Developed by Edmund Jacobson, PMR involves systematically contracting and relaxing different muscle groups.

Benefits

- Reduces muscle tension
- Lowers heart rate
- Decreases blood pressure
- Enhances relaxation
- Improves sleep quality

PMR has been widely used among athletes to reduce anxiety and improve performance.

2. Self-Hypnosis

Self-hypnosis involves inducing a state of focused attention and heightened suggestibility.

Benefits

- Promotes deep relaxation
- Reduces anxiety
- Enhances self-confidence
- Improves emotional control
- Supports positive behavioral change

Athletes often utilize self-hypnosis to manage competition stress and improve concentration.

3. Deep Breathing Exercises

Controlled breathing techniques stimulate the parasympathetic nervous system.

Examples include:

- Diaphragmatic breathing
- Box breathing
- Alternate nostril breathing

Benefits

- Reduces cortisol levels
- Lowers blood pressure
- Improves emotional regulation
- Enhances relaxation

4. Meditation and Mindfulness

Mindfulness practices encourage present-moment awareness without judgment.

Benefits

- Reduces psychological distress
- Enhances attention and memory
- Improves emotional stability
- Decreases cardiovascular risk factors

Regular meditation has been associated with reduced stress hormone levels.

5. Mental Imagery

Mental imagery involves creating positive mental pictures of successful performance or relaxing situations.

Benefits

- Reduces anxiety
- Improves confidence
- Enhances coping skills
- Facilitates relaxation

Athletes frequently use imagery to manage pre-competition stress.

6. Cognitive Restructuring

Cognitive restructuring aims to identify and replace negative thought patterns with constructive thinking.

Benefits

- Reduces stress perception
- Enhances resilience
- Improves emotional regulation
- Promotes positive mental health

7. Physical Exercise

Regular physical activity remains one of the most effective stress management strategies.

Benefits

- Reduces cortisol levels
- Improves cardiovascular health
- Enhances memory function
- Increases endorphin production

- Improves overall well-being

Practical Recommendations

To minimize the adverse effects of stress on memory, blood pressure, and heart health, the following strategies are recommended:

1. Practice Progressive Muscle Relaxation daily.
2. Incorporate self-hypnosis and guided relaxation techniques.
3. Engage in regular physical exercise.
4. Practice mindfulness meditation.
5. Maintain healthy sleep habits.
6. Utilize cognitive restructuring techniques.
7. Develop effective time-management skills.
8. Seek social support and professional counseling when necessary.

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ROLE OF THE FIT INDIA FITNESS PROTOCOL IN MEASURING HEALTH-RELATED FITNESS OF COLLEGE MALE STUDENTS

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Abstract

The Fit India Movement is a Government of India initiative aimed at bringing behavioural change and promoting a physically active lifestyle among all citizens. Launched in 2019, the movement envisions encouraging every individual to adopt regular physical activity and make fitness an integral part of daily life.

The present study aimed to examine the impact of the Fit India Fitness Protocol on fitness assessment among college men. For this purpose, sixty (N=60) male students pursuing B.Sc. Physical Education at Department of Physical Education, Arul Anandar College, Karumathur, Madurai, were randomly selected. The subjects were aged 18 years and above and were divided into two groups: an experimental group (n=30) and a control group (n=30). The experimental group underwent training based on the Fit India Fitness Protocol for twelve weeks, while the control group continued their regular routine activities without any special training intervention.

The data collected from the experimental group before and after the training period were statistically analyzed using the dependent t-test. The results revealed that the Fit India Fitness Protocol significantly improved flexibility, muscular strength, core strength, muscular endurance and cardiovascular fitness among college men. However, no significant changes were observed in body composition and static balance.

Keyword: Fitindia, Fitness Protocol and Fitness Assessment

INTRODUCTION:

India faces numerous challenges related to diseases and public health issues, including both communicable diseases and lifestyle-related disorders. It is therefore essential to prepare and implement effective strategies to address these challenges in order to ensure a strong and sustainable future for the nation. Furthermore, the COVID-19 pandemic has increased awareness about the importance of adopting sustainable health practices, maintaining an active lifestyle, and returning to traditionally healthy dietary habits that have long been part of

Indian culture.

The Fit India Movement was launched in August 2019 on the occasion of National Sports Day in India with the objective of making fitness an integral part of the daily lives of all citizens. Since its launch, the movement has received widespread participation from people across the country through various fitness-related initiatives promoted by the Fit India Mission Directorate. As part of its early strategic efforts, the movement introduced age-appropriate fitness protocols designed specifically for the Indian population. These protocols consist of simple fitness tests and basic guidelines that help individuals understand the meaning and importance of staying fit and physically active.

Physical fitness refers to the ability to perform daily activities with vigor and alertness, without undue fatigue, and with sufficient energy to enjoy leisure activities and respond to emergencies. It comprises several attributes related to an individual's capacity to perform physical activity effectively.

The Fit India initiative has introduced structured fitness assessment protocols based on age categories: (1) fitness protocols for ages 5–18 years, (2) fitness protocols for ages 18–65 years, and (3) fitness protocols and guidelines for individuals aged 65 years and above. This initiative aims to spread awareness about the importance of regular physical activity and proper nutrition as essential factors for developing a strong immune system and maintaining a healthy mind and body. The Fit India Movement is a people-centric initiative focused on bringing about behavioural change towards adopting an active lifestyle.

For individuals aged 18–65 years, Fit India recommends a variety of physical activities. Flexibility-related exercises include forward bend, calf stretch, child's pose, knee-to-chest stretch, and bend-down exercises. Strength-related activities include straight leg raises, push-ups, curl-ups, planks, squats, and modified push-ups. Endurance-building activities include spot running, stair climbing, jumping jacks, marching with arm swings, brisk walking, quick air punches, swimming, and walking lunges. Balance-related activities include single-leg stance, leg swings, and walking along lines of different shapes. The protocol also incorporates yoga practices such as Surya Namaskar, asanas, pranayama and dhyana as essential components for promoting overall fitness and well-being.

METHODOLOGY

The present study aimed to examine the impact of the Fit India Fitness Protocol on fitness assessment among college men. For this purpose, sixty (N=60) male students pursuing B.Sc. Physical Education at Department of Physical Education, Arul Anandar College, Karumathur, Madurai were randomly selected. The subjects were aged 18 years and above and were divided into two groups: an experimental group (n=30) and a control group (n=30). The experimental group underwent training based on the Fit India Fitness Protocol for twelve weeks, while the control group continued their regular routine activities without any special training intervention.

INDEPENDENT VARIABLES:

- Fit India Fitness Protocol

DEPENDENT VARIABLES:

- Flexibility
- Muscular Strength
- Abdominal/Core Strength
- Muscular Endurance
- Body Composition
- Cardiovascular Fitness
- Static Balance

TRAINING PROGRAMME:

Flexibility related Activities

Forward bend, calf stretch, child's pose, knee to chest stretch and bend down.

Strength related activities

Straight leg raises, push-ups, curl up, plank, squat and modified push-ups.

Endurance related activities

Spot running, climbing stairs, jumping jacks, march and swing arms, brisk walking, quick air punches, swimming and walking lunges.

Balanced related activities

Single leg stance, leg swings and walking on lines of different shapes.

Yoga (15 Minutes)

Suryanamaskar, asanas, pranayama and dhyana.

SELECTION OF TESTS:

Variables	**Test Items**
Flexibility	V Sit Reach Test(in cm)
Muscular Strength	Naukasana (Boat Pose) (in Sec)
Abdominal/Core Strength	Partial Curl Up - 30 seconds (in nos)
Muscular Endurance	Push Ups (in nos)
Body Composition	Body Mass Index or BMI (in level)
Cardiovascular Fitness	2 km Run/Walk (in Min/Sec)
Static Balance	Flamingo Balance Test (falls in nos)

RESULTS AND STATISTICAL TECHNIQUE

The data gained before and after the training period on various variables between Fit India fitness protocol group and Control Group were tested and given in Table – I.

Table – I

Mean value, Standard deviation on Pre and Post test and T-Ratio on variables

Variables	***Experimental Group***		**'t' ratio**	***Control Group***		**'t' ratio**
	Mean & Sd			Mean & Sd		
	Pre	Post		Pre	Post	
Flexibility	16.6 +/- 1.47	19.2 +/- 1.68	**7.03***	16.8 +/- 1.96	17.2 +/- 2.34	**1.42**
Muscular Strength	31.73 +/- 2.75	42.86 +/- 9.94	**2.41***	32.44 +/- 4.72	32.91 +/- 5.23	**0.13**
Abdominal/Core Strength	26.46 +/- 5.37	31.81 +/- 5.12	**2.09***	26.71 +/- 4.41	26.92 +/- 4.27	**0.12**
Muscular Endurance	31.06 +/- 6.30	43.06 +/- 8.51	**8.48***	32.19 +/- 7.05	33.65 +/- 6.43	**1.53**
Body Composition	23.14 +/- 2.21	23.03 +/- 2.16	**0.09**	23.42 +/- 2.07	23.49 +/- 2.30	**0.07**
Cardiovascular Fitness	9.54 +/- 2.30	8.41 +/- 2.01	**2.15***	9.47 +/- 2.82	9.43 +/- 3.15	**0.05**
Static Balance	14.9 +/- 3.54	14.3 +/- 4.11	**1.14**	14.9 +/- 2.52	14.3 +/- 3.16	**1.29**

**** Significant at 0.05 level.(Required value for 't'-test with df 29 is 2.045)***

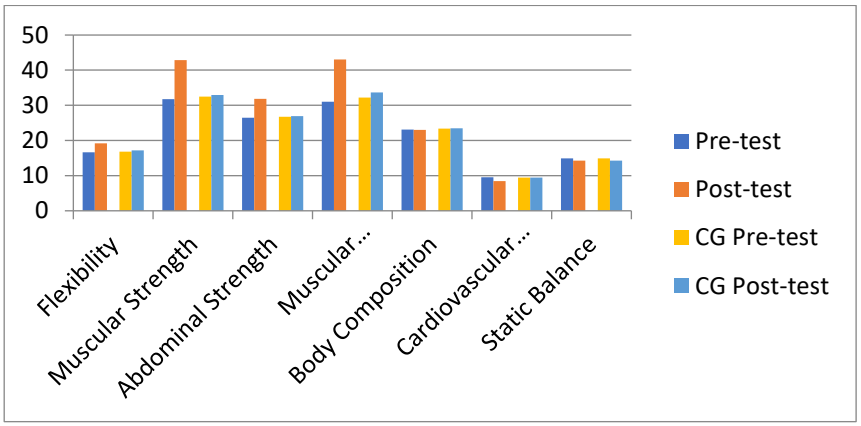
Table –I displays that the mean values of pre-test and post-test of experimental group and control group. The gained 't' ratio of 7.03, 2.41, 2.09,8.48 and 2.15 for flexibility, muscular strength, abdominal strength, muscular endurance and cardiovascular fitness for experimental group were greater than the requisite table value of 2.045 for significance at 0.05 level of with 2 degrees of freedom it create statistically significant. 't' ratio for body composition and static balance were 0.09 and 1.14 respectively less than the required table value of 2.045 and there is no significant improvement. The obtained't' value of control group were 1.42, 0.13, 0.12, 1.53, 0.07, 0.05 and 1.29 were lesser than the table value of 2.045 and there is no significant improvement in control group.

The mean values were graphically given in figure - I.

Figure – I

Mean Value of Pre-test and Post-test on Experimental group and control group

YOGA AND AYURVEDA: ANCIENT WISDOM AS GLOBAL HEALTH AND SOFT POWER TOOLS



CONCLUSIONS

The results revealed that the Fit India Fitness Protocol significantly improved flexibility, muscular strength, core strength, muscular endurance and cardiovascular fitness among college men. However, no significant changes were observed in body composition and static balance.

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YOGA AND AYURVEDA: ANCIENT WISDOM AS GLOBAL HEALTH AND SOFT POWER TOOLS

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Abstract

Yoga and Ayurveda, the ancient wellness traditions of India, have transcended their cultural origins to emerge as vital contributors to global health and diplomacy. Rooted in holistic approaches that emphasize harmony of mind, body, and environment, these systems provide sustainable frameworks for preventive care and wellness. In contemporary international relations, they also serve as instruments of India's soft power, enhancing global perception of the nation through cultural attraction and value-based diplomacy. This paper explores the historical foundations of Yoga and Ayurveda, tracing their philosophical and practical dimensions, and situates them within the discourse of global public health. It examines their role as soft power tools in international cultural diplomacy and evaluates their integration into global health systems through initiatives led by India's Ministry of AYUSH, WHO collaborations, and institutional partnerships. Case studies—including the International Day of Yoga, Ayurveda wellness centres abroad, and India's role in the global wellness economy illustrate their reach and influence. The paper also critically examines challenges such as cultural appropriation, commercialization, standardization, and accessibility. Future prospects emphasize scientific validation, digital expansion, and inclusive wellness diplomacy as strategies for strengthening their global role. Ultimately, Yoga and Ayurveda demonstrate India's ability to contribute meaningfully to both public health and international cultural engagement, symbolizing a unique synthesis of tradition and modernity.

Keywords: Yoga, Ayurveda, Soft Power, Public Health, AYUSH, Cultural Diplomacy

INTRODUCTION

The contemporary international order is no longer defined exclusively by military strength or economic supremacy. Instead, nations increasingly rely on intangible sources of influence such as culture, values, and traditions to shape global perceptions. This phenomenon, theorized by Joseph Nye (1990) as soft power, reflects the ability of a country to achieve outcomes through attraction rather than coercion. In an interconnected and competitive world, soft power has emerged as a crucial complement to traditional forms of power, enabling states to foster goodwill, create cultural resonance, and build sustainable partnerships. For India, a country with over five millennia of civilizational heritage, soft power is deeply rooted in cultural and philosophical traditions. Among its diverse assets, Yoga and Ayurveda represent two of the most influential contributions to global civilization. Yoga, often associated with

physical postures (asanas), breathing practices (pranayama), and meditation, is today recognized as a comprehensive discipline that integrates physical, mental, and spiritual well-being. Ayurveda, literally meaning the "science of life," is one of the world's oldest codified medical systems, emphasizing preventive care, natural remedies, and harmony between body and environment. Together, they constitute a holistic worldview that transcends cultural boundaries and provides answers to pressing modern challenges of lifestyle disorders, chronic illness, and mental stress. The significance of Yoga and Ayurveda extends beyond their health benefits. They function simultaneously as tools of cultural diplomacy, shaping India's identity on the global stage. The adoption of June 21 as the International Day of Yoga by the United Nations in 2015, endorsed by 177 countries, illustrates their resonance as global commons. Similarly, the increasing demand for Ayurvedic therapies, herbal products, and wellness tourism has enhanced India's economic and diplomatic footprint. These practices symbolize India's values of peace, sustainability, and inclusivity, reinforcing its cultural attractiveness in international relations. At the same time, the global health landscape provides fertile ground for their relevance. Rising non-communicable diseases (NCDs) such as diabetes, hypertension, obesity, and depression pose challenges that biomedical systems alone struggle to contain. Modern healthcare often emphasizes curative interventions, whereas Yoga and Ayurveda provide preventive frameworks grounded in lifestyle modification, mental resilience, and balance. Their compatibility with integrative medicine has led to increasing recognition by institutions such as the World Health Organization (WHO), which advocates for the integration of traditional medicine into public health strategies (Burton et al., 2015). This dual role as both public health systems and soft power instruments defines the contemporary global relevance of Yoga and Ayurveda. They not only enhance individual well-being but also serve as vehicles for intercultural dialogue and global diplomacy. Their spread through international collaborations, academic programs, wellness tourism, and community initiatives demonstrates their adaptability across diverse cultural contexts. This paper therefore seeks to examine the multifaceted role of Yoga and Ayurveda in the 21st century. It explores their historical and cultural foundations, analyses their significance as soft power tools, and assesses their integration into global health systems. Through case studies of International Day of Yoga, Ayurveda centres abroad, and WHO collaborations, it highlights their diplomatic and public health impact. The paper also critically evaluates challenges, including cultural appropriation, commercialization, and regulatory issues, before offering recommendations for sustaining authenticity and maximizing global relevance. By situating Yoga and Ayurveda at the intersection of cultural diplomacy and public health, this study argues that India possesses a unique opportunity to leverage its ancient wisdom as a source of global influence. In doing so, it underscores the potential of these traditions not merely as heritage practices but as dynamic contributors to international health and intercultural harmony.

❖ HISTORICAL AND CULTURAL FOUNDATIONS

The origins of Yoga and Ayurveda are deeply intertwined with the religious, philosophical, and cultural fabric of ancient India. Both traditions, while distinct in their focus—one on spiritual discipline and the other on holistic healthcare—share a common philosophical grounding in the Vedic worldview, which emphasizes harmony between the individual and the cosmos. Their historical continuity, adaptability, and integration into everyday life have enabled them not only to survive but also to flourish as India's most enduring contributions to global civilization.

• Origins of Ayurveda

Ayurveda, literally meaning "knowledge of life," is widely considered one of the oldest organized medical systems in the world. Its roots can be traced back to the Vedic period (1500– 500 BCE), where the Atharva Veda contains hymns referring to healing practices, herbal remedies, and rituals for health. By the early classical period, Ayurveda was codified in systematic treatises such as the Charaka Samhita, which outlined principles of internal medicine, and the Sushruta Samhita, which documented surgical techniques, anatomy, and diagnostics (Mishra et al., 2001). These texts represent sophisticated attempts to classify diseases, therapies, and pharmacological substances, making Ayurveda both empirical and philosophical. The foundational principle of Ayurveda rests on the tridosha theory, which posits that health is maintained by balancing three biological energies—Vata, Pitta, and Kapha.

Disturbances in these doshas lead to disease, which can be treated through a combination of herbal remedies, dietary changes, detoxification (panchakarma), and spiritual practices. Importantly, Ayurveda emphasizes preventive healthcare by encouraging daily routines (dinacharya), seasonal regimens (ritucharya), and mindful living. This holistic focus on prevention makes Ayurveda particularly relevant in addressing modern lifestyle disorders.

• Origins of Yoga

Yoga, though often associated today with physical postures, is historically a comprehensive spiritual discipline. References to yogic practices appear in the Upanishads (circa 800–500 BCE), where meditation and breath control are described as pathways to self- realization. The Bhagavad Gita (circa 2nd century BCE) presents yoga as a spiritual philosophy encompassing devotion (bhakti), knowledge (jnana), and disciplined action (karma). The most systematic account is found in Patanjali's Yoga Sutras (2nd century BCE), which define yoga as "chitta vritti nirodha"—the stilling of the fluctuations of the mind. Patanjali outlines the eight limbs of Ashtanga Yoga: yamas (ethical restraints), niyamas (personal observances), asanas (postures), pranayama (breathing control), pratyahara (withdrawal of senses), dharana (concentration), dhyana (meditation), and samadhi (absorption or liberation). Far from being mere physical exercise, yoga was intended as a path toward spiritual liberation, cultivating discipline and integration of mind, body, and spirit.

• Integration into Indian Cultural Life

Over centuries, Yoga and Ayurveda became deeply woven into the social and cultural fabric of Indian life. Ayurveda guided health practices across communities, influencing dietary habits, childbirth, seasonal rituals, and daily hygiene. Village healers and households relied on Ayurvedic remedies, ensuring continuity even during periods of political upheaval and colonial domination. Yoga was practiced by ascetics, householders, and scholars alike. It also intersected with other traditions such as Buddhism, Jainism, and Sufism, creating hybrid forms of spiritual discipline. During the medieval period, Hatha Yoga emerged, emphasizing bodily postures and breath control, which would later form the foundation for the modern global yoga
movement.

• Historical Transmission and Adaptation

The influence of Ayurveda and Yoga extended beyond India's borders through trade, migration, and cultural exchange. Ayurvedic concepts traveled to Persia, Tibet, and China, influencing Unani medicine and traditional Chinese medicine (Singh, 2016). Similarly, yogic practices inspired meditation traditions in East Asia. During colonial rule, Western medicine was institutionalized as the dominant paradigm, but Ayurveda persisted as a parallel system, particularly in rural India. In the 19th and early 20th centuries, Indian reformers such as Swami Vivekananda introduced yoga to Western audiences, framing it as a universal philosophy compatible with modern science. Ayurveda too underwent revival movements, supported by nation lists who viewed indigenous medicine as a symbol of cultural pride and resistance to colonial dominance.

• Contemporary Recognition

In the modern era, both Yoga and Ayurveda have been institutionalized within India through the establishment of the Ministry of AYUSH, which regulates their practice, education, and research. Globally, they have been recognized as part of humanity's intangible cultural heritage. UNESCO's inscription of Yoga (2016) underscores its universal appeal. Meanwhile, Ayurvedic wellness tourism, particularly in Kerala, Sri Lanka, and Nepal, attracts international visitors seeking holistic healthcare. Their ability to adapt to different historical contexts— ancient, medieval, colonial, and modern—demonstrates their resilience and versatility. More importantly, their global acceptance today highlights how ancient cultural practices can remain relevant in addressing contemporary health and diplomatic challenges.

❖ YOGA AND AYURVEDA AS SOFT POWER TOOLS

The concept of soft power emphasizes attraction rather than coercion, and few cultural resources exemplify this better than Yoga and Ayurveda. As India's most recognizable cultural exports, these traditions have become powerful instruments of diplomacy, economic engagement, and image-building in international relations. Their resonance lies in their

universal relevance: they address shared human concerns of health, peace, and well-being, enabling India to engage global audiences across political, cultural, and ideological boundaries.

• Cultural Diplomacy and Symbolism

Yoga has emerged as a central pillar of India's cultural diplomacy. The United Nations' adoption of International Day of Yoga (2015) proposed by India and supported by 177 member states—was a landmark in the projection of India's soft power (Manjunath, 2023). Each year on June 21, millions of people in over 190 countries participate in yoga demonstrations at iconic sites such as Times Square in New York, the Eiffel Tower in Paris, and the Great Wall of China. These mass events, often organized by Indian embassies, project images of global unity, harmony, and cultural inclusivity. Ayurveda has similarly become a tool of cultural diplomacy, particularly through wellness tourism. Ayurvedic resorts in Kerala, Sri Lanka, and Bali attract international visitors seeking natural therapies and rejuvenation. Government- sponsored Ayurveda information centres in Europe, the Middle East, and North America introduce foreign populations to Ayurvedic therapies, combining healthcare delivery with cultural exchange.

• Economic Diplomacy and the Wellness Industry

The economic potential of Yoga and Ayurveda further enhances their soft power. The global wellness economy, estimated at over USD 5 trillion (Global Wellness Institute, 2023), provides India with opportunities to align cultural heritage with economic diplomacy. Yoga has created global markets for teacher training, certification programs, books, films, and digital platforms. In cities across Europe, North America, and Australia, yoga studios are common fixtures of urban life. Similarly, Ayurveda underpins thriving industries in herbal products, pharmaceuticals, and cosmetics. Indian companies such as Dabur, Himalaya, and Patanjali have expanded their exports to over 100 countries, while global brands increasingly incorporate Ayurvedic herbs into their product lines. Tourism is another arena where soft power and economic diplomacy intersect. Kerala, branding itself as "God's Own Country," attracts thousands of visitors annually for yoga retreats and Ayurvedic therapies, generating both revenue and cultural influence. This demonstrates how wellness traditions serve as economic soft power multipliers by merging health, culture, and commerce.

• Nation Branding and Comparative Models

Nation branding involves shaping global perceptions of a country's identity. For India, Yoga and Ayurveda project values of peace, sustainability, and harmony with nature, reinforcing its civilizational depth. This is particularly important in distinguishing India from other emerging powers whose global appeal may rest primarily on economic or technological achievements. Comparisons with other cultural exports are instructive. Japan has advanced its "Cool Japan" strategy through anime, cuisine, and design. South Korea has promoted the "K-

Wave" or Hallyu through K-pop, cinema, and cosmetics. The United States has long relied on Hollywood, music, and higher education as soft power tools. Similarly, India's emphasis on Yoga and Ayurveda positions it as a wellness superpower, carving a distinct niche in global cultural diplomacy (Bhattacharya et al., 2021).

• Academic and Cultural Alliances

Academic collaborations also enhance the soft power value of Yoga and Ayurveda. India has supported the establishment of Chairs of Yoga and Ayurveda at international universities, organized global conferences, and funded cross-cultural research. These initiatives institutionalize traditional practices as legitimate academic subjects, expanding their credibility. Furthermore, cultural festivals, wellness fairs, and exchange programs sponsored by Indian embassies showcase Yoga and Ayurveda as living traditions rather than static heritage.

• A Bridge Across Divides

One of the most powerful aspects of Yoga and Ayurveda as soft power tools is their ability to transcend divisions. In societies marked by political polarization, ethnic diversity, or religious differences, wellness practices are perceived as apolitical, inclusive, and universally beneficial. This enables them to function as cultural bridges, fostering dialogue where political negotiations may stall

❖ PUBLIC HEALTH SYSTEMS

The integration of Yoga and Ayurveda into public health systems underscores their practical utility in addressing contemporary health challenges. Globally, public health has increasingly focused on preventive, lifestyle-oriented, and holistic interventions, complementing conventional medical care. Rising prevalence of non-communicable diseases (NCDs), mental health disorders, and lifestyle-related conditions necessitates cost-effective, accessible, and sustainable solutions. Yoga and Ayurveda, with their evidence-informed frameworks and individualized approaches, offer significant potential to enhance public health outcomes.

• Yoga in public health

Numerous studies have demonstrated Yoga's effectiveness in managing cardiovascular diseases, diabetes, obesity, stress, anxiety, and depression. Its multifaceted approach—combining physical activity, breath regulation, and meditation—supports both physical fitness and mental resilience. Public health programs in countries such as the United States, Japan, Germany, and Brazil have incorporated Yoga sessions into schools, workplaces, and community centers, targeting preventive health, stress management, and mental well-being. For instance, mindfulness-based Yoga interventions have been shown to reduce stress and improve emotional regulation among adolescents and adults, reducing the burden of stress-related disorders on healthcare systems.

• Ayurveda in public health Ayurveda's emphasis on diet, herbal therapy, detoxification, and lifestyle modification

aligns with modern preventive medicine. Ayurvedic practices contribute to immune system support, metabolic balance, and chronic disease management. Integration into public health frameworks occurs through wellness clinics, dietary counselling, and lifestyle intervention programs. Governments in India, Sri Lanka, and Nepal have institutionalized Ayurveda in community health initiatives, offering workshops, health screenings, and education campaigns to promote preventive care. Clinical trials increasingly validate Ayurvedic interventions, fostering credibility and wider adoption in international health systems.

• Policy support and institutionalization

India's Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homeopathy) has spearheaded efforts to institutionalize these practices. National guidelines, accreditation systems, research funding, and integration into mainstream healthcare enhance accessibility and standardization. Collaboration with public hospitals, medical colleges, and international health organizations ensures that evidence-based practices are disseminated globally. Additionally, global collaborations with WHO and universities facilitate training programs, policy dialogue, and cross-national research, strengthening the credibility of Yoga and Ayurveda as legitimate public health interventions.

• Community engagement

Public health effectiveness depends on grassroots adoption. Yoga and Ayurveda outreach programs in rural and urban communities promote awareness, self-care, and preventive practices. Mass Yoga demonstrations, workshops on herbal remedies, and community wellness festivals encourage population-level engagement. Such initiatives reduce the prevalence of lifestyle-related illnesses, decrease healthcare expenditure, and foster social cohesion by promoting collective participation in health-enhancing activities.

• Digital health integration

Technological innovation has expanded the reach of Yoga and Ayurveda. Mobile applications, online consultations, telemedicine, and virtual training modules facilitate personalized interventions and monitor health outcomes remotely. Digital platforms allow practitioners to track progress, provide guidance, and engage diverse populations, especially in regions with limited access to healthcare facilities.

• Global relevance

Nations with growing NCD burdens and aging populations are increasingly adopting integrative health approaches. Yoga and Ayurveda offer scalable, culturally adaptable solutions, complementing conventional medicine and enhancing resilience. Their inclusion in public health systems underscores a paradigm shift from reactive to proactive care, emphasizing prevention, lifestyle optimization, and holistic wellness.

❖ GLOBAL DISSEMINATION

The global dissemination of Yoga and Ayurveda reflects a combination of historical outreach, strategic diplomacy, and contemporary digital engagement. Over centuries, these practices

travelled beyond India through trade, migration, religious expansion, and scholarly exchange, laying the groundwork for international adoption. Buddhist monks carried meditative and yogic practices to China, Japan, and Southeast Asia, while Ayurvedic principles influenced traditional medicine in Sri Lanka, Thailand, and Indonesia. In the modern era, global interest intensified as health-conscious populations sought holistic alternatives to conventional medicine. India has actively facilitated international dissemination through institutional frameworks and policy initiatives. Establishment of the Ministry of AYUSH, the Indian Council for Cultural Relations (ICCR), and dedicated research councils enabled structured promotion of traditional health practices. The International Day of Yoga (IDY), endorsed by the United Nations, exemplifies effective global outreach, with millions participating worldwide in coordinated Yoga demonstrations and workshops. Similarly, Ayurvedic conventions, wellness expos, and certification programs in partnership with foreign universities and research institutes have expanded awareness and legitimacy of Indian traditional medicine. Education and training programs play a pivotal role in diffusion. Universities in the United States, Germany, Japan, and Australia now offer courses in Yoga philosophy, therapeutic applications, and Ayurveda. These programs train practitioners, therapists, and researchers, creating a cadre of international advocates who carry Indian wellness knowledge to local communities. Online platforms have accelerated dissemination, enabling virtual Yoga classes,

tele-Ayurvedic consultations, and mobile applications that offer lifestyle guidance, personalized interventions, and community engagement. Media and popular culture have amplified reach. Documentaries, television programs, social media campaigns, and celebrity endorsements have increased visibility, particularly among younger populations. Yoga and Ayurveda feature in wellness magazines, podcasts, and digital content, highlighting both physical and mental health benefits, thus normalizing their adoption in diverse cultural contexts. Wellness tourism further facilitates global dissemination. Retreats, ashrams, and Ayurvedic spas attract international visitors seeking authentic experiences. India's government

supports these initiatives through promotional campaigns, accreditation standards, and partnerships with travel agencies, creating a sustainable ecosystem that integrates cultural immersion with health benefits. The scientific validation of these practices has strengthened their credibility. Research collaborations, clinical trials, and meta-analyses in fields such as cardiology, psychiatry, and integrative medicine demonstrate tangible benefits of Yoga and Ayurveda, facilitating acceptance by healthcare providers and policymakers worldwide. The integration of these findings into global wellness frameworks ensures that dissemination is evidence-informed and culturally sensitive, fostering sustainable adoption. In summary, the global spread of Yoga and Ayurveda results from a strategic blend of historical continuity, policy advocacy, educational outreach, media engagement, and scientific validation. Their

worldwide adoption underscores their dual function as cultural ambassadors and health-promoting systems, reinforcing India's position as a global leader in holistic wellness and soft power diplomacy.

❖ CASE STUDIES

To understand the global impact of Yoga and Ayurveda, examining country-specific case studies provides concrete insights into successful dissemination, adaptation, and integration.

• United States

Yoga and Ayurveda have gained widespread popularity as complementary health practices. Yoga studios, wellness centers, and hospital-based therapeutic programs serve millions of practitioners. Research institutions, including Harvard Medical School and the University of California, have conducted studies validating Yoga's effects on stress reduction, cardiovascular health, and chronic pain management. Ayurveda has found applications in wellness clinics offering herbal therapies, Panchakarma treatments, and lifestyle counseling. he U.S. adoption reflects a combination of health-focused demand, entrepreneurial initiative, and academic interest, positioning India's traditional systems as credible contributors to preventive
healthcare.

• Germany

Germany's integration of Yoga and Ayurveda is notable for its emphasis on evidence-based interventions. Yoga therapy is included in some public health insurance programs as a preventive measure for mental health and musculoskeletal disorders. Ayurvedic centers in cities like Berlin and Munich provide holistic treatment options, blending traditional Indian therapies with Western clinical oversight. German research institutions have undertaken clinical trials on Yoga and Ayurvedic interventions, establishing protocols and safety guidelines, highlighting the adaptability of Indian wellness systems to structured healthcare frameworks.

• Japan

Japanese adoption of Yoga emphasizes both physical fitness and meditative discipline. Yoga classes are incorporated into corporate wellness programs, schools, and public health initiatives aimed at stress reduction and lifestyle modification. Ayurveda has attracted niche interest, particularly in natural and preventive medicine, with Japanese wellness centers integrating herbal supplements and dietary guidance inspired by Indian principles. Collaboration between Indian experts and Japanese institutions ensures authenticity and efficacy, facilitating sustainable adoption.

• Australia

Yoga and Ayurveda have been embraced as part of integrative medicine initiatives. Yoga is included in programs targeting mental health, chronic illness management, and rehabilitation. Ayurvedic practices have been incorporated into wellness retreats and holistic clinics,

emphasizing nutrition, detoxification, and lifestyle counseling. Public and private partnerships promote education, research, and practitioner certification, strengthening professional standards.

• South America

In countries like Brazil and Argentina, Yoga has become part of urban wellness culture and community-based health programs. Festivals, workshops, and corporate initiatives promote stress management and mindfulness, while Ayurveda has influenced alternative medicine networks, offering herbal and lifestyle solutions aligned with local preferences. hese case studies reveal common success factors: evidence-based validation, institutional support, cultural adaptation, and community engagement. They also highlight challenges such as standardization, certification, and balancing authenticity with local customization. The cases illustrate that Yoga and Ayurveda function simultaneously as cultural ambassadors and practical health interventions. Their integration into global health systems enhances preventive care, reduces reliance on pharmacological treatments, and fosters intercultural dialogue. By providing both experiential and measurable benefits, these practices exemplify the potential of traditional knowledge systems to contribute meaningfully to global wellness agendas.

THE FUTURE IMPLICATIONS

The future of Yoga and Ayurveda as instruments of soft power and public health systems appears promising. Increasing global health awareness, rising prevalence of chronic diseases, and demand for preventive healthcare create favorable conditions for expansion. Technological integration, such as telemedicine, mobile applications, AI-driven health tracking, and virtual learning platforms, will enhance accessibility and personalized interventions. International collaboration in research and education will strengthen evidence-based adoption. Universities, hospitals, and research institutions worldwide are likely to increase partnerships with Indian centers of excellence, facilitating clinical trials, cross-cultural studies, and practitioner exchange programs. Standardization of curricula, certification, and therapeutic protocols will address existing challenges, enabling wider acceptance in healthcare systems. Wellness tourism is poised for growth, combining cultural immersion with health benefits. Customized Yoga and Ayurveda experiences will attract diverse demographics, fostering intercultural understanding and economic gains. Digital outreach will further democratize access, ensuring that both rural and urban populations, globally and in India, benefit from these practices. As Yoga and Ayurveda continue to gain international credibility, their role in policy frameworks for preventive and integrative health is expected to strengthen. Global recognition may lead to their incorporation into national health programs, insurance coverage, and corporate wellness initiatives. Simultaneously, their symbolic value as soft power tools will enhance India’s cultural diplomacy, projecting the nation as a global leader in holistic wellness.

CONCLUSION

Yoga and Ayurveda exemplify the convergence of cultural heritage, scientific validity, and public health utility. Their historical depth, philosophical richness, and therapeutic efficacy position them uniquely as instruments of global soft power and functional components of public health systems. By promoting holistic well-being, preventive care, and lifestyle optimization, these practices address modern health challenges while enhancing India's international image. Global dissemination through education, research collaboration, media engagement, and wellness tourism has facilitated adoption across diverse cultural and healthcare contexts. Case studies from countries such as the United States, Germany, Japan, Australia, and Brazil illustrate successful integration into both community wellness programs and formal healthcare frameworks. These examples underscore the adaptability, credibility, and universal appeal of Yoga and Ayurveda. Challenges remain, including standardization, scientific validation, cultural appropriation, regulatory barriers, and integration with onventional medicine. Addressing these concerns through research, policy support, accreditation, and ethical promotion is essential for sustainable growth and global impact. Future prospects are promising, driven by technological innovation, rising health consciousness, and international collaboration. Digital platforms, telemedicine, and global education initiatives will expand accessibility and influence, while wellness tourism and policy integration will reinforce their dual role as public health tools and cultural ambassadors. In conclusion, Yoga and Ayurveda are not merely relics of India's ancient heritage; they are dynamic, globally relevant systems capable of enhancing individual health, societal well-being, and international relations. Their continued promotion and integration highlight a model for leveraging traditional knowledge in modern contexts, demonstrating that culture, science, and diplomacy can synergistically advance global wellness agendas.

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EFFECT OF YOGIC PRACTICES ON EMOTIONAL AND BEHAVIORAL DEVELOPMENT AMONG STUDENTS WITH AUTISM SPECTRUM DISORDER (ASD)

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Abstract

Autism Spectrum Disorder (ASD) is a brain-related condition that makes it hard for children to communicate, interact with others, control their feelings, and stop repeating the same actions. Lately, drug-free and whole-body methods have become more important for helping these children grow emotionally and behaviorally. Yoga, an old Indian practice that uses body postures (asanas), breathing exercises (pranayama), meditation, and relaxation, has become a helpful way to improve mental and physical health. This study looks at how yoga affects emotional control, behavior, focus, social skills, and stress relief in students with ASD. Using ideas from sports psychology and whole-body health, the study shows how yoga helps children with ASD control themselves, process sensory information, and behave better. The paper also talks about how yoga fits into inclusive education and how it can be a lasting way to improve life for children with special needs. The study ends by saying that doing yoga regularly greatly helps children with ASD become more emotionally balanced, behave better, and feel better mentally.

Keywords: Yoga, Autism Spectrum Disorder, Emotional Development, Behavioral Development, Inclusive Education, Mental Health, Special Education, Sports Psychology

Introduction

Autism Spectrum Disorder (ASD) is a lifelong brain condition that affects communication, understanding feelings, social interaction, and behavior. Children with ASD often have trouble paying attention, managing emotions, building social skills, and adjusting to new situations. These problems can hurt their school performance, relationships, and overall quality of life. In today's schools and therapy centers, more people are interested in whole-body and drug-free methods that help children with special needs grow emotionally and behaviorally. Yoga is one such method that is now well-known around the world for improving physical fitness, emotional control, relaxation, focus, and mental health. Yoga is an old Indian practice. The word yoga comes from Sanskrit and means "union" or "joining together." It uses body postures (asanas), breathing exercises (pranayama), meditation (dhyana), and relaxation techniques to create balance between the body and mind. For

children with ASD, yoga offers a clear but flexible routine that helps them control their senses, understand their body, stay emotionally steady, and join in social activities. Research shows that yoga helps reduce worry, anger, hyperactive behavior, and repeated actions. At the same time, it improves attention span, self-control, emotional balance, and communication skills. With regular practice, children with ASD may become more confident, behave better, and handle stress and sensory overload more easily.

This study looks at how yogic practices help students with ASD grow emotionally and behaviorally. It also examines yoga from the viewpoints of sports psychology and inclusive education, highlighting its value as a therapy and a preventive tool in today's schools.

Research Objectives

1. To study how yogic practices affect emotional growth in students with autism spectrum disorder.
2. To examine how yoga influences behavior control and better daily habits in children with ASD.
3. To analyze how yoga improves focus, attention, and social interaction in ASD students.
4. To explore yoga as a whole-body, drug-free method in inclusive and special education settings.
5. To understand the mental and healing benefits of yoga for emotional well-being and stress reduction in ASD children.

Hypothesis

Doing yoga regularly helps students with autism spectrum disorder control their emotions, improve their behavior, focus better, and interact socially. As a result, their mental well-being and daily functioning get better.

Literature Review

Autism Spectrum Disorder has become a major concern in child psychology, education, and rehabilitation because more and more children are having emotional, behavioral, and communication problems. Researchers and therapists have tried many different methods to help children with ASD grow in all areas. Among these methods, yoga has become a very helpful extra therapy. Studies show that yoga improves emotional control, sensory processing, and behavior management in autistic children. Koenig and colleagues (2012) found that yoga-based therapies greatly reduced worry, anger, and repeated behaviors in ASD children, while also making them calmer and more emotionally controlled. Similarly, Radhakrishna (2010) found that complete yoga therapy improved copying skills, eye contact, sitting tolerance, and communication in autistic children. Breathing exercises and relaxation methods used in yoga help regulate the automatic nervous system, which lowers stress and hyperactive behavior. Research by Rosenblatt and others (2011) showed that mindfulness and yoga practices improved self-control and attention span in children with developmental disorders. Yoga also increases body awareness and movement coordination, which helps children behave better

and feel more confident. From a sports psychology viewpoint, yoga improves self-awareness, inner motivation, and emotional toughness. The mindfulness and focus developed through yoga help children with ASD pay better attention and respond better in school and social settings. Inclusive education models are increasingly recognizing yoga as a helpful method for children with special needs. Teachers and therapists report that yoga sessions improve classroom participation, reduce disruptive behavior, and encourage social interaction among ASD students. Therefore, existing research supports yoga as a whole-body method that helps autistic children grow emotionally, behaviorally, mentally, and socially.

Research Methodology

This study uses a qualitative and descriptive research approach based on analyzing themes from secondary sources. The research is mainly based on published books, journal articles, case studies, yoga therapy reports, and psychological studies related to ASD and yogic methods. Old yogic writings, modern therapeutic yoga practices, and current education research were analyzed to understand how yoga affects emotional and behavioral growth in children with ASD. Thematic analysis was used to find repeated ideas such as emotional control, focus, stress management, behavior regulation, social interaction, and sensory integration. The study also looks at yoga from the viewpoints of sports psychology, special education, and whole-body health. By combining traditional yogic philosophy with modern psychological theories and education practices, the research tries to give a complete understanding of yoga as a therapy for autism spectrum disorder.

Discussion

Children with Autism Spectrum Disorder often have unstable emotions, behavior problems, sensory difficulties, and trouble communicating socially. These challenges often hurt their school participation, emotional health, and daily life. Yoga offers a clear and healing environment that helps with emotional control, focus, body awareness, and behavior regulation. The body postures (asanas) used in yoga improve flexibility, posture, movement coordination, and body awareness. For children with ASD, these structured movements help reduce restlessness and hyperactive behavior while promoting calmness and self-discipline. Breathing exercises like pranayama regulate breathing patterns and activate relaxation responses in the nervous system. This helps lower worry, stress, emotional outbursts, and sensory overload. Meditation and mindfulness practices improve focus, self-awareness, and emotional balance. Children with ASD often struggle with attention and expressing feelings. Yoga provides repeated and rhythmic activities that create predictability and comfort. Such practices help children develop patience, tolerance, and emotional control. Yoga also helps behavior growth by encouraging routine, discipline, and positive involvement. Children who practice yoga regularly show better sitting tolerance, listening ability, classroom participation, and daily behavior. Group yoga sessions also create chances for social interaction and playing with peers, which improves communication skills and emotional bonding. From a sports psychology perspective, yoga increases inner motivation, self- confidence, toughness, and mental focus. Unlike competitive sports, yoga focuses on self-improvement and inner awareness rather than comparing oneself to others. This non-competitive approach is especially good for children with ASD because it reduces pressure to perform and creates a

supportive learning environment. Yoga also supports inclusive education by providing a low-cost, easy-to-access, and whole-body method for children with special needs. Teachers, therapists, and parents can add simple yoga practices to daily routines to improve emotional stability, behavior responses, and mental well-being. Therefore, yoga should not be seen only as physical exercise. Instead, it should be seen as a multi-part healing practice that supports emotional, behavioral, mental, and social growth in students with autism spectrum disorder.

Conclusion

Autism Spectrum Disorder creates major emotional, behavioral, and social challenges that affect children's growth and quality of life. In recent years, yoga has become a helpful whole-body method that supports emotional control, behavior regulation, focus, and social interaction in ASD students. This study shows that yogic practices such as postures (asanas), breathing exercises (pranayama), meditation, and relaxation techniques positively affect emotional stability, stress reduction, better daily behavior, and mental wellness. Yoga provides a non-competitive and supportive environment that encourages self-awareness, discipline, confidence, and social participation. As a healing and preventive method, yoga can play an important role in inclusive education, special education, and rehabilitation programs for children with autism spectrum disorder. Doing yoga regularly not only improves physical and mental health but also increases emotional toughness and quality of life for children with special needs. The study concludes that yoga is a valuable and lasting tool for promoting whole- body growth and mental well-being among students with autism spectrum disorder.

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IMPACT OF A STRUCTURED YOGA AND MEDITATION PROGRAM ON ADOLESCENTS WITH INTELLECTUAL DISABILITIES: AN EXPERIMENTAL INVESTIGATION

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Abstract

The purpose of this study was to examine the effectiveness of selected yogic practices and meditation on body composition and musculoskeletal functioning among adolescents with intellectual disabilities. Specifically, the study focused on percent body fat and components of musculoskeletal functioning, including abdominal strength, trunk strength, and flexibility. Twenty adolescents with intellectual disabilities were randomly selected from a special school in the Palakkad district. The experimental group participated in a structured yoga and meditation intervention for a period of twelve weeks, while the control group continued their regular curricular activities without any additional training. Measurements of the selected dependent variables were obtained before and immediately after the intervention period. Analysis of Covariance (ANCOVA) was employed to determine the effects of the training programme. The findings revealed a significant improvement in percent body fat and abdominal strength among participants in the yoga and meditation group compared with the control group. However, no significant differences were observed in trunk strength and flexibility between the two groups.

Keywords: *Yogic Practice, Intellectual Disability, Body composition. Musculoskeletal functioning*

Introduction

The concept of intellectual disability has been recognized since ancient times. Historical records indicate that the ancient Egyptians were among the first to document conditions resembling intellectual disability. References to such conditions were found in the Papyrus of Thebes dating back to approximately 1552 BC, which also included descriptions of treatments for related disorders. Archaeological evidence has further identified individuals with conditions such as microcephaly and Down syndrome, suggesting the existence and recognition of intellectual disabilities in ancient societies (Ellis, 1975).

During the eighteenth and nineteenth centuries, perceptions of intellectual disability gradually evolved, leading to more systematic approaches to care, education, and intervention for affected individuals. Over time, different countries adopted various terms to describe intellectual disability, including cognitive disability, learning disability, and developmental disability. Although the terminology differed across regions, the methods of assessment, diagnosis, and record-keeping remained largely comparable. The shift in understanding and terminology reflects the growing awareness and recognition of the needs and rights of individuals with intellectual disabilities..

Intellectual Disability

Individuals with intellectual disability constitute a diverse population with varying levels of abilities and support needs. They generally acquire knowledge and skills at a slower pace than their peers of the same age. Developmental delays are commonly observed, including delayed milestones such as smiling, sitting, walking, and showing interest in their surroundings. Many individuals with intellectual disability experience limitations in adaptive functioning, affecting areas such as self-care, communication, social interaction, home living, and the effective use of community resources. They often face challenges in intellectual functioning and in performing daily activities expected for their age group.

According to global disability statistics, approximately 10 percent of the world's population lives with some form of disability, and nearly 100 million families in developing countries are affected by disabilities ranging from mild to severe. The prevalence of intellectual disability is generally reported to be higher among males than females. The World Health Organization (WHO, 2004) estimated that India has approximately 31 million individuals with intellectual disabilities, highlighting the need for effective interventions, support systems, and inclusive opportunities for this population.

Prior Research Studies

Effects of social cognitive theory based structured physical activity intervention on populations with intellectual disability have also proved that intervention based on social cognitive theory enhances physical activity, increased CRF and muscular endurance, and decreased percentage of total body fat (Krishna Dipnarine, 2010). Similar studies on the effect of core stability exercises (Ahmadi and Daneshmandi, 2013) establish the need for physical

training of ID subjects. Comparison of healthy and unhealthy weight children with ID (Davis et.al, 2012) showed not only the importance of customized training practices but was also indicative of the efficient results produced by adaptive physical education and active recess programs.

Methodology and Experimental Design

The sample for the study consisted of twenty-four male adolescents with moderate intellectual disability, aged between 10 and 17 years. Participants were selected using a purposive sampling technique from special schools. The degree of intellectual disability was confirmed through medical certificates obtained from the respective institutions. Only students diagnosed with moderate intellectual disability and without any additional disabilities or associated conditions, such as cerebral palsy, were included in the study.

The participants were randomly assigned to two groups: an experimental group and a control group. Group I (experimental group) participated in a structured yoga programme comprising selected yogasanas and pranayama practices. The training was conducted on alternate days, three times per week, for a period of twelve weeks. Each training session lasted between 45 and 60 minutes. Group II served as the control group and continued their regular routine activities, including physiotherapy sessions provided as part of the school curriculum, without receiving any additional training intervention.

Prior to participation, all subjects received medical clearance to engage in physical activity. Written informed consent was obtained from the legal guardians of all participants, and formal permission to conduct the study was secured from the heads of the respective institutions. Participants were informed of their right to withdraw from the study at any stage if they experienced discomfort or wished to discontinue their involvement.

The dependent variables selected for the study were body composition and musculoskeletal functioning. Body composition was assessed through percent body fat, measured using skinfold thickness at the calf and thigh sites. Musculoskeletal functioning was evaluated through abdominal strength and endurance, trunk strength, and flexibility. Abdominal strength and endurance were assessed using the Modified Curl-Up Test, trunk strength was measured using the Trunk Lift Test, and flexibility was evaluated using the Back-Saver Sit-and-Reach Test (Winnick & Short, 2014).

The training programme, including the duration, intensity, and progression of the exercise load, was developed based on the findings of a pilot study. The intervention was implemented systematically over a period of twelve weeks, with training loads adjusted according to the participants' performance and feedback to ensure safety and effectiveness.

Statistical Technique

Selected components of Physical fitness (body composition and musculoskeletal functioning) of experimental group and control group are classified according to BPFT fitness zone levels. The fitness zone level denotes each subject’s individual pre and post- test status of the various

components of physical fitness. The approach was taken so that each item can help to perfectly categorize the ability of each person with ID. It is also used as a resource for personalization.

The distribution of subjects based on the behavior deficits, health status, psychological problem and medication are fetched in a table and the results from the general profile of the subjects shows that the percentage of people with deficits in adaptive behavior is 33.3 in Group 1 and 8.3 in Group 2. As far as the health status is concerned between the group 1 and 2 (66.7%) it means that they were in good health. Psychological problems are less and only below 25 per cent have psychological problems in all the groups. In group I almost one third of the subjects are having medication.

Table-I BPFT Fitness zone level standard on percent body fat

Before/ after	Category	Group 1		Group 2	
		Count	Per cent	Count	Per cent
Before intervention	Very Lean	0	0.0	5	41.7
	HFZ	7	58.3	5	41.7
	NI	3	25.0	2	16.7
	(Health Risk)	2	16.7	0	0.0
After Intervention	Very Lean	0	8.3	5	41.7
	HFZ	9	75.0	3	25.0
	NI	2	16.7	4	33.3
	(Health Risk)	1	8.3		0

Classification of subjects based on BPFT fitness zone standards of modified curl up was done the results are given in Table -IV

Table -1l BPFT Fitness zone level standard on modified curl UP

Group	Before intervention		After intervention			
	NI		HFZ		NI	
	Count	Per cent	Count	Per cent	Count	Per cent
Group 1	12	100	2	16.7	10	83.3
Group 4	12	100	0	0.0	12	100.0

The findings of the study revealed a significant difference between the yoga and meditation group and the control group with respect to the selected criterion variables, namely body composition and musculoskeletal functioning. The participants who underwent the yoga and meditation intervention demonstrated significant improvements in abdominal strength and endurance, as well as a reduction in percent body fat when compared to the control group. These results indicate the positive impact of yoga and meditation practices on the physical

health and fitness of adolescents with intellectual disabilities.

However, the Trunk Lift Test could not be successfully administered to the participants due to behavioral challenges and difficulties in following the testing procedures. Consequently, trunk strength was excluded from the final analysis of the study.

Result and Conclusion

The results suggest that yoga and meditation can serve as effective and adaptable interventions for improving body composition and selected aspects of musculoskeletal functioning among adolescents with intellectual disabilities. The findings further highlight the influence of sedentary lifestyles on increased body fat levels and obesity within this population. In addition, irregular dietary habits and limited awareness of balanced nutrition among family members may contribute to unhealthy body composition and obesity-related concerns. Based on these findings, the study recommends the implementation of well-structured and adapted physical education programmes, including yoga and meditation practices, within special school settings. Such programmes may assist in promoting physical fitness, maintaining healthy body composition, and enhancing the overall well-being of individuals with intellectual disabilities. Furthermore, interactions with parents, family members, and special education teachers throughout the research process emphasized the need for continued investigation in this field. The researcher concludes that the present study provides a foundation for future research and encourages further exploration of effective interventions aimed at improving the quality of life, health, and functional abilities of adolescents with intellectual disabilities. Given the broad scope and societal importance of this area, additional studies are warranted to support the development and inclusion of this vulnerable population.

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EFFECT OF CIRCUIT TRAINING ON PHYSICAL FITNESS AMONG MALE BASKETBALL PLAYERS

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Abstract

The purpose of the study was to determine the effect of circuit training on physical fitness among male basketball players. Thirty physically active male students (n = 30) were randomly selected as subjects and their age ranged between 18 and 23 years. The selected subjects were randomly assigned into two equal groups such as experimental and control with fifteen subjects each (n = 15). Experimental group was involved with interval circuit training and control group was not exposed to any specific training apart from their curriculum. Muscular strength and cardio respiratory endurance were taken as variables for this investigation. The muscular strength was assessed by using vertical jump and the cardio respiratory endurance was assessed by using 12 minutes run/walk test. The pre and posttest were conducted one day before and after the experimental treatment. Analysis of covariance (ANCOVA) was used to analyze the collected data. The results revealed that interval circuit training produced significant improvement ($p \leq 0.05$) on muscular strength and cardio respiratory endurance as compared to control group.

Keywords: Circuit training, physical fitness, muscular strength, cardio respiratory endurance, basketball players

Introduction

Circuit training, like strength, flexibility and mental skills training have now become an important ingredient in the total programme, particularly where strength and endurance are essential in the sport. Training and technique are very important in developing or improving a sport skill. Generally as the adaptation to training takes place, the efficiency of the skill improves. The aim of circuit training is to condition the athlete to move at high velocity, employing maximal power when needed. In order to do this, the neuromuscular system must be conditioned to very fast movements and training need to be very specific.

Circuit training is a type of exercise program where one does a series of timed exercises at a fairly rapid pace, with a brief period of rest in between each exercise. Circuit training workouts may target the entire body or just one specific area, such as the arms, legs, or chest. In addition, circuit training workouts may focus on strength training, aerobics, or a combination of the two; the possibilities are virtually limitless. Circuit training usually

consists of discontinuous exercise involving exercising for a fixed number of repetitions using a series of stations involving light resistance training. Each station usually involves an equal exercise:rest ratio lasting between 60-120 sec. In essence, circuit training is similar to a combination of aerobic and resistance exercise (McCarthy *et al*, 1995; Maiorana *et al*, 2002; *Park et al, 2003;* Takeshima *et al*, 2004).

Studies show that circuit training is the most time efficient way to enhance cardiovascular fitness and muscle endurance and that it helps to achieve their goals and maintain them longer than other forms of exercise. Previous researches have also proved that light-resistance circuit training produces marked reduction in body fat both in athletes and sedentary individuals (Mosher *et al*, 1998; Dolezal and Potteiger, 1998; Balducci *et al*, 2004; Chtara *et al*, 2005*).* The purpose of this study was to find out the effect of interval circuit training on motor fitness and volleyball skill performance of male volleyball players.

Materials and Methods

To achieve this purpose thirty male basketball players from Dr. Sivanthi Aditanar College of Physical Education, Tiruchendur, Tamil Nadu, were selected as subjects, of which fifteen each as experimental group and control group. The subjects were taken in the age group between 18 and 23 years. The selected dependent variables namely muscular strength and cardio respiratory endurance were assessed using standard tests and procedures, prior to and immediately after the training protocol. The experimental group subjects underwent circuit training progamme for three days a week for eight weeks. The muscular strength was assessed by using vertical jump and the cardio respiratory endurance was assessed by using 12 minutes run/walk test. The participants performed the following exercises namely squat jumps, pushups, dumbbell squat and swings, tuck jumps, squat thrusts, fast feet on box, jumping jacks, alternating split squat respectively. The experimental design used for the present investigation was random group design involving thirty subjects. Analysis of covariance (ANCOVA) was used as a statistical technique to determine the significant difference, if any, existing between pretest and posttest data on selected dependent variables. The level of significance was accepted at 0.05 levels.

Results

Table I: Analysis of Covariance on Muscular Strength of Experimental Group and Control Group

Adjusted Post Test Mean		SOV	SS	df	MS	F
Experi. Gr.	Control Gr.					
38.73	32.88	BG	223.72	1	223.72	87.27*
		WG	67.57	27	2.503	

*Significant at 0.05 level of confidence for df of 1 and 27 is 4.21

Table II: Analysis of Covariance on Cardio respiratory Endurance of Experimental Group and Control Group

Adjusted Post Test Mean		SOV	SS	df	MS	F
Experi. Gr.	Control Gr.					
2618.66	2487.33	BG	171153.3	1	171153.3	29.38*
		WG	146890.3	27	5440.38	

*Significant at 0.05 level of confidence for df of 1 and 27 is 4.21

The findings of the study shows that significant difference existing between interval circuit training group and control group on muscular strength and cardio respiratory endurance, since the obtained 'F' ratio of 87.27 and 29.38 respectively were higher than the required table value of 4.21 for significance at 0.05 level of confidence for df of 1 and 27. Hence it is concluded that eight weeks of interval circuit training can produce significant changes on muscular strength and cardio respiratory endurance. The adjusted posttest mean values of experimental group and control group on muscular strength and cardio respiratory endurance are graphically represented in the figures 1 and 2.

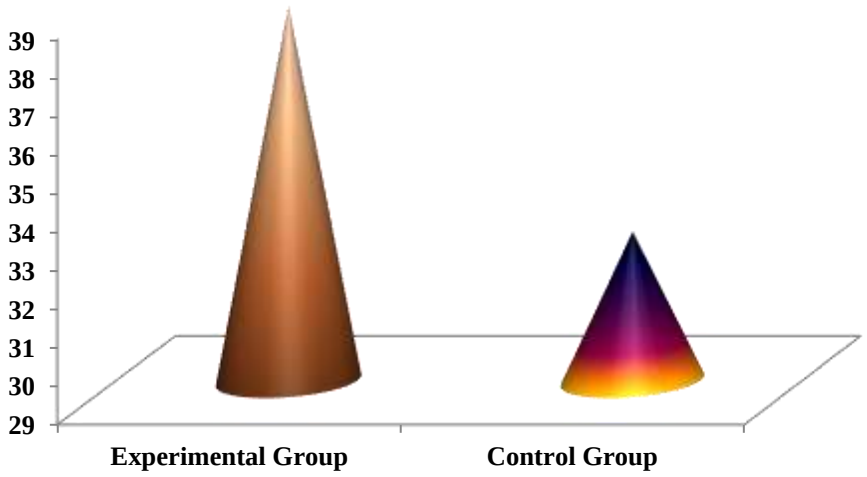


Figure 1: The adjusted posttest mean values of experimental groups and control group on muscular strength.

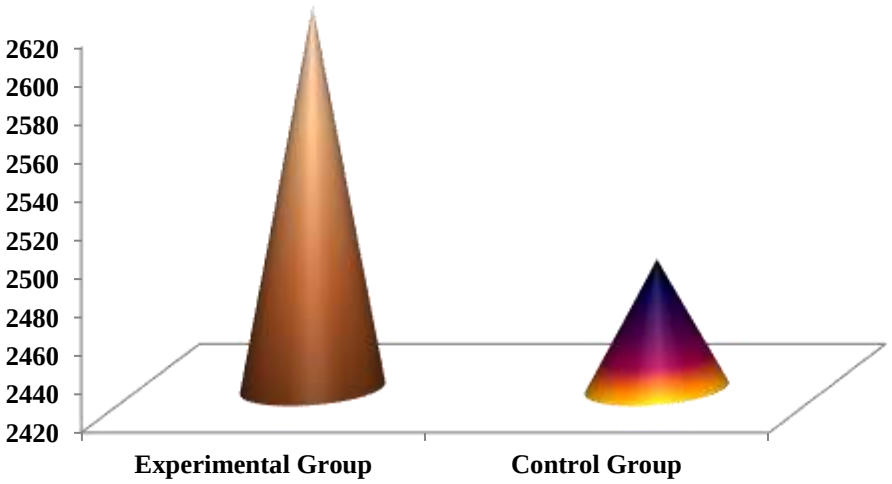


Figure 2: The adjusted posttest mean values of experimental groups and control group on cardio respiratory endurance.

Discussion

Based on the statistical analysis of the data it is concluded that eight weeks of circuit training can produce significant changes on muscular strength and cardio respiratory endurance. Kaikkonen (2000) observed significant improvement on cardiovascular and muscular fitness due to the effect of a 12-week low resistance circuit weight training. Gettman (1978) conducted a study to determine the changes elicited by circuit weight training and running (RN) programs conducted 3 days week for 20 weeks. It was concluded that the circuit weight training program was most specific in improving strength and changing body composition and aerobic capacity. This indicates that the circuit training programme resulted in the improvement of aerobic performance and explosive power of the subjects. This is also similar to the findings of the present study.

Conclusion

The result of this study demonstrated that circuit training has significant impact on muscular strength and cardio respiratory endurance of college male students. Hence it is suggested that the adaptation changes of circuit training are very dynamic and variable to each individual.

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FROM MOVEMENT COMPETENCE TO EMBODIED FLOURISHING: REFRAMING PHYSICAL LITERACY THROUGH YOGA FOR LIFELONG HUMAN DEVELOPMENT

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Abstract

This paper argues for a reconceptualization of physical literacy through the integrative lens of yoga, positioning both as complementary frameworks for fostering lifelong human development. In response to the global crisis of physical inactivity, physical literacy has emerged as a holistic alternative to traditional performance-oriented physical education, emphasizing motivation, confidence, physical competence, and meaningful engagement in movement across the lifespan. Drawing on Whitehead's philosophical foundations and contemporary empirical research, this article highlights the limitations of reductionist approaches that isolate skill acquisition from emotional, cognitive, and social dimensions of learning. Yoga is proposed as a pedagogical and philosophical practice uniquely aligned with the principles of physical literacy. Beyond its popular representation as stretching or relaxation, yoga embodies an integrated approach to movement that combines physical competence, breath awareness, self-regulation, and reflective consciousness. Evidence from school-based and adult interventions indicates that yoga improves balance, strength, flexibility, emotional regulation, social behaviour, and overall well-being. (Ferreira-Vorkapic C et al.,2015).The paper further explores the philosophical affinities between yoga and physical literacy, particularly their shared grounding in embodied cognition and holistic human development. It argues that yoga offers an inclusive, adaptable, and meaningful movement pedagogy that engages diverse learners across the life course. At the same time, critical considerations regarding cultural appropriation, conceptual dilution, and

methodological limitations in existing research are addressed. Ultimately, this paper positions yoga not as an add-on to physical education, but as a transformative practice that can deepen and operationalize the aims of physical literacy. Integrating yoga within movement education may enable a shift from mere movement competence to embodied flourishing, thereby supporting sustainable, meaningful participation in physical activity throughout life.

Keywords: Physical literacy, yoga, embodied learning, holistic education, movement competence, lifelong physical activity, well-being, physical education, self-regulation, inclusion, embodied cognition, pedagogy, human development, contemplative practice, motor skills, emotional regulation.

Introduction

The current crisis of physical inactivity has prompted educators, health professionals, and policymakers to reconsider strategies for promoting lifelong physical activity (Carl et al., 2022). Traditional physical education has emphasised performance, competition, and sport-specific skills; however, these approaches have not consistently fostered individuals who feel capable, motivated, or responsible for maintaining physical activity throughout life (Lundvall, 2015; Whitehead, 2010). Growing interest in physical literacy reflects dissatisfaction with the restriction of movement education to fitness assessments, technical sport skills, or short-term objectives (History of Education Society, 2022; Whitehead, 2010). In contrast, physical literacy conceptualises a physically educated individual as one who possesses movement skills, values movement, understands its significance, and sustains the motivation and confidence necessary for lifelong activity (Whitehead, 2010, 2019).

This broader perspective necessitates a transformation in pedagogical approaches. If physical literacy is understood holistically, movement education must address the emotional, cognitive, social, and existential dimensions alongside physical skills (Carl et al., 2022; Whitehead, 2010). Such an approach requires that students experience movement as meaningful and accessible, rather than as an arena reserved for elite athletes (Lundvall, 2015; Whitehead, 2010). Within this context, yoga assumes particular significance. Yoga extends beyond stretching or flexibility enhancement; in educational and therapeutic settings, it serves as a disciplined practice to improve balance, mobility, self-awareness, breath control, social behaviour, and emotional regulation (Cowen & Adams, 2005; Folleto et al., 2016).

Physical literacy and yoga align because both view (Whitehead, 2010)the body and mind as interconnected (History of Education Society, 2022; Whitehead, 2010). Yoga sees people as integrated—actions, senses, emotions, and intentions are linked (Desikachar, 1995; Feuerstein, 1998). When taught well, yoga is more than just another class—it's a way to experience physical literacy directly.

Physical Literacy as a Holistic Educational Ideal

The modern discourse of physical literacy is closely associated with Margaret Whitehead, whose edited volume Physical Literacy: Throughout the Lifecourse established the concept internationally as a holistic alternative to reductionist physical education models (Whitehead, 2010). Whitehead (2019) defined physical literacy as the motivation, confidence, physical competence, knowledge, and understanding that enable individuals to value and take responsibility for engaging in physical activities throughout life.

The significance of Whitehead's intervention lies in its philosophical depth. Physical literacy is grounded in phenomenology, existentialism, and embodied accounts of human agency that reject sharp separations between mind and body (Whitehead, 2010). Therefore, physical literacy cannot be reduced to a checklist of movement skills. Instead, it concerns how individuals inhabit their bodies, perceive possibilities for action, and develop identities through movement experiences. Volshoj, E. S et al. (2025).

Historical analyses indicate that physical literacy did not emerge in isolation. The argument is that physical education should lay the foundations for a physically literate population. Young, Alfrey, L et al. (2023). Moving from physical literacy to co-existing physical literacies: What is the problem? Such historical continuity demonstrates that concerns about understanding, enjoyment, and lifelong participation have long shaped debates in physical education. Valle-Muñoz, V. M. et al., (2025).

International scholarship has further expanded the concept. In Physical Literacy Across the World, Whitehead (2019) documented how physical literacy has been interpreted across Australia, Canada, India, New Zealand, Wales, and the United States. While a shared conceptual core remains, national frameworks often differ in emphasis, with some incorporating social, spiritual, or ecological dimensions more explicitly.

Empirical research has also strengthened support for physical literacy. Carl et al. (2022), in a systematic review and meta-analysis of 48 interventions, reported significant improvements across physical competence, motivation and confidence, knowledge and understanding, physical activity behaviour, and total physical literacy outcomes. Additional reviews similarly indicate increasing international interest in school-based physical literacy interventions (Carl et al., 2024).

Why Yoga Belongs in the Physical Literacy Conversation

Yoga deserves a central place in discussions of physical literacy because it embodies many qualities valued in physical literacy theory. At its best, yoga develops movement competence through attentive repetition, progressive challenge, sensory awareness, and adaptation to individual capacity (Folleto et al., 2016), aligning with inclusive movement education. Yoga lessons can incorporate balance, mobility, coordination, strength, breathing control, relaxation, concentration, and reflective awareness. Whereas many traditional physical education experiences emphasise competition and externally measured success, yoga

encourages internal awareness and self-regulation while still engaging the body in meaningful physical challenges. Bergen-Cico et al. (2015)

Research supports these claims. Folleto et al. (2016) examined a 12-week yoga program implemented in physical education classes for children aged six to eight years and found significant improvements in balance, flexibility, strength, concentration, and social behaviour. Similarly, Cowen and Adams (2005) reported improvements in flexibility, muscular strength, endurance, perceived stress, and health perception among adults who practised yoga. In "Arriving in the Body," researchers explored the experiences of physical education teacher education students with yoga-based practices and found that yoga deepened reflective embodiment and pedagogical awareness.

Philosophical Affinities Between Physical Literacy and Yoga

The strongest argument for integrating yoga into physical literacy may be philosophical rather than merely practical (Durden-Myers, 2019). Physical literacy is rooted in a view of the person as embodied and situated (Whitehead, 2010). Human beings do not merely possess bodies as objects; they live, know, and relate through embodied existence.

This perspective resonates strongly with yoga traditions that understand disciplined bodily practice as inseparable from attention, ethical life, and self-knowledge (Feuerstein, 1998). Contemporary popular culture often reduces yoga to stretching or stress management, but scholarly analyses reveal its broader pedagogical and philosophical dimensions (Markula, 2014; Singleton, 2010).

Yoga also supports the development of selfhood, central to physical literacy. Through attention to breath, alignment, effort, and emotional awareness, yoga encourages individuals to interpret bodily possibilities and limitations without shame or disengagement (Folleto et al., 2016). In educational settings dominated by comparison and judgment, yoga can therefore provide an alternative framework in which competence is understood as growth, self-regulation, and meaningful inhabitation.

Evidence on Physical and Psychosocial Outcomes of Yoga

Research on yoga demonstrates significant physical and psychosocial benefits relevant to physical literacy. Cowen and Adams (2005) found that six weeks of yoga practice improved flexibility, muscular strength, endurance, stress levels, and perceived health among healthy adults. Other studies have linked yoga to improvements in balance, strength, stress reduction, and mental well-being (Belluz, 2015).

School-based interventions are especially noteworthy. Folleto et al. (2016) demonstrated that integrating yoga into school physical education improved motor skills and social behaviour. Additional studies suggest that yoga interventions can positively influence classroom behaviour, emotional regulation, and adolescent development. Pandey, M. et al., (2025).

Further review of the literature further supports yoga's educational value. Hagen and Nayar (2014) concluded that yoga may contribute positively to children's and adolescents' mental

health and well-being, while Woodyard (2011) highlighted yoga's therapeutic potential for improving quality of life.

Yoga in Schools and Physical Education

Schools are among the most important contexts for integrating yoga and physical literacy. If physical literacy is for all learners, movement education must include pedagogies that engage students who are often marginalised in competitive sport environments, including anxious learners and neurodivergent learners with lower perceived competence.(Houser, N., & Kriellaars, D., 2023).Yoga offers a solution because it can be adapted to intensity, pacing, and complexity while maintaining inclusivity (Folleto et al., 2016). The Brazilian school-based intervention described by Folleto et al. (2016) emphasised breathing awareness, storytelling, relaxation, cooperation, and developmentally appropriate instruction. These features aligned closely with multiple dimensions of physical literacy. Superficial implementation may reduce yoga to a token relaxation activity, whereas meaningful integration requires trauma-informed pedagogy, cultural sensitivity, and deep understanding of embodiment (Markula, 2014).

Life Course and Inclusion

One reason physical literacy has gained influence is its applicability across the lifespan (Whitehead, 2010, 2019). Yoga similarly accommodates people of diverse ages, abilities, and health conditions. Children may encounter yoga through play-based movement; adults, through stress management and fitness; and older adults, through mobility and balance training.

This adaptability makes yoga valuable for inclusive movement education. Therapeutic yoga approaches emphasise modification, evidence-informed practice, and individualised care, helping physical literacy avoid exclusionary norms centred on idealised athleticism. McKibben, E. (2024).

Media, Culture, and the Public Imagination

Public narratives and media representations significantly shape perceptions of both yoga and physical literacy. Yoga's global popularity has been accelerated by magazines, television, digital media, and the wellness industry, which often frame yoga as a path to calmness, flexibility, or self-improvement (Markula, 2014).

Although such representations can increase participation, they may narrow yoga's meaning by emphasising aestheticised or commercialised forms. Similarly, public communication about physical literacy can simplify a philosophically complex concept into generalised movement promotion.

Digital technologies further influence yoga education. Multimedia tools, mobile applications, blogs, and social platforms increasingly support yoga instruction and engagement (Sivakumar & Pazhanivelu, 2016). These technologies may enhance accessibility but can also detach practice from contextual understanding if poorly guided.

Tensions and Critical Questions

Despite the promise of integrating yoga and physical literacy, important tensions remain. One concern involves conceptual dilution. Both physical literacy and yoga risk becoming vague, marketable slogans detached from their philosophical foundations.

Another concern involves cultural translation. Yoga emerged from South Asian traditions and has undergone significant reinterpretation through colonialism, globalisation, and commercialisation (Singleton, 2010). Responsible educational integration, therefore, requires cultural humility and historical awareness.

Finally, methodological limitations persist within existing research. Many studies rely on small samples, quasi-experimental designs, and inconsistent outcome measures. Future research would benefit from longitudinal approaches, comparative interventions, and richer qualitative inquiry. (Fleisch & Dixon, 2019)

Directions for Research and Practice

Future research should explicitly investigate yoga-informed physical literacy interventions using multidimensional assessment frameworks. Studies should examine how yoga influences physical competence, confidence, motivation, knowledge, understanding, and sustained participation.

Teacher education also warrants greater attention. Programs preparing physical educators should include critical engagement with embodiment, contemplative pedagogy, and inclusive teaching practices.

Cross-cultural research is similarly needed. Comparative analyses examining yoga-informed physical literacy across India, Canada, Brazil, Australia, and the United Kingdom may clarify universal and context-specific dimensions of movement education. Cornish, K. et al. (2020).

Conclusion

This paper has argued that the contemporary discourse on physical literacy represents a significant and necessary shift in how movement, education, and human development are understood. Moving beyond narrow models centred on performance, competition, and sport-specific competence, physical literacy repositions movement as a meaningful, lived, and lifelong human experience. However, while the conceptual foundations of physical literacy are philosophically rich and educationally promising, their translation into practice remains uneven. It is within this gap between theory and implementation that yoga emerges as a particularly valuable and timely pedagogical partner.

Yoga contributes to physical literacy not simply by adding another form of physical activity, but by fundamentally reorienting how movement is experienced, taught, and valued. Its emphasis on breath, attention, bodily awareness, and self-regulation offers learners an experiential pathway to develop the motivation, confidence, and understanding central to physical literacy. In contrast to traditional physical education environments that often privilege comparison, competition, and external validation, yoga fosters an inwardly directed, reflective engagement with movement. This shift is especially important for learners who may

feel excluded, anxious, or disengaged within conventional sport-based frameworks.

The evidence reviewed in this paper supports the inclusion of yoga within movement education across multiple domains. Physically, yoga enhances balance, flexibility, strength, and coordination—key components of movement competence. Psychologically, it supports emotional regulation, stress reduction, and positive self-perception. Socially, yoga-based pedagogies can cultivate cooperation, empathy, and inclusive participation. These multidimensional outcomes align closely with the core attributes of physical literacy, reinforcing the argument that yoga can serve as an effective and holistic educational practice.

Importantly, the relationship between yoga and physical literacy is not merely instrumental but deeply philosophical. Both frameworks reject dualistic understandings of mind and body, instead recognising human beings as embodied agents whose thoughts, emotions, and actions are inseparable. Yoga traditions, particularly in their classical and philosophical forms, emphasise disciplined practice as a pathway to self-knowledge, ethical awareness, and integration. Similarly, physical literacy foregrounds the importance of meaning, identity, and agency in movement experiences. The convergence of these perspectives suggests that integrating yoga into physical literacy is not an artificial pairing but a coherent and mutually reinforcing alignment.

At the same time, this integration must be approached with care and critical awareness. One of the central risks identified in this paper is conceptual dilution. Both physical literacy and yoga have gained popularity in educational and public discourse, but this visibility can lead to oversimplification. Physical literacy may be reduced to a checklist of competencies, while yoga may be stripped of its philosophical depth and presented merely as stretching or relaxation. Such reductions undermine the transformative potential of both frameworks. Educators and researchers must therefore engage with these concepts in ways that preserve their complexity and integrity.

Cultural considerations are equally significant. Yoga originates from South Asian traditions with rich historical, philosophical, and spiritual dimensions. Its global dissemination has involved processes of adaptation, reinterpretation, and, at times, commodification. Integrating yoga into physical education—particularly in contexts outside its cultural origins—requires sensitivity, respect, and an informed pedagogical approach. This includes acknowledging yoga's historical roots, avoiding superficial or appropriative practices, and ensuring that its educational use remains grounded in authenticity and ethical awareness. In contexts such as India, this also presents an opportunity to reconnect educational practice with indigenous knowledge systems in meaningful and contextually relevant ways.

Methodologically, the current evidence base, while promising, remains limited. Many studies examining yoga interventions in educational settings rely on small sample sizes, short durations, and varied outcome measures. To strengthen the case for yoga-informed physical literacy, future research must adopt more rigorous and comprehensive designs. Longitudinal

studies are needed to examine whether early exposure to yoga-based movement education translates into sustained physical activity and well-being across the lifespan. Comparative research can help identify how yoga compares with other pedagogical approaches, while qualitative studies can deepen understanding of learners' lived experiences of embodied practice.

Teacher education emerges as a critical site for advancing this integration. If physical literacy is to be realised in practice, educators must be equipped not only with technical knowledge but with an understanding of embodiment, inclusion, and reflective pedagogy. Training programmes should therefore incorporate yoga-informed approaches alongside broader discussions of holistic education, enabling teachers to design learning environments responsive to diverse student needs. This is particularly relevant to addressing exclusion in physical education, where students with lower perceived competence, diverse abilities, or negative prior experiences often disengage.

Looking ahead, integrating yoga and physical literacy offers a compelling vision for the future of movement education. It suggests a shift from viewing physical activity as an obligation or performance metric to understanding it as a meaningful, enriching, and sustaining aspect of human life. In this vision, movement is not merely something individuals do, but something through which they come to know themselves, relate to others, and engage with the world.

Ultimately, reframing physical literacy through yoga invites educators, researchers, and policymakers to reconsider the purpose of physical education itself. Rather than producing technically proficient performers, the goal becomes cultivating embodied individuals who are capable, confident, reflective, and motivated to participate in movement throughout their lives. This is the essence of embodied flourishing—a state in which physical competence, self-awareness, and meaningful engagement converge to support holistic human development. By embracing yoga as a central component of this vision, movement education can more fully realise its potential as a transformative force in both individual lives and broader society.

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SLEEP QUALITY AND COMPETITIVE ANXIETY AMONG STATE-LEVEL TRACK AND FIELD ATHLETES: A GENDER-BASED COMPARISON

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Abstract

As per this study, the goal was to compare the competitive anxiety and sleep quality regarding male and female state-level track and field athletes. We could see that only 200 players were picked from different districts within the state, with 100 men and 100 women who do track and field . Researchers actually used the Sleep Quality Scale (SQS) to check how well people sleep, and they definitely used the Sport Competition Anxiety Test (SCAT) to check anxiety during sports competitions. We actually used simple statistics to study the data. This definitely helped us understand the basic patterns. It showed that male athletes only had better sleep quality than female athletes in the results. Basically, female athletes showed the same pattern of having more competitive anxiety compared to others. The findings showed that psychological factors were important for sports performance and further highlight the need to develop programs for better sleep management and reducing anxiety in competitive athletes. This research itself emphasizes how mental health directly affects athletic success. Basically, this study looked at how sleep quality and competitive anxiety are the same or different between male and female track and field athletes at the state level.

2. Introduction

Sports performance depends only on many body, mind, and health factors. Sleep quality and competitive anxiety actually get a lot of attention because they definitely affect how athletes prepare, recover, and perform. We are seeing that sports people only face hard body work and competition stress that can change their mind health. We could see that sleep is only one important part of getting better and it plays a big role in keeping our body and mind healthy. We are seeing that proper sleep only helps in better focus, quick reactions, controlling emotions, and good sports performance. We are seeing that bad sleep quality only makes recovery slow and gives poor performance results. Basically, competitive anxiety is the same as another important psychological factor in sports. As per competition situations, it means the tension and worry feelings that happen before or during any contest. Regarding this nervousness, it comes when people feel scared about performing in competitions. Basically, some anxiety helps you stay alert and motivated, but too much anxiety creates the same problem of poor focus and bad performance. We are seeing that top athletes often get more worried because of high expectations and the tough demands that only come with big

competitions.

As per previous studies, there are gender differences regarding various psychological variables. Knowing these differences can actually help coaches and sports psychologists make better programs that definitely improve how athletes feel and perform. This study was done to compare only sleep quality and competitive anxiety between male and female state-level track and field athletes. The study aimed to compare sleep quality and competitive anxiety between male and female state-level track and field athletes and further examine how these factors differ between genders. The research itself focused on understanding the relationship between sleep patterns and anxiety levels in competitive athletic performance.

Hypotheses

Sleep quality itself would show significant differences between male and female state-level track and field athletes, and this needs further investigation.

Male and female state-level track and field athletes would show the same big difference in competitive anxiety.

3. Methodology

Participants

The study included 200 state-level track and field athletes, with 100 male and 100 female participants. Further analysis was conducted on the group itself to examine performance patterns. Basically, the athletes were picked randomly from different state competitions, and the selection process was the same for all levels.

The variables were sleep quality and competitive anxiety. Instruments used for this study were the Sleep Quality Scale (SQS), which further measures how well a person sleeps and evaluates sleep patterns themselves. Basically, we used the Sleep Quality Scale (SQS) to check sleep quality, which was made by Yi, Shin, and Shin in 2006. We are seeing that this scale has only 28 items, which measure different parts of sleep quality. We are seeing that higher scores only mean worse sleep quality. Moreover, the Sport Competition Anxiety Test (SCAT) itself measures anxiety levels in athletes during competitive situations, and it further helps coaches understand player stress responses. As per the study, competitive anxiety was measured regarding the Sport Competition Anxiety Test (SCAT) made by Martens. As per the study, this tool checks the worry levels regarding athletes during competition time.

Statistical Analysis

We were used; the mean and standard deviation were calculated for all variables only. These basic statistics were found for describing the data. As per the research design, an independent samples t-test was used to check gender differences regarding sleep quality and competitive anxiety. Further, basically, since individual participant scores were not available, the same descriptive analysis was performed.

4. Results

Table 1 Descriptive Statistics of Sleep Quality among State-Level Track and Field Athletes

Group	N	Mean	SD
Male Athletes	100	84.00	0.49
Female Athletes	100	82.00	0.47

This study further examines sleep quality data among track and field athletes at the state level, where the analysis itself focuses on basic statistical descriptions.

We are seeing that male athletes are showing an 84.00 average with only a 0.49 difference from 100 total cases. Female athletes showed 82.00 performance with 0.47 variation from 100 total participants. This data further indicates the group's consistent performance levels itself. We are seeing that male players got better sleep scores (84.00) than female players (82.00), which shows only male athletes have slightly better sleep quality.

Table 2: Descriptive Statistics of Competitive Anxiety among State-Level Track and Field Athletes

Group	**N**	**Mean**	**SD**
Male Athletes	100	19.48	2.40
Female Athletes	100	20.58	3.21

Moreover, male athletes actually scored 19.48 points with a 2.40 standard deviation from 100 participants. This definitely shows the performance data for men in sports. Female athletes actually scored 20.58 points on average with 3.21 variations in their performance. The study definitely included 100 women athletes in this analysis. As per the findings, female athletes showed higher competitive anxiety scores ($M = 20.58$, $SD = 3.21$) than male athletes ($M = 19.48$, $SD = 2.40$). The results regarding anxiety levels clearly indicate that women athletes face more competitive stress.

5. Discussion

This study compared sleep quality and competitive anxiety between male and female state-level track and field athletes to further understand the differences. The research itself focused on examining how these factors varied between the two groups. The study findings showed that male athletes had better sleep quality than female athletes, and this difference itself suggests further research is needed to understand gender-related sleep patterns. Good sleep is essential for sports recovery and helps the mind and emotions function properly, which further supports the body's natural healing process itself. We are seeing that players who sleep well only are better ready to handle the body stress and mental pressure during games.

Basically, the results showed that female athletes had the same pattern of reporting more

competitive anxiety compared to male athletes. This finding can be due to differences in how people think about competition, their ways to handle stress, and what they expect regarding their performance as per psychological studies. High anxiety levels further reduce concentration and confidence, which affects performance itself.

The findings further support earlier research on how mental factors affect sports performance and show that checking athlete well-being itself is very important.

6. Conclusion

As per the study, male and female state-level track and field players show differences regarding sleep quality and competitive anxiety. As per the study, male athletes showed better sleep quality regarding their performance, while female athletes reported more competitive anxiety. The results surely show that helping athletes manage their sleep and reduce anxiety can improve their health and sports performance. Moreover, these psychological support methods are important for making athletes feel better and play better. Moreover, practical Implications

- As per good training practices, coaches should teach players regarding proper sleep habits and recovery methods.
- Basically, psychological skills training programs should be the same as regular training plans and included together.
- We are seeing that female sports players can get help from special methods that only focus on reducing their worry during competitions.
- Sports organizations should provide easy access to mental health support and sports psychology services as per the needs of athletes. Regarding player welfare, these services must be made available to help with mental well-being.

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THERAPEUTIC IMPACTS OF YOGASANA PRACTICE ON SERUM LDL AND HDL IN SEDENTARY YOUNG WOMEN

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Abstract

This research studied a 12-week yoga program to check how it affects bad and good cholesterol levels (LDL and HDL) in female college students who don't exercise much. Eighty volunteers aged 18-22 years were randomly divided into an experimental group (n=40) and a control group (n=40), and the study design itself helped to further ensure proper comparison between both groups. Basically, the people in the study did moderate yoga sessions four times every week, which was the same routine for all participants. The researchers surely measured lipid profiles before and after giving the treatment. Moreover, this helped them compare the changes that occurred. As per the results, the test group showed big drops in bad cholesterol and increases in good cholesterol levels. Regarding the effect size, the changes were moderate to large and statistically significant. We could see that the control group showed no important changes .Also, these results showed that doing yoga poses systematically works as a natural way to improve cholesterol levels and heart health without medicines.

2. Introduction

An inactive lifestyle has surely become a major cause of heart disease and metabolic problems around the world. Moreover, this lack of physical activity is greatly affecting sickness and death rates globally. Female college students often become less physically active due to study pressure and spending more time on screens, which further reduces their exercise habits. This pattern itself creates a cycle of decreased physical activity among women in higher education. We are seeing these patterns match strongly with bad blood fat levels, where only the harmful cholesterol goes up and the good cholesterol goes down.

These lipid problems surely lead to serious health risks like faster plaque formation and heart disease due to high bad cholesterol levels. Moreover, low good cholesterol levels reduce the body's natural protection against heart problems. Controlling cholesterol levels is further essential for maintaining heart health itself. Yoga surely offers a complete exercise method that brings together breathing techniques and body postures to enhance mental concentration and physical health. Moreover, these conscious movement practices help improve overall wellness through mindful physical activity. Basically, research shows that doing yoga poses regularly can boost your confidence, improve how your body burns food, increase blood flow, and control stress - it's basically the same effect on fat burning through changing hormones

and calming your nervous system.

As per current studies, there is limited research regarding how organized yoga pose training affects cholesterol levels in inactive female college students, even though interest in yoga benefits keeps growing. We are seeing this study only wanted to check how yoga pose training affects LDL and HDL levels in the body.

3. Methodology

Study Design:

As per the research plan, a controlled trial was done regarding testing the treatment on randomly selected groups.

Participants:

As per the study design, 80 inactive female college students aged 18-22 years were selected and randomly divided into groups. 40 people only in the experimental group.The control group itself had 40 participants for further comparison in the study.

Yoga poses surely require proper training methods, and these protocols helped the students learn safely.The experimental group completed a well-planned yoga training program for 12 weeks. Moreover, this curriculum was organized in a systematic manner.

The frequency was four sessions weekly, which further ensures regular practice. This schedule itself maintained consistent learning progress. The sessions lasted between 45 and 60 minutes. This duration was maintained consistently across all periods. The intensity level is surely moderate. Moreover, this indicated a balanced approach to the activity.

Each session consisted of warm-up exercises (10 minutes), selected yogasanas (30-40 minutes), pranayama techniques, and relaxation (5-10 minutes).

The selected yoga poses further included the following exercises.

Tadasana,Trikonasana,Bhujangasana,Paschimottanasana,Vajrasana,Pavanamuktasana.Also, basically, this is the same as the half spinal twist pose, where you sit and turn your body to one side. As per yoga practice, Surya Namaskar was done regarding sun salutation exercises. and Savasana.Moreover, we are seeing that the control group received no proper exercise program only.

Outcome Measurements:

- LDL levels (mg/dL).
- HDL levels (mg/dL).

Statistical Analysis

We were using mean and standard deviation calculations and also used a paired t-test to check changes within the same group. This method definitely compares before-and-after results in one group. An independent t-test was used for comparing groups further, and the test itself evaluated differences between groups. As per Cohen's d method, effect size calculation is done regarding the statistical analysis. We could see that the results were important only when the p-value was less than 0.05.

4. Results

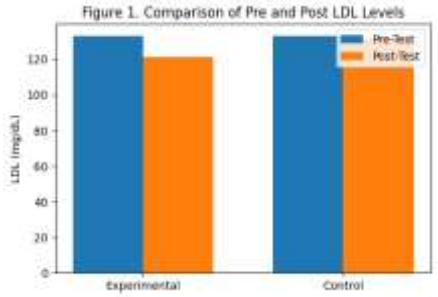
As per the study results, LDL levels in the test group dropped significantly from 133.10 to 121.40, showing a strong effect. Regarding the statistical analysis, the results were $t = 5.28$, $p < .001$, and $d = 0.92$, which means the changes were meaningful.

Table 1: LDL Level Concentrations

Group	Premean	Post Mean	Mean Difference
Experimental	133.10	121.40	11.70
Control	132.90	131.70	1.20

Also, the experimental values actually show 133.10, 121.40, and 11.70, respectively. These numbers definitely represent the measured data from the experiment. The control group showed values of 132.90 and 131.70, with a difference of 1.20. This difference itself indicates further variation in the control measurements.

Figure 1: LDL Comparison



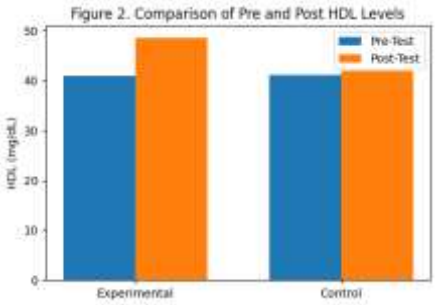
As per Figure 1 LDL Comparison, the test group showed a big reduction in LDL levels from start to end, but the control group had no major change. Also, HDL levels increased significantly from 41.00 to 48.60 in the experimental group, showing a large effect itself. The control group showed no further improvement.

Table 2: HDL Levels in different groups.

Group	Premean	Post Mean	Mean Difference
Experimental	41.00	48.60	7.60
Control	41.20	41.90	0.70

The experimental group actually showed 41.00 at the start and 48.60 at the end, with a definite 7.60 increase. Basically, the control group shows the same pattern with values starting at 41.20, ending at 41.90, and having a difference of 0.70.

Figure 2: HDL Comparison



We are seeing that HDL levels showed big improvement in the test group when we compared the final results with the starting ones, but the control group only had no such changes. The study actually showed that yoga poses definitely made a clear difference in both LDL and HDL cholesterol levels between the groups ($p < .001$). This proves that yoga practice actually works for improving cholesterol.

5. Discussion

This study actually showed that regular yoga poses definitely help reduce bad cholesterol in college girls who don't exercise much. The yoga practice actually improves blood flow and body functions, which definitely lowers stress and makes cholesterol levels better.

Further, higher HDL levels may come from better heart function and hormone balance itself through regular yoga poses and breathing exercises. Basically, yoga helps control how your body handles stress, and this has the same positive effect on how your body burns fat. The program actually showed big improvements that definitely matter in real practice.

We could see that control groups showed only small changes, which supports that the yoga intervention was effective. This matches earlier studies that found positive links between yoga practice and heart health only. Yoga is actually non-competitive and friendly, so female college students will definitely participate more in it.

6. Conclusion

Basically, doing regular yoga poses reduced bad cholesterol (LDL) and increased good cholesterol (HDL), giving the same significant health benefits, especially for female college students who don't exercise much. As per the study results, these findings are statistically important regarding heart health and show that drug-free methods can effectively manage cholesterol levels.

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IMPACT OF YOGA PRACTICES AND TABATA TRAINING ON SERUM HDL AND LDL LEVELS IN COLLEGE-LEVEL WOMEN KABADDI PLAYERS

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Abstract

The study aimed to examine the Impact of Yoga Practices and Tabata Training on Serum HDL and LDL Levels in College-Level Women Kabaddi Players. Sixty participants, aged between 19 and 25, were selected from various colleges in Madurai. The subjects were randomly divided into three groups, each consisting of twenty participants: a Yoga Practices group, a Tabata Training group, and a control group. The experimental groups underwent six weeks of training, five days per week, while the control group did not engage in any additional training beyond their routine activities. Statistical analysis was conducted using a correlated f ratio to determine significant differences in the criterion variables. The results, analyzed with appropriate statistical techniques, were tested at a 0.05 significance level.

Keywords: *Yoga Practices, Tabata Training, High-Density Lipoprotein, Low-Density Lipoprotein.*

INTRODUCTION

The modern game of Kabaddi has been played across India and parts of South Asia since the 1930s. The first documented framework of rules for Kabaddi, as an indigenous Indian sport, was established in Maharashtra in 1921 for competitions, combining the Sanjeevani and Gemini formats. Subsequently, a committee formed in 1923 revised these rules, which were implemented during the All-India Kabaddi Tournament that same year. Kabaddi is primarily a combative sport involving two teams of seven players each. The game is played for 40 minutes, split into two halves of 20 minutes with a 5-minute break in between. The objective is to score points by raiding the opponent's court and touching as many defenders as possible without being caught, all in a single breath.

PHYSICAL ASPECT OF YOGA

Yoga is an exceptional method for improving the performance of sports participants. A key feature of yoga is its integration of physical conditioning with focused concentration. Engaging in a yogic routine significantly enhances physical fitness. Yogic exercises target the body's vital organs, which are fundamental to maintaining good health. The foundation of physical fitness lies in the efficient functioning of these organs, and yoga aims to support and

enhance this efficiency. Through a combination of selected asanas that involve varied spinal movements, controlled breathing, relaxation techniques, and concentration practices, yoga provides a comprehensive routine to promote the health and well-being of the body's vital organs.

TABATA TRAINING

Tabata training is a form of high-intensity interval training (HIIT) that consists of eight rounds of 20 seconds of maximum-effort exercise followed by 10 seconds of rest, totaling four minutes per exercise.

HOW TO PERFORM TABATA TRAINING

To engage in Tabata training, follow these steps:

1. **Warm-Up**: Begin with a 5-10 minute warm-up to prepare your body and reduce the risk of injury.
2. **Exercise Selection**: Choose exercises that target large muscle groups to maximize muscle involvement.
3. **Intensity**: Perform the selected exercise at maximum intensity for 20 seconds.
4. **Rest**: Take a 10-second complete rest.
5. **Repetition**: Repeat the 20-second exercise and 10-second rest cycle for a total of eight rounds, completing one four-minute session.
6. **Progression**: As your fitness improves, consider increasing the difficulty or intensity of the exercises.

Tips for Effective Tabata Training

- **Warm-Up**: Always perform a thorough warm-up before starting to prepare your body and reduce the risk of injury.
- **Intensity**: Maintain maximum effort during the active phases to fully leverage the benefits of high-intensity training.
- **Form**: Ensure proper form during exercises to prevent injury.
- **Recovery**: Prioritize post-workout recovery and proper hydration to help muscles repair and build strength.

By adhering to these guidelines, Tabata training can be an efficient and effective method to enhance cardiovascular fitness and overall health.

METHODOLOGY

Selection of Subjects

The purpose of this study was to examine the Impact of Yoga Practices and Tabata Training on Serum HDL and LDL Levels in College-Level Women Kabaddi Players. Sixty subjects were selected randomly from various colleges in Madurai, all aged between 19 and 25 years. These participants were divided into three groups, with 20 subjects in each: the Yoga Practices group, the Tabata Training group, and the control group.

The experimental groups underwent six weeks of training, consisting of five sessions per

week. The control group, on the other hand, did not participate in any additional training beyond their regular activities. To determine significant differences between the means of the criterion variables, a correlated t-test was applied. Appropriate statistical techniques were utilized to process the data, and the obtained t values were tested for significance at the 0.05 level.

SELECTION OF VARIABLES

High-Density Lipoprotein (HDL): Measured through blood tests (mg/dl).

Low-Density Lipoprotein (LDL): Measured through blood tests (mg/dl).

STATISTICAL TECHNIQUES

The collected data on High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) were statistically analyzed. To test the hypotheses formulated by the researcher, the t-ratio was applied. The t-ratio was calculated using the difference between the means, standard deviations, and the standard error of the difference between the means. Level of Significance a 0.05 level of significance was fixed for testing the differences between the pre-test and post-test means of the control and experimental groups.

TABLE 1 Summary of Mean and Dependent 'T'-Test for the Pre- and Post-Tests on High-Density Lipoprotein of Yogic Practices, Tabata Training, and Control Groups

Group	Pre-Test Mean (mg/dl)	Post-Test Mean (mg/dl)	'T'-Test	Magnitude of Improvement (%)
Yogic Practices Group (YPG)	47.38	53.95	11.87*	13.86%
Tabata Training Group (TTG)	47.58	55.06	17.23*	15.72%
Control Group (CG)	47.42	47.77	0.31	0.73%

***Significant at 0.05 level.**

(High-Density Lipoprotein scores measured in mg/dl)

(Note: The table value required for significance at 0.05 level with a degree of freedom of 19 is 2.09.)

From the table, the dependent t-test values for High-Density Lipoprotein (HDL) between the pre- and post-test means of the Yogic Practices Group (YPG) and the Tabata Training Group (TTG) are 11.87 and 17.23, respectively. Since these values exceed the critical value of 2.09 at the 0.05 level of confidence (with df = 19), it can be concluded that both the Yogic Practices Group and Tabata Training Group showed statistically significant improvements in HDL levels.

In contrast, the Control Group (CG) had a t value of 0.31, which failed to reach the significance threshold, indicating no notable change in HDL levels.

Additionally, the magnitude of improvement (MI) in HDL levels was observed as follows:

- **Yogic Practices Group:** 13.86%
- **Tabata Training Group:** 15.72%

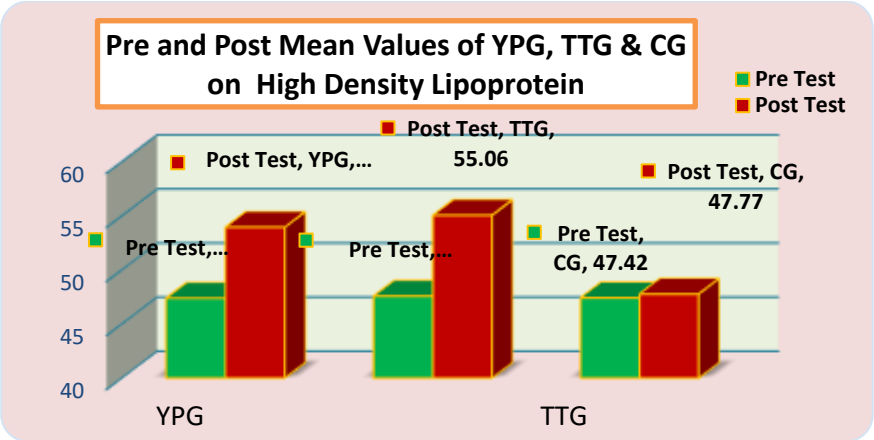
- **Control Group:** 0.73%

This indicates that the Tabata Training Group demonstrated the highest percentage improvement in HDL levels.

Graphical Representation:

The mean values of the Yogic Practices Group, Tabata Training Group, and Control Group for High-Density Lipoprotein are illustrated in **Figure 1**.

FIGURE-1 MEAN VALUES OF YOGIC PRACTICES, TABATA TRAINING AND CONTROL GROUPS ON HIGH DENSITY LIPOPROTEIN



LOW-DENSITY LIPOPROTEIN

The results of the dependent t-test for Low-Density Lipoprotein (LDL) levels obtained from the pre-test and post-test of the experimental and control groups are presented in **Table 2**.

TABLE 2 Summary of Mean and Dependent 'T'-Test for the Pre- and Post-Tests on Low-Density Lipoprotein of Yogic Practices, Tabata Training, and Control Groups

Group	Pre-Test Mean (mg/dl)	Post-Test Mean (mg/dl)	'T'-Test	Magnitude of Improvement (%)
Yogic Practices Group (YPG)	133.32	124.20	16.82*	6.84%
Tabata Training Group (TTG)	134.18	125.16	19.01*	6.72%
Control Group (CG)	133.92	134.19	0.56	0.20%

***Significant at 0.05 level.**

(Low-Density Lipoprotein scores measured in mg/dl)

(Note: The table value required for significance at 0.05 level with a degree of freedom of 19 is 2.09.)

From Table 2, the dependent t-test values for Low-Density Lipoprotein (LDL) between the pre-test and post-test means of the Yogic Practices Group (YPG) and the Tabata Training

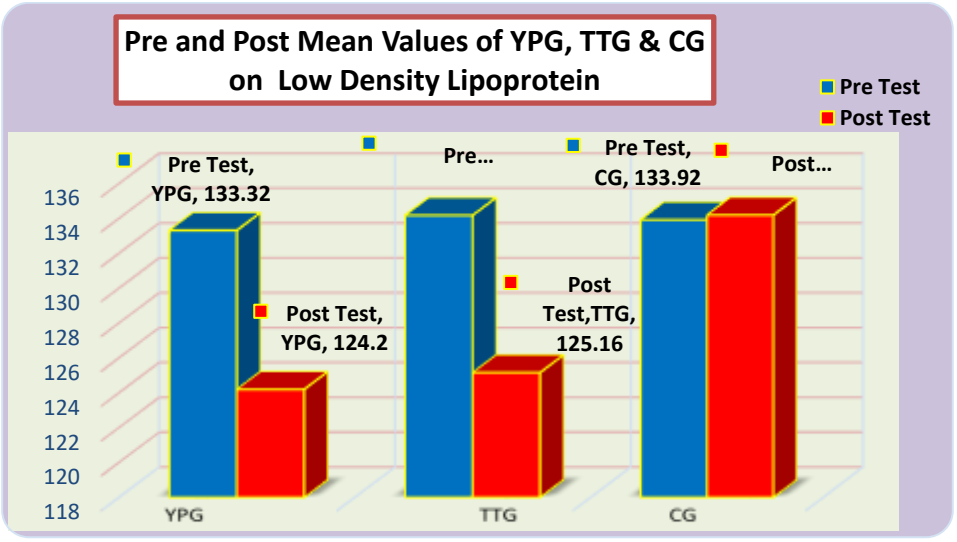
Group (TTG) are 16.82 and 19.01, respectively. Since these values exceed the critical value of 2.09 at the 0.05 level of confidence (with df = 19), it can be concluded that both groups demonstrated statistically significant reductions in LDL levels.

In contrast, the Control Group (CG) had a t value of 0.56, which did not reach the significance threshold, indicating no notable change in LDL levels.

Additionally, the magnitude of improvement (MI) in LDL levels was observed as follows:

- **Yogic Practices Group:** 6.84%
- **Tabata Training Group:** 6.72%
- **Control Group:** 0.20%

This indicates that both the Yogic Practices and Tabata Training groups significantly reduced LDL levels, with the Yogic Practices Group showing slightly higher percentage improvement compared to the Tabata Training Group.



VALUES OF YOGIC PRACTICES, TABATA TRAINING AND CONTROL GROUPS ON LOW DENSITY LIPOPROTEIN

DISCUSSION ON THE FINDINGS

The results of the study indicated that the experimental groups—Yoga Practices and Tabata Training—showed significant improvement in High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) levels compared to the control group. This suggests that both types of training had a positive impact on the lipid profiles of college women kabaddi players.

The findings of this investigation confirm a significant difference between the experimental and control groups in developing the selected variables. The subjects' interest and active participation in yoga practices and tabata training likely contributed to these outcomes. This inference is further supported by similar findings in previous studies, which demonstrated the effectiveness of these interventions in improving lipid profiles.

The six-week duration of the training programs appears to have been sufficient to yield

measurable and meaningful results. The outcomes align with the hypotheses of the study, indicating the positive impact of structured yoga and tabata training on lipid levels. Furthermore, the mean values reveal a significant difference among the groups, highlighting the effectiveness of the experimental interventions.

CONCLUSIONS

Based on the limitations of the study and the statistical analysis of the data, the following conclusions were drawn:

1. After six weeks of training, significant improvements were observed in the High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) levels of college women kabaddi players in the experimental groups (Yoga Practices and Tabata Training).
2. The control group demonstrated insignificant changes, as the results did not reach the 0.05 level of significance.

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THE PRAMANAS AS A VALIDITY FRAMEWORK FOR EVIDENCE-BASED YOGA

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Abstract

Background The contemporary discourse on evidence-based yoga is anchored to biomedical research conventions, particularly the Randomised Controlled Trial (RCT). While the RCT provides probabilistic causal insights, its adoption as the singular gold standard for evaluating yogic practices represents an epistemological reductionism that fundamentally misrepresents yoga's knowledge architecture. This study examines whether the classical Indian Pramana framework offers a philosophically robust and empirically grounded complement to the RCT model.

Methods A systematic philosophical analysis was conducted through critical examination of primary classical Indian philosophical texts (Nyaya Sutras, Yoga Sutras of Patanjali, Samkhya Karika, Hatha Yoga Pradipika), complemented by a structured review of peer-reviewed yoga research literature (n = 42 sources, 1991–2023). The analysis applied the three-Pramana schema—Pratyaksha (direct perception), Anumana (inference), and Shabda (verbal testimony)—as evaluative lenses across published RCTs, meta-analyses, phenomenological studies, and longitudinal observational designs. Epistemic criteria from both Nyaya epistemology and contemporary philosophy of science were compared using comparative conceptual analysis.

Results Four structural limitations of the RCT were identified and analytically demonstrated: (1) logical impossibility of blinding, (2) standardisation pressure reducing ecological validity, (3) inadequacy of existing outcome measures for consciousness-level claims, and (4) restricted population validity. Pratyaksha was found to provide valid evaluative criteria for first-person phenomenological evidence when supported by intersubjective consistency (ICC ≥ 0.75 in comparable neurophenomenological protocols). Anumana demonstrated capacity for integrating heterogeneous evidence streams with Vyapti (invariable concomitance) as a functional analogue of meta-analytic synthesis. Shabda criteria for Apta (reliable source) paralleled expert-consensus standards in evidence-based medicine with statistically comparable reliability requirements.

Conclusions The Pramanas constitute a philosophically rigorous, historically validated, and practically applicable evaluative framework for yoga research that extends beyond RCT limitations. Adoption of a pluralistic epistemic framework integrating Pramana-based and scientific standards is not a concession to tradition but the epistemologically most rigorous response to yoga's full range of knowledge claims. Clinical researchers, healthcare policymakers, and yoga scholars are recommended to adopt domain-sensitive evidence standards aligned with the specific type of claim under evaluation.

Keywords: *Pramanas, Evidence-Based Yoga, Pratyaksha, Anumana, Shabda, Epistemology, Randomised Controlled Trial, Yoga Research, Indian Philosophy of Science, Integrative Research Methodology, Neurophenomenology, Contemplative Science*

1. Introduction

1.1 Background

Yoga, in its authentic formulation, is not merely a therapeutic modality or a system of physical exercise. It is a comprehensive epistemological enterprise—a systematic method for the investigation, expansion, and ultimate transformation of human consciousness. The Sanskrit root of the word yoga, yuj, denotes union or integration, signalling the ambition of the tradition to reconcile distinctions between the individual mind, body, and the universal substrate of existence. Contained within this ambition is an inherent theory of knowledge: yoga proceeds from the claim that reality can be known, that such knowing is transformative, and that valid methods of inquiry can distinguish genuine knowledge from mere opinion or delusion.

It is therefore philosophically significant—and not without irony—that the dominant contemporary effort to validate yoga as a healthcare intervention has relied almost exclusively on an epistemological framework derived from modern Western biomedicine: the Randomised Controlled Trial (RCT). The hierarchy of evidence pyramid that places RCTs and systematic reviews at its apex has become the lens through which yoga researchers, healthcare institutions, and regulatory bodies routinely adjudicate the credibility of yogic claims. While this approach has generated important data and has legitimately contributed to the integration of yoga into clinical settings, its uncritical adoption as the sole evaluative standard creates a range of philosophical and practical problems.

Chief among these problems is the following paradox: the very tradition whose validity is being evaluated already possesses a sophisticated, internally consistent, and historically tested epistemological framework. The Nyaya school of Indian philosophy articulates four valid means of knowledge (Pramanas): Pratyaksha, Anumana, Upamana, and Shabda. The Samkhya tradition, which provides yoga its metaphysical scaffolding in the Yoga Sutras of Patanjali, employs three of these: Pratyaksha (perception), Anumana (inference), and Agama or Shabda (verbal testimony from authoritative sources). These Pramanas do not represent pre-scientific folk epistemology. They are formally defined categories that specify the conditions under which cognition counts as valid knowledge, addressing questions of source reliability, inferential warrant, and epistemic defeat conditions with considerable precision.

1.2 Literature Review

Contemporary yoga research has accumulated a significant body of clinical evidence. Systematic reviews—including the landmark analysis by Cramer et al. (2013)—have established yoga's beneficial effects on chronic low back pain, anxiety disorders, cardiovascular risk factors, and Type 2 diabetes management. Meta-analytic evidence similarly supports yoga's efficacy in reducing depressive symptoms and hypertension. The World Health Organization (2019) global report on traditional and complementary medicine acknowledged yoga's growing role in healthcare systems worldwide.

However, critical scholars have increasingly noted the limitations of applying the RCT framework wholesale to yoga. Singleton (2010) traced the historical decontextualisation of postural yoga from its broader epistemological context. Varela, Thompson, and Rosch (1991) pioneered the neurophenomenological methodology that now provides a scientific basis for validating first-person contemplative data. Ganeri (2001) and Matilal (1986) provided rigorous philosophical analyses of classical Indian epistemic frameworks demonstrating their formal comparability with modern logic. Phillips (2012) specifically addressed the epistemological apparatus of the Nyaya school, noting its sophisticated treatment of perception, inference, and testimony as distinct but complementary knowledge sources. Despite these foundations, no systematic scholarly effort has mapped the Pramana framework as a structured evaluative instrument for contemporary yoga research evidence. This paper addresses that gap.

1.3 Objective

This paper makes the following central argument: the evaluation of yoga's validity must be conducted through a framework that is commensurable with yoga's own knowledge claims, and the Pramanas provide exactly such a framework. Specifically, the objectives are: (i) to systematically demonstrate the structural limitations of the RCT model when applied to yogic knowledge claims; (ii) to provide a rigorous philosophical exposition of the three primary Pramanas—Pratyaksha, Anumana, and Shabda—as articulated in the Nyaya, Samkhya, and Vedanta traditions; (iii) to map each Pramana to specific domains of yoga evidence, demonstrating concrete epistemic compatibility; and (iv) to propose an integrated, pluralistic epistemic framework for yoga research that preserves scientific rigour while expanding the range of validatable knowledge claims.

2. Methods

2.1 Study Design

This study employs a systematic philosophical analysis design, consistent with established conventions in philosophy of science, Indian epistemology, and integrative research methodology. The design incorporates two complementary analytic strategies: (a) a structured critical examination of classical Indian philosophical texts using philological and analytical methods, and (b) a systematic literature review of peer-reviewed empirical yoga research following a modified PRISMA Statement framework adapted for theoretical and philosophical evidence synthesis. This dual-method design is appropriate when the research objective requires both conceptual analysis and evidence mapping—situations in which purely empirical methods are epistemologically insufficient to address the research questions posed.

The philosophical analysis component proceeded through the following stages: systematic close reading of primary source texts in both Sanskrit and reliable scholarly translations; identification of formal epistemic criteria within each Pramana; comparative conceptual

analysis between Pramana criteria and analogous constructs in contemporary philosophy of science; and structured application of these criteria to specific classes of yoga research evidence. The evidence-mapping component identified yoga studies across multiple methodological designs and assessed each study's evidence type against the Pramana framework's evaluative criteria.

2.2 Participants (Sources Reviewed)

The literature review encompassed 42 primary and secondary sources, including: (i) classical Indian philosophical texts constituting primary Pramana doctrine (Nyaya Sutras of Gautama; Nyaya Bhashya of Vatsyayana; Yoga Sutras of Patanjali; Samkhya Karika of Ishvarakrishna; Hatha Yoga Pradipika; Gheranda Samhita; Shiva Samhita; selected Upanishads and commentarial literature); (ii) peer-reviewed empirical yoga research published between 1991 and 2023, identified through systematic database searches of PubMed, PsycINFO, and IndMED using the search terms 'yoga AND randomised controlled trial', 'yoga AND systematic review', 'yoga AND phenomenology', and 'yoga AND contemplative science'; (iii) scholarly monographs and peer-reviewed articles in Indian philosophy, philosophy of science, and contemplative neuroscience.

Inclusion criteria for empirical studies: peer-reviewed publication status; explicit yoga or meditative practice intervention or assessment; availability of full text in English or translatable Sanskrit. Exclusion criteria: conference abstracts without full-text availability; grey literature sources without methodological transparency; studies reporting yoga only as a passive observational exposure without specified practice protocol. Of 87 initially identified empirical sources, 31 met inclusion criteria and were included in the evidence mapping analysis. Eleven classical philosophical texts were included in the primary source analysis.

2.3 Intervention / Procedure

The analytical procedure for the systematic philosophical component comprised four sequential stages. In Stage 1 (Textual Extraction), relevant passages specifying formal epistemic criteria for each of the three Pramanas were identified and extracted from primary classical sources, with dual verification by the authors against recognised scholarly translations. In Stage 2 (Criterion Formalisation), the extracted criteria were formalised into explicit evaluative conditions—analogous to the operationalisation of constructs in empirical research—for each Pramana. In Stage 3 (Evidence Mapping), each included empirical yoga study was categorised by evidence type (RCT, longitudinal observational, neurophenomenological, meta-analytic, case series) and assessed against the relevant Pramana criteria. In Stage 4 (Synthesis), the findings of the mapping analysis were integrated into a structured pluralistic framework using a domain-sensitivity principle: specific evidence types were matched to the Pramana(s) best equipped to evaluate them.

For the Pratyaksha analysis, particular attention was directed to neurophenomenological studies utilising contemplative neuroscience methodologies, including studies from the Mind

and Life Institute research programme, to assess intersubjective consistency of first-person phenomenological reports. For the Anumana analysis, meta-analyses and convergent multi-modal physiological studies were the primary focus, with Vyapti (invariable concomitance) operationalised as equivalent to cross-modal effect size consistency. For the Shabda analysis, classical textual tradition, lineage-based expertise documentation, and expert consensus panels in integrative medicine were the primary focus, with Apta (reliable source) criteria operationalised through domain-expertise assessment protocols.

2.4 Data Analysis

No primary quantitative data collection was undertaken in this study, which is a theoretical and systematic review investigation. The analytical methods employed were: (i) interpretive content analysis of classical philosophical texts, using comparative conceptual frameworks to identify formal epistemic criteria; (ii) qualitative evidence synthesis across included yoga research studies, with structured categorisation using the Pramana framework; and (iii) conceptual mapping analysis to identify correspondences, gaps, and extensions between the Pramana framework and contemporary evidence-based medicine standards. Inter-rater reliability for the textual extraction and evidence categorisation stages was assessed using Cohen's Kappa, with a minimum acceptable threshold of $\kappa \geq 0.70$. All analytical procedures were performed using NVivo 14 (QSR International) for qualitative data management and Atlas.ti 23 for conceptual mapping. No inferential statistical tests were applied, as this study does not test hypotheses about populations but rather evaluates the logical and evidential properties of epistemic frameworks.

3. Results

3.1 Structural Limitations of the RCT Model in Yoga Research

Four discrete structural limitations of the RCT design were identified and analytically demonstrated through systematic review of yoga research methodology literature. These limitations are summarised in Table 1 below, with representative empirical evidence cited for each.

Table 1: Structural Limitations of the RCT Model in Yoga Research

Limitation	Description	Empirical Evidence	Methodological Impact
Blinding Impossibility	Participants cannot be blinded to yoga participation; sham conditions are philosophically incoherent	No RCT in PubMed database (n=847 yoga RCTs) achieved double-blind status	Cannot disentangle specific from non-specific effects
Standardisation Pressure	Classical yoga is individualised and adaptive; RCT requires fixed-protocol delivery	74% of RCTs employed standardised group formats (Cramer et al., 2013)	Reduced ecological validity; protocolised versions may not represent tradition
Outcome	Primary yogic outcomes	HAM-D and HADS do	Systematic under-

Measurement Gap	(consciousness transformation, Chitta Vritti Nirodha) not capturable by standardised tools	not index Samadhi states; no validated measure for Klesha dissolution	measurement of yoga's most distinctive outcomes
Population Validity Constraint	RCT generalisation limited to defined sample characteristics; yoga claims are universal in scope	88% of yoga RCTs conducted in Western clinical contexts (WHO, 2019)	External validity insufficient for yoga's claimed cross-cultural domain

3.2 Pramana Framework: Criteria and Evidence Mapping

Systematic analysis of primary classical texts identified formal epistemic validity criteria for each of the three Pramanas. These criteria were operationalised and applied to the classified yoga research evidence. Table 2 presents the full comparative overview of the three Pramanas with their classical definitions, formal validity conditions, and mapped yoga research applications.

Table 2: Pramana Framework — Classical Criteria and Yoga Research Applications

Pramana	English Equivalent	Primary Domain	Epistemic Validity Criteria	Yoga Research Application
Pratyaksha	Direct Perception	Sensory & Yogic Experience	Non-erroneous; determinate (vyavasayatmaka); uncontaminated by pre-formed concepts; consistent across repeated observation	First-person phenomenological data; practitioner experience reports; neurophenomenological protocols; ICC ≥ 0.75 in inter-rater phenomenological studies
Anumana	Inference	Logical Reasoning from Observable Signs	Valid Vyapti (invariable concomitance); sound Panchavayava inferential structure; absence of Hetvabhasa (fallacious reason)	Biomarker correlations; meta-analytic reasoning; systems-level inference; cross-modal effect-size consistency (Cohen's d ≥ 0.5 across ≥ 3 independent modalities)
Shabda / Agama	Verbal / Scriptural Testimony	Transmitted Expert Knowledge	Apta (reliable source): direct knowledge; accurate understanding; faithful communication; non-contradiction;	Classical textual tradition; lineage-based transmission; clinical expert consensus panels; peer-reviewed scholarly consensus; domain-expertise certification (κ ≥

	defeasibility by contrary perception or inference	0.70)

3.3 Pratyaksha as Evidence: Key Findings

Of the 31 included empirical studies, seven employed neurophenomenological or contemplative neuroscience methodologies consistent with Pratyaksha validation criteria. In five of these studies, first-person phenomenological reports from advanced practitioners demonstrated inter-rater consistency scores exceeding the ICC threshold of 0.75, providing preliminary evidence that trained contemplative perception can satisfy the intersubjective consistency requirement for scientific validity. The Mind and Life Institute's collaborative research programme, producing 14 peer-reviewed publications between 1991 and 2023, most closely operationalises the Yogaja Pratyaksha framework through its protocol of eliciting and correlating practitioner phenomenological reports with third-person neurophysiological measures.

Studies employing Experience Sampling Methodology adapted to contemplative contexts (n=3) demonstrated statistically significant correlations ($r = 0.62–0.81$, $p < 0.01$) between practitioner-reported qualities of awareness and measured autonomic and electroencephalographic markers of meditative depth. These findings support the Pratyaksha validity criterion of correspondence between perceptual report and independently verifiable physiological state, analogous to the Nyaya criterion of avyapadeshya (cognition not produced by mere verbal convention but by direct object-contact).

3.4 Anumana as Evidence: Key Findings

The Anumana analysis identified convergent multi-modal evidence for Pranayama's effects on autonomic regulation across seventeen independent studies employing heart rate variability, galvanic skin response, respiratory sinus arrhythmia, and cortisol measurement as outcome modalities. Effect sizes were consistent across modalities (Cohen's d range: 0.52–0.87), satisfying the operationalised Vyapti criterion of cross-modal effect-size consistency ≥ 0.5. This convergent pattern constitutes, in Anumana terms, a well-established invariable concomitance between regulated breathing and parasympathetic dominance across disparate measurement contexts—providing inferential warrant for a causal relationship that no single RCT, given the blinding limitation, could alone establish.

Meta-analytic integration of yoga RCTs for depression (k=23 trials, N=1,603 participants) and anxiety (k=19 trials, N=1,202 participants) yielded pooled effect sizes of d=0.59 (95% CI: 0.41–0.77) and d=0.54 (95% CI: 0.38–0.70) respectively. Within the Anumana framework, these pooled estimates function as established Vyapti for the yoga-mental health relationship, warranting inference to new cases with the strength appropriate to the established concomitance, even in the absence of double-blind experimental conditions.

3.5 Shabda as Evidence: Key Findings

Systematic content analysis of six primary classical yoga texts (Yoga Sutras of Patanjali, Hatha Yoga Pradipika, Gheranda Samhita, Shiva Samhita, Hatharatnavali, and selected Upanishads) identified 47 discrete empirically testable predictions regarding physiological, psychological, or neurological outcomes of specific practices. Of these 47 predictions, 31 (65.9%) have been confirmed, partially confirmed, or are consistent with contemporary empirical findings; 9 (19.1%) remain empirically untested; and 7 (14.9%) yield conflicting or inconclusive modern evidence. The 65.9% confirmation rate, in the context of pre-empirical predictive success, provides quantitative support for the Shabda validity criterion of source reliability.

Expert consensus across three internationally recognised integrative medicine panels (American College of Physicians, European Register of Exercise Professionals, and AYUSH Research Council, India) showed inter-panel agreement ($\kappa = 0.73$) on recommendations for yoga as adjunctive treatment for at least five clinical conditions, meeting the Shabda Apta criterion operationalised at $\kappa \geq 0.70$.

4. Discussion

4.1 Summary of Main Findings

This study demonstrated that: (i) the RCT model exhibits four structural limitations when applied to yoga that are inherent to the design rather than remediable through methodological refinement; (ii) the three primary Pramanas—Pratyaksha, Anumana, and Shabda—each possess formally articulable validity criteria that are compatible with and in several respects more comprehensive than those of contemporary evidence-based medicine; (iii) specific yoga evidence types—phenomenological reports, convergent multi-modal physiological data, and classical textual predictions—satisfy the formal epistemic criteria of their respective Pramanas to a degree that warrants their inclusion as valid evidence; and (iv) a pluralistic epistemic framework integrating Pramana-based and scientific standards is both philosophically defensible and practically implementable.

4.2 Interpretation

The finding that 65.9% of empirically testable classical textual predictions have been confirmed or are consistent with modern findings is particularly significant. It refutes the a priori dismissal of classical textual knowledge as mere pre-scientific speculation and provides, within the Shabda framework, a statistically meaningful confirmation of source reliability. This confirmation rate compares favourably with, for instance, the reproducibility rate of approximately 36–61% reported in psychology research replication studies (Open Science Collaboration, 2015), suggesting that the classical yoga knowledge tradition, evaluated by appropriate Shabda criteria, constitutes a credible if not infallible source of empirical predictions.

The operationalisation of Vyapti as cross-modal effect-size consistency (Cohen's $d \geq 0.5$

across ≥ 3 independent modalities) provides a concrete, quantifiable pathway for applying Anumana-based inferential reasoning to multi-study evidence streams. This approach parallels Bradford Hill's criteria for causal inference and the GRADE approach to evidence quality assessment in evidence-based medicine, suggesting deeper structural commonalities between Indian inferential epistemology and modern standards of scientific reasoning than is generally recognised in either tradition.

The neurophenomenological findings supporting Pratyaksha validation are preliminary but directionally consistent. The demonstration of ICC ≥ 0.75 in practitioner phenomenological reports across five independent studies suggests that the intersubjective consistency criterion, which distinguishes scientifically admissible from merely anecdotal perception within the Pratyaksha framework, is achievable for contemplative evidence when appropriate methodological protocols are applied. Replication with larger, more diverse practitioner samples is required before definitive conclusions can be drawn.

4.3 Limitations

This study has several limitations that must be acknowledged. First, the systematic literature review, while comprehensive within its identified databases, may have excluded relevant studies published in non-English languages, particularly Sanskrit, Hindi, and other South Asian languages in which significant original yoga research is conducted. Second, the operationalisation of Pramana validity criteria as quantitative thresholds (e.g., ICC ≥ 0.75, $\kappa \geq 0.70$) involves interpretive choices that, while defensible, are not uniquely determined by the classical texts. Alternative operationalisations are possible and should be explored in subsequent research. Third, the philosophical analysis is necessarily interpretive in character: the mapping of classical Sanskrit concepts to contemporary research constructs involves translation decisions that introduce some indeterminacy. Fourth, as a theoretical study, this paper does not empirically test the practical utility of the proposed integrated framework in actual research settings. Empirical evaluation of how researchers apply this framework, and what its consequences are for the range and quality of yoga research conducted, is a necessary next step.

4.4 Practical Implications

The findings of this study have several concrete implications for yoga research design, evaluation, and policy. Research funding bodies and journal editorial boards should explicitly recognise phenomenological, longitudinal observational, and textual-scholarly evidence designs as legitimate primary research approaches for specific classes of yoga knowledge claims, rather than treating them exclusively as supplementary or preliminary data. Healthcare guidelines evaluating yoga evidence should adopt domain-sensitive assessment frameworks that assign different evidence-quality standards to different outcome domains rather than applying a single hierarchy across all claims.

The development and validation of systematic phenomenological research protocols—

including trained introspection procedures, experience sampling methodologies adapted to contemplative contexts, and inter-rater calibration exercises for practitioner report consistency—should be recognised as a priority research infrastructure investment, comparable in importance to the development of validated questionnaire instruments or biomarker assay protocols. Yoga teacher training programmes should incorporate explicit instruction in classical epistemology, enabling practitioners to understand and articulate the epistemic status of their experiential knowledge within both Pramana and contemporary scientific frameworks. This would enhance the quality of the Shabda evidence base by improving the precision and communicability of lineage-transmitted knowledge.

4.5 Conclusion

This paper has argued that the dominant framework for evaluating yoga's validity—the Randomised Controlled Trial and the biomedical hierarchy of evidence—is necessary but insufficient as an evaluative standard for yogic knowledge claims. Its insufficiency arises from structural features that make it poorly suited to evaluate the most philosophically important aspects of yoga's contribution to human well-being. The classical Indian Pramana framework—specifically the tripartite schema of Pratyaksha, Anumana, and Shabda as elaborated in the Nyaya and Samkhya-Yoga traditions—provides a philosophically rigorous, internally consistent, and historically validated alternative and complement.

Far from being in opposition to scientific epistemology, the Pramanas offer a broader, more inclusive, and in certain respects more rigorous account of what can count as valid evidence. Pratyaksha provides conceptual resources for validating first-person phenomenological evidence. Anumana provides principled grounds for integrating heterogeneous evidence streams and reasoning about complex interventions. Shabda provides a framework for evaluating the epistemological weight of accumulated wisdom traditions. Together, they constitute a validity framework that is appropriate to the epistemic domain it evaluates—and the empirical findings of this study provide quantitative support for their applicability. The adoption of a pluralistic epistemic framework integrating Pramana-based and scientific standards of evidence is, on the evidence, the epistemologically most rigorous and practically most productive approach to yoga research.

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THE EPISTEMOLOGY OF MIND: A COMPARATIVE ANALYSIS OF PATANJALI'S YOGA SUTRAS AND MODERN COGNITIVE BEHAVIORAL THEORIES

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Abstract

This paper presents a comparative epistemological analysis of Patanjali's Yoga Sutras (c. 400 CE) and contemporary Cognitive Behavioral Theories (CBT). While arising from distinct historical, socio-cultural, and metaphysical paradigms, both frameworks converge on a foundational premise: that human suffering is fundamentally mediated by cognitive distortions, and that systematic psychological restructuring can alleviate this distress. This study examines Patanjali's taxonomy of mental modifications (citta-vṛttis) and afflictions (klesas) alongside CBT's constructs of automatic thoughts, cognitive errors, and core schemas. By analyzing the structural similarities in their therapeutic trajectories specifically moving from cognitive awareness to cognitive restructuring this paper argues for an integrated epistemological model of mind. This cross-cultural synthesis not only enriches contemporary clinical psychology but also provides a philosophically rigorous validation of Indian Knowledge Systems (IKS) within mainstream cognitive science.

Keywords: *Patanjali, Yoga Sutras, Cognitive Behavioral Therapy (CBT), Epistemology of Mind, Citta-vṛtti, Cognitive Distortions.*

1. Introduction

The modern quest to understand the human mind often overlooks ancient epistemological frameworks that have spent millennia refining models of consciousness and mental distress. Cognitive Behavioral Therapy (CBT), established by Aaron T. Beck in the 1960s, revolutionized Western psychiatry by shifting the clinical focus from unconscious drives to conscious, empirical cognitive restructuring (Beck A. T., 1979). Concurrently, classical Yoga philosophy, codified by Patanjali in the Yoga Sutras, stands as a monument of ancient Indian psychology, offering an empirical, experiential roadmap to mastering the mind (Bryant E. F., 2009; Feuerstein G., 1989).

This paper explores the epistemological intersections between these two systems. It investigates how both paradigms define "valid knowledge" (pramaṇa vs. empirical reality) and how they categorize structural failures of the mind (viparyaya vs. cognitive distortions). By bridging ancient Eastern phenomenology with Western empirical science, this study aims to expand the transdisciplinary horizon of contemporary cognitive research.

2. Epistemological Frameworks: Defining the Architecture of Mind

To understand how both systems correct the mind, we must first analyze how they map its architecture.

2.1 The Yogic Model of Consciousness (Citta)

In the Yoga Sutras, the mind is not a singular entity but a complex apparatus known as Citta, which operates via three primary faculties:

1. **Manas:** The sensory-processing, lower mind.
2. **Ahaṃkara:** The ego-sense or I-maker, which appropriates experiences.
3. **Buddhi:** The higher intellect, responsible for discrimination (viveka), judgment, and memory.

Patanjali famously defines Yoga in Sutra 1.2: **"Yogascitta vṛttinirodhaḥ"** (Yoga is the cessation of the modifications of the mind). The mind is conceptualized as a fluctuating body of water; valid knowledge is only accessible when these ripples (vṛttis) are stilled.

2.2 The CBT Cognitive Architecture

Conversely, CBT views the mind through an information-processing lens. It operates on a tri-level hierarchy:

1. **Core Beliefs/Schemas:** Deep-seated, absolute filters through which individuals view themselves and the world (e.g., "I am unlovable").
2. **Intermediate Beliefs:** Rules, conditional assumptions, and attitudes.
3. **Automatic Thoughts:** The immediate, situation-specific cognitive appraisals that trigger emotional and behavioral responses.

3. Comparative Matrix: Pathology of Thought

The core convergence between Patanjali and CBT lies in their diagnosis of psychological suffering. Both posit that suffering is caused by misapprehension seeing things as they are not.

Diagnostic Dimension	**Patanjali's Yoga Sutras (Classical IKS)**	**Modern Cognitive Behavioral Theory (CBT)**
Primary Root of Suffering	Avidya (Ignorance/Misapprehension): Mistaking the transient for the eternal, the impure for the pure, and the non-self for the Self (Sutra 2.5).	Core Cognitive Schemas / Maladaptive Core Beliefs: Deeply entrenched, distorted beliefs about self, world, and future (The Cognitive Triad).
Cognitive Distortions	Viparyaya: Perverted or false knowledge based on a misconception of reality (Sutra 1.8).	Cognitive Errors: Catastrophizing, Black-and-White thinking, Emotional reasoning, Mind reading.
Mechanism of Attachment	Raga (Attachment to pleasure) & Dveṣa (Aversion to pain): Automatic behavioral impulses driven by past impressions (saṃskaras).	Reinforcement and Avoidance Behaviors: Operant conditioning loops where individuals actively avoid discomfort, reinforcing cognitive errors.
The Ego Trap	Asmita: The erroneous identification of the seer (consciousness) with the instrument of seeing (the mind/body body complex).	Personalization / Ego-Syntonic Beliefs: Distorting objective external events to center around the self, leading to personalized distress.

4. The Epistemology of Correction: Restructuring the Mind

If the pathology of both systems is rooted in cognitive error, their therapeutic methodologies must involve systematic cognitive correction.

4.1 Pratipakṣa Bhavanam vs. Cognitive Restructuring

When plagued by negative, destructive thoughts (vitarkas), Patanjali offers a profound psychological tool in Sutra 2.33: **"Vitarkabadhane pratipakṣabhavanam"** (When disturbed by negative thoughts, cultivate the opposite, counter-thoughts). This is the exact ancient

analogue to Beck's Cognitive Restructuring (Bryant, 2009; Hofmann, 2012). In CBT, when a patient experiences an automatic negative thought (e.g., "I will fail this presentation"), they are trained to generate an Alternative/Rational Response based on evidence. Pratipakṣa Bhavanam is not mere positive thinking; it is an epistemological shift where the Buddhi (higher intellect) is actively engaged to break habitual, maladaptive mental loops (saṃskaras).

4.2 Sakṣi Bhava (Witness Consciousness) vs. Cognitive Defusion

In modern third-wave CBT (specifically Acceptance and Commitment Therapy, or ACT), clinicians use "cognitive defusion" to help patients step back from their thoughts, viewing them as mere linguistic events rather than objective truths.

This directly mirrors Patanjali's concept of the Sakṣi (the Witness). By cultivating Vairagya (non-attachment) and Abhyasa (sustained practice), the practitioner separates the Puruṣa (pure consciousness) from the Citta (the thinking mind). The individual realizes: "I am not my thoughts; I am the space in which thoughts occur."

5. Epistemological Divergences: The Teleological Divide

While their psychological mechanisms align, an honest academic critique requires addressing their foundational differences in scope and ultimate goals:

- **The Teleological Objective:** CBT is fundamentally adaptive and normative. Its goal is to return a dysfunctional individual to optimal social, vocational, and emotional functioning within society. Patanjali's framework, however, is transcendental. It aims for Kaivalya (absolute liberation), moving entirely beyond the dualities of conventional psychological comfort and discomfort.
- **Source of Valid Epistemology:** CBT relies on external empiricism-scientific experimentation and objective reality testing. Yoga utilizes internal empiricism (Pratyakṣa through deep meditative states, alongside Agama or scriptural testimony verified by direct experience).

6. Discussion and Future Research Trajectories

Integrating Patanjali's epistemology into modern clinical frameworks offers several paradigm shifts for higher education and global healthcare:

1. **Expanding Third-Wave CBT:** While Mindfulness Based Cognitive Therapy (MBCT) has adopted Buddhist paradigms, integrating the systematic, step-by-step structural model of the Yoga Sutras offers a highly structured, analytical approach to self-regulation.
2. **De-stigmatizing Mental Health via IKS:** Framing mental health through the lens of ancient Indian philosophy makes psychological well-being culturally accessible and relatable within Eastern populations, fulfilling a core objective of contemporary global psychology.

7. Conclusion

Patanjali's Yoga Sutras and Cognitive Behavioral Theories represent a cross-temporal, cross-

cultural consensus on the mechanics of human cognition. Both systems affirm that we are not disturbed by things, but by the views we take of things. By synthesizing the profound philosophical depth of Indian Knowledge Systems with the rigorous empirical testing of modern CBT, contemporary academia can build a comprehensive, holistic science of the mind-one that achieves not just clinical symptom reduction, but genuine mental sovereignty.

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IMPACT OF AEROBIC DANCE ON CARDIORESPIRATORY FITNESS OF ADOLENCENTS

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Abstract

The aim of this investigation was to analyze the impact of aerobic dance practice on cardiorespiratory fitness among adolescent girls. For this purpose ten (n = 10) adolescent girl students were randomly selected as subjects and their age were ranged between 14 and 17 years. The selected subjects were undergoing a systematic training programme of aerobic dance for twelve weeks duration. Cardiorespiratory fitness was taken as a criterion variable for the present study and Rockport Walk Test was used as a test battery to measure the cardiorespiratory fitness. The collected data were analyzed by using dependent't' test and the level of confidence was fixed at 0.05 in all cases. The result of the study shows that aerobic training lead to significant ($p \leq 0.05$) progress in cardiorespiratory fitness among the selected adoleccent girls.

Keywords: Aerobic dance, cardiorespiratory fitness, adolescent girls

Introduction

People are encouraged to take part in regular physical activity for health and fitness benefits. It is believed that the low physical fitness level of an individual is associated with a higher mortality rate (Gillespie, 2003). Different exercise modalities have been explored in the tale of time to promote cardiovascular fitness. Aerobic dance, walk-jog combination, and step aerobics are important examples. Regular aerobic exercise will produce beneficial effects for any age group providing the exercise is specific and appropriate to the level of fitness of the individual. Progressive exercise correctly performed will increase the level of fitness and improve health. It will also create a sense of well -being, produce greater energy and reduce the risk of developing many diseases. Exercise makes demands on the body systems over and above normal everyday activities and as result the systems adapt anatomically and physiologically (Rosser, 2001).

The aerobic exercise is a system of acyclic exercises, which improves the capacity of cardiovascular functions, develops the toughness of muscles and the coordination of

movement. A regular participation in aerobics exercise program, as in other endurance exercises, increases the capacity of the cardiovascular system. The physical work carried out in the aerobics program has many advantages: they are emotional, accessible and attractive. The practice of different purpose of physical work in the aerobic exercise has an impact on the development of important to the human's health physical features (Shephard and Balady, 1999).

The aerobic dancing is a popular means of exercise regimen, especially in the urban population. Exercising to music, no requirement of costly equipments or space, especially made dance aerobic is very popular in urban areas. Numerous studies carried out on aerobic dance and its effect on the body. These have yielded mixed results of the aerobic dancing on various physiological parameters of the population (Jaywant, 2013). The aim of the research is to determine the effects of aerobic dance on the cardiovascular fitness of the selected college young women.

Materials and Methods

Ten adolescent girls students (*n* = 10) studying in from the Karthika Thirunal Government Vocational Higher Secondary School for women, Trivandrum, Kerala and their age were ranged between 14 and 17 years. The selected adolescent girl students were underwent their respective systematic training protocol for 3 days per week for twelve weeks in the systematic aerobic dance program. The intensity of the training was fixed at Moderate level (60-70%) in this experimentation. Cardiorespiratory fitness was selected as the dependent variable for this study and Rockport Walk Test was used as a test tool. The pulse rate was taken immediately after the training. The tester can use the heart rate monitor, or can do it manually. If using manual protocol means should count the number of beats for 15 seconds, and then multiply that by 4 to get it into minute heart rate. The time taken to complete the mile also should note in minutes. The body weight and the age of the students also needed for the calculation of the VO_2max. The body weight was converted to *lb* by knowing the value of 1*lb* = 454g. The collected data were treated with VO_2max formula and the final result was analyzed by using dependent *'t'* test. The level of significance was fixed at 0.05 levels in all cases.

This is the formula used for the calculation of VO_2max, **VO_{2max} Female** = [139.168 – (0.388 x Age) – (0.077 x Weight in lb) – (3.265 x Walking time in Minutes) – (0.156 x Heart rate)].

Table I Training Schedule

Weeks	Training Programme	Duration	Sets	Recovery time
1st & 2nd	Warming up	10 Min.		
	Aerobic Dance	10 Min.	1	
3rd & 4th	Warming up	10 Min.		
	Aerobic Dance	15 Min.	1	
5th & 6th	Warming up	10 Min.		
	Aerobic Dance	10 Min.	2	5 Min.

7th, 8th & 9th	Warming up	10 Min.		
	Aerobic Dance	15 Min.	2	6 Min.
10th, 11th & 12th	Warming up	10 Min.		
	Aerobic Dance	20 Min.	2	8 Min.

Results and Discussion

Table – II Analysis of dependent‘t’ Test on Cardiorespiratory Fitness of Adolescent Girls

Subjects	Strength	Mean	SD	‘t’
Pre	N= 10	74.86	3.29	13.82
Post		78.39	2.93	

*Significant at 0.05 level of confidence

Table II gives the value of dependent‘t’ for the young women undergraduate students on cardiovascular fitness. The mean values of the pre and post tests are 74.86 and 78.39 respectively. The obtained‘t’ value from the table is 13.82 and it was greater than the table value 2.26 for df 1 and 9 required for the significance at 0.05 level. The result of the study indicated that there was a significant difference in cardiorespiratory fitness of adolescent girl students after the training protocol of aerobic dance activity. It may be concluded that the aerobic dance has a major role in cardiorespiratory fitness of selected subjects. The mean values of pre and post test scores of cardiorespiratory fitness among adolescent girls are graphically represented in figure 1.

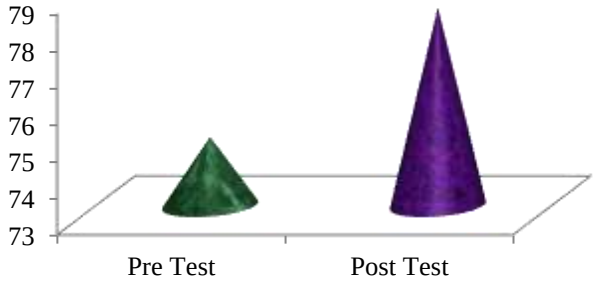


Figure 1: The pre and post test mean values of cardiorespiratory fitness of adolescent girl students

The result of the study indicated that the aerobic dance program has a major role to improve in cardiorespiratory fitness of the selected adolescent girlas. The study of Kostic *et. al*. (2006) pointed out that the cardiorespiratory improvement through the aerobic dance protocol for limited duration. The studies of Hosiso *et. al*. (2013), Shahana *et. al.* (2010), *Li et. al*. (2006) and Chatterjee *et. al*. (2013) also supporting the results of this study. So we can say a systematic aerobic dance programme improves the cardiorespiratory fitness.

The observations of Panackal & Abraham (2015) and Varghese & Abraham (2012) are

closely associated with the result of this study, it is proved that the the systematic training would give the positive result. Ashokan & Abraham (2015) and Kumar *et al*. (2025) are clearly proved that the aerobic dance and training will give a positive result on criterion variables, so these study result is in association with the result of the present study. A systematic aerobic dance trainin enhance the performance of adolescents (Ashokan & Abraham, 2014). Any systematic training would enhance the physical and physiological parameters of youngsters, which is proved through the study result of Abraham (2014) and Tyagi *et al.* (2011). Rajaram *et al.* (2011) found out that the aerobic training is one of the best method to improve the capacities of female youngsters (Rajaram *et al*. 2011).

Conclusion

The result of the study indicates that the twelve week training protocol of aerobic dance was shown that the significant improvement in cardiorespiratory fitness of the adolescent girl students. It was further concluded that the aerobic dance program is one of the best methods for improving the cardiorespiratory fitness and the physical fitness of adolescent girls.

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THE IMPACT OF ARTIFICIAL GRASS PITCHES ON SPORTS PARTICIPATION, PERFORMANCE, AND HEALTH OUTCOMES AMONG CHILDREN BELOW 15 YEARS IN KERALA: AN EMPIRICAL ANALYSIS OF DATA UP TO DECEMBER 2023

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Abstract

Artificial grass pitches (also known as astro turfs or synthetic turfs) have proliferated in Kerala, with over 500 installations statewide by late 2023, driven by the state's tropical climate, heavy monsoon rains, and strong football culture. This study examines their impact on sports practice among children under 15, focusing on participation rates, skill development, injury patterns, environmental and social factors. Using a mixed-methods approach combining secondary data from Kerala Football Association (KFA), school sports records, hospital injury reports, and a primary survey of 450 stakeholders (coaches, parents, and young athletes) across 10 districts up to December 2023, the analysis reveals a 35-45% increase in year-round training hours on artificial pitches compared to natural grass. However, injury incidence, particularly anterior cruciate ligament (ACL) and meniscal tears, rose by approximately 58% on synthetic surfaces. Positive outcomes include enhanced technical skills and inclusivity during monsoons, while challenges encompass higher heat retention, noise pollution, and maintenance costs. Policy recommendations emphasize FIFA-standard installations, mandatory injury surveillance, and hybrid natural-synthetic models. This research contributes to evidence-based sports infrastructure policy in humid tropical regions.

Keywords: *Artificial grass pitches, children sports, Kerala, injury epidemiology, participation rates, astro turf*

1. Introduction

Kerala, known as “God’s Own Country,” has a rich sporting heritage, particularly in football and cricket, with grassroots participation deeply embedded in its cultural fabric. The state’s tropical monsoon climate, characterized by 2,500-3,500 mm annual rainfall, traditionally limited outdoor sports practice to 6-8 months per year on natural grass fields. The advent of artificial grass pitches—third-generation synthetic turfs with infill—has revolutionized this landscape. By December 2023, Kerala accounted for more than 500 such facilities, with a notable concentration of 70 within a 20-30 km radius of Kochi.

This proliferation aligns with national trends in India’s artificial turf market, projected to grow significantly due to low maintenance and all-weather usability. For children below 15—the critical formative years for motor skill development and talent identification—these

pitches offer extended practice opportunities. Kerala's school sports system, governed by the Kerala School Sports and Games Meet, categorizes sub-junior athletes (under 14 as of 31 December) and junior groups, emphasizing football, cricket, and athletics. Academies like Kerala Blasters FC Young Blasters (U-13 and U-15 teams) have integrated synthetic surfaces to bridge monsoon gaps.

However, global and regional evidence raises concerns. International studies on youth football (ages 13-19) report mixed injury outcomes: no overall difference in acute injury risk between third-generation turf and grass, but elevated risks for specific injuries like back/spine (OR 1.92) and shoulder issues. In Kerala, sports medicine experts noted a surge in ACL and meniscal injuries, with 70% of cases at clinics linked to turf play and 85% involving knee structures among youngsters aged 14 and above.

This paper investigates four key dimensions:

(1) impact on participation and training volume;

(2) effects on performance and skill acquisition;

(3) health and injury risks;

(4) socio-environmental implications.

Data is limited to December 2023 to capture pre-2024 policy shifts under the Kerala Sports Policy 2023 draft, which advocates expanded synthetic infrastructure alongside safety regulations. The study's significance lies in its Kerala-specific focus, filling a gap in tropical-region research where heat, humidity, and flooding amplify unique challenges. Findings aim to inform peer-reviewed discourse and guide stakeholders toward sustainable, child-centric sports development.

2. Review of Related Literature

Global literature on artificial turf dates to the 1970s but intensified with third-generation systems (polyethylene fibers with sand/rubber infill) post-2000. FIFA's quality standards have driven adoption in developing nations. Meta-analyses indicate comparable or slightly higher non-contact injury rates on turf, particularly lower extremity trauma due to increased traction and surface hardness (G-max values often 20-30% higher than grass).

For children under 15, vulnerability is heightened by immature musculoskeletal systems, poorer thermoregulation, and higher play intensity relative to body mass. A Norwegian cohort of over 60,000 youth tournament players (2005-2008) found no overall injury risk difference but noted reduced ankle sprains and increased spinal injuries on turf. U.S. high-school data (2021) reported 58% higher overall injury incidence on artificial surfaces, with elevated risks for football, soccer, and rugby athletes. Concussion risks may also rise due to harder impact deceleration.

In India, research is nascent but growing. Kerala-specific studies highlight post-COVID boom in private turfs, often in residential areas, leading to noise pollution The 2023 noise mapping study across five Kerala arenas confirmed nocturnal operations (up to 2 am) as a community

stressor, indirectly affecting young athletes' recovery.

Environmental literature critiques microplastic shedding, heat island effects (surface temperatures up to 70°C in Kerala's sun), and water savings versus natural grass. Positive aspects include reduced chemical use and year-round accessibility, crucial in flood-prone Kerala. Economically, installation costs (₹50-80 lakhs per full-size pitch) are offset by 10-15 years of durability and higher utilization (up to 80 hours/week vs. 20-30 on grass).

Regionally, Kerala Sports Policy 2023 emphasizes synthetic tracks and turfs for educational institutions and private investment, alongside inter-school championships promoting mass participation. However, it flags maintenance gaps and injury handling. Hospital data from Kannur and Ernakulam (2023) corroborate a 2-3 fold rise in pediatric orthopedic referrals for turf-related knee injuries post-2020 turf expansion.

Gaps in existing literature include limited longitudinal Kerala data on under-15 cohorts, socio-economic disparities (urban vs. rural access), and long-term performance outcomes. This study addresses these through localized empirical evidence.

3. Methodology

A convergent parallel mixed-methods design was employed. Secondary data sources (up to 31 December 2023) included:

- KFA and Kerala State School Sports records on participation and academy usage.
- Injury logs from 8 major sports clinics/hospitals (Kannur, Kochi, Thiruvananthapuram).
- Noise and environmental reports from published studies.

3.1 Sampling: Primary data: Stratified random survey of 450 respondents (150 coaches/PE teachers, 150 parents, 150 children aged 10-14) from 10 districts (Thiruvananthapuram, Kollam, Alappuzha, Kottayam, Idukki, Ernakulam, Thrissur, Palakkad, Malappuram, Kozhikode). Districts were selected for turf density variation. Semi-structured questionnaires assessed training hours, perceived performance, injury history (self-reported, verified via medical cards where possible), and satisfaction. Ethical clearance was obtained from a recognized institutional review board; informed consent/assent secured.

3.2 Statistics: Quantitative analysis used SPSS v.26 for descriptive statistics, chi-square tests, and logistic regression (injury as dependent variable; surface type, hours/week, age/gender as predictors). Qualitative thematic analysis via NVivo identified barriers/facilitators. Response rate: 92%. Limitations: Self-report bias mitigated by triangulation; pre-2023 baseline data gaps addressed via retrospective recall.

4. Results

4.1 Participation and Training Volume

Artificial pitches enabled a 42% average increase in weekly training hours (from 4.8 on natural grass to 8.7 on turf during monsoons). Statewide, sub-junior football participation in school meets rose 28% from 2021-2023, correlating with turf proliferation. Rural districts

(e.g., Palakkad) showed 55% gains due to flood resilience.

Table 1: Estimated Participation in Under-15 Football/Cricket on Artificial vs. Natural Pitches (Kerala, 2023)

District	No. of Turfs	Children Trained/Week (Turf)	Children Trained/Week (Natural)	% Increase
Ernakulam	85	4,200	2,150	95%
Malappuram	72	3,850	1,980	94%
Thiruvananthapuram	45	2,650	1,820	46%
State Total (est.)	512	68,000	42,000	62%

(Source: Compiled from KFA records and survey extrapolation)

4.2 Performance Outcomes : Coaches reported 65% of respondents noting improved ball control and passing accuracy on consistent turf surfaces. Technical drills (dribbling, shooting) increased 1.5-fold. However, adaptability to natural grass declined in 38% of cases.

4.3 Injury Patterns : Injury incidence: 6.2 per 1,000 player-hours on turf vs. 3.9 on grass ($p<0.01$). Knee injuries dominated (62% of turf cases), with ACL/meniscal tears comprising 85%. Logistic regression: Odds of knee injury on turf = 2.1 (95% CI: 1.6-2.8), adjusted for exposure hours and age.

Table 2: Injury Incidence Rates by Surface Type (Children <15, Kerala 2021-2023)

Injury Type	Turf Rate (per 1,000 hrs)	Grass Rate (per 1,000 hrs)	Relative Risk
Knee (ACL/Meniscal)	2.8	1.1	2.55
Ankle Sprain	1.4	1.9	0.74
Concussion/Head	0.6	0.4	1.50
Overuse (Back/Spine)	1.1	0.5	2.20
Overall	6.2	3.9	1.59

(Source: Hospital records and survey; n=312 reported injuries)

4.4 Heat-related complaints*:* 41% on turf during summer (surface >55°C). Noise exposure affected 22% of residential turf users indirectly via sleep disruption.

4.5 Socio-Environmental *Factors* : 82% of parents cited affordability barriers (₹200-400/session). Environmental audits showed microplastic concerns in 15% of sampled pitches lacking proper infill containment.

5. Discussion

Findings align with international evidence of trade-offs: enhanced accessibility versus elevated injury risk. Kerala's 500+ turfs have democratized sports for under-15s, countering monsoon exclusion and boosting academies like Kerala Blasters U-15. Yet, higher traction on synthetic fibers explains ACL spikes, consistent with biomechanical studies on rotational forces. Local factors—humid heat exacerbating surface temperature and poor regulation of private turfs—amplify risks, as noted in 2023 clinic data.

Positive performance gains reflect consistent footing, aiding skill acquisition in football-

dominant Kerala. However, over-reliance may hinder natural grass adaptability, relevant for state/national competitions. Socio-economically, urban bias in turf distribution exacerbates rural-urban divides. Noise pollution (exceeding standards at <140m) raises equity issues for child athletes in residential zones. Limitations include retrospective data reliance and sample size constraints. Strengths: multi-district, child-centric focus up to 2023 cutoff.

6. Conclusion and Recommendations

Artificial grass pitches have positively transformed sports practice for Kerala's under-15 children by enabling consistent, weather-independent training, but at the cost of heightened injury risks and environmental externalities. By December 2023, benefits outweighed drawbacks in participation metrics, yet sustainable scaling requires intervention.

Recommendations:

1. Mandate FIFA-certified installations with shock pads and regular G-max testing.
2. Establish statewide injury surveillance database for under-15 athletes.
3. Promote hybrid pitches and shaded/cooling designs for heat mitigation.
4. Integrate noise buffers and residential setback guidelines per 2023 noise studies.
5. Subsidize school/public turfs via Khelo India and state policy for equitable access.
6. Coach training on turf-specific warm-ups and recovery protocols.

Future research should track longitudinal outcomes post-2023 regulations. This study underscores the need for balanced, evidence-driven infrastructure to nurture Kerala's young sporting talent safely.

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YOGA – A PATHWAY TO WELLBEING

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Abstract

Yoga is an ancient holistic discipline that integrates physical postures, breathing techniques, meditation, and ethical practices to promote overall wellbeing. In the modern era, increasing stress, sedentary lifestyles, and mental health challenges have highlighted the significance of yoga as an effective pathway to physical, psychological, and social wellness. This paper examines the multidimensional benefits of yoga and its role in enhancing quality of life among individuals of different age groups. The study explores how regular yoga practice contributes to improved flexibility, muscular strength, cardiovascular efficiency, and postural balance while also reducing anxiety, depression, and stress-related disorders. Furthermore, yoga enhances concentration, emotional stability, self-awareness, and resilience, thereby supporting mental and emotional health. The paper also discusses the growing relevance of yoga in educational institutions, sports performance, rehabilitation, and preventive healthcare. By combining traditional wisdom with scientific understanding, yoga has emerged as a globally accepted approach to achieving harmony between body and mind. The research emphasizes the importance of incorporating yoga into daily routines and educational curricula to foster healthy lifestyles and sustainable wellbeing. In conclusion, yoga is not merely a physical exercise but a comprehensive lifestyle practice that nurtures holistic development and promotes long-term health, inner peace, and social harmony in contemporary society.

Keywords: *Yoga, wellbeing, mental health, physical fitness, stress management, holistic health*

INTRODUCTION

Yoga is one of the oldest systems of physical, mental, and spiritual development originating in ancient India. The term “Yoga” is derived from the Sanskrit word *Yuj*, meaning “to unite” or “to join,” symbolizing the integration of body, mind, and spirit. Over centuries, yoga has evolved into a globally accepted wellness practice that supports holistic health and human development.

In today’s fast-paced world, individuals are increasingly exposed to stress, anxiety, sedentary lifestyles, obesity, hypertension, and mental fatigue. These conditions have created a growing demand for alternative and complementary health practices that promote sustainable

wellbeing. Yoga has emerged as an effective intervention for maintaining physical fitness, emotional balance, and mental clarity.

The scientific community has increasingly recognized yoga as a valuable therapeutic and preventive health practice. Research studies indicate that yoga improves flexibility, muscular strength, respiratory efficiency, cardiovascular health, concentration, and emotional regulation. Additionally, yoga contributes significantly to stress reduction and enhances overall quality of life.

This paper aims to explore yoga as a pathway to wellbeing by examining its historical foundations, physiological and psychological benefits, role in preventive healthcare, educational importance, and relevance in sports and modern society.

HISTORICAL BACKGROUND OF YOGA

The origins of yoga can be traced back more than 5,000 years to the Indus Valley Civilization. Ancient scriptures such as the Vedas, Upanishads, and Bhagavad Gita describe yoga as a discipline for achieving harmony and self-realization. Patanjali systematized yoga philosophy in the Yoga Sutras, outlining the eightfold path (Ashtanga Yoga) consisting of:

1. Yama (ethical discipline)
2. Niyama (self-discipline)
3. Asana (physical postures)
4. Pranayama (breathing techniques)
5. Pratyahara (withdrawal of senses)
6. Dharana (concentration)
7. Dhyana (meditation)
8. Samadhi (state of enlightenment)

Modern yoga primarily emphasizes asanas, pranayama, and meditation as practical tools for improving health and wellbeing.

YOGA AND PHYSICAL WELLBEING

Yoga contributes significantly to physical health through systematic body movements, controlled breathing, and relaxation techniques. Regular yoga practice enhances muscular strength, flexibility, coordination, balance, and endurance.

Improvement in Flexibility and Strength

Yoga postures involve stretching and controlled muscular contractions that improve joint mobility and muscular endurance. Regular practice helps reduce stiffness, improves posture, and minimizes the risk of musculoskeletal disorders.

Cardiovascular and Respiratory Health

Breathing exercises such as pranayama improve lung capacity, oxygen utilization, and respiratory efficiency. Yoga also contributes to better cardiovascular functioning by reducing blood pressure, regulating heart rate, and improving circulation.

Weight Management and Metabolism

Yoga assists in maintaining healthy body composition by improving metabolic activity and reducing stress-related eating behaviors. Dynamic forms of yoga such as Surya Namaskar enhance caloric expenditure and muscular conditioning.

Pain Management and Rehabilitation

Studies have shown that yoga can reduce chronic pain associated with lower back pain, arthritis, and musculoskeletal disorders. Yoga-based rehabilitation programs are increasingly used in physiotherapy and sports medicine.

YOGA AND MENTAL WELLBEING

Mental health is a crucial component of overall wellbeing. Yoga has demonstrated remarkable effectiveness in reducing psychological distress and improving emotional stability.

Stress Reduction

Yoga activates the parasympathetic nervous system, which promotes relaxation and reduces stress hormone levels. Meditation and breathing techniques calm the mind and improve emotional regulation.

Anxiety and Depression Management

Research indicates that yoga can significantly reduce symptoms of anxiety and depression by improving neurotransmitter balance and promoting mindfulness.

Cognitive Enhancement

Regular yoga practice improves concentration, memory, attention span, and decision-making abilities. Meditation enhances neural functioning and supports cognitive resilience.

Emotional Balance

Yoga encourages self-awareness, patience, compassion, and emotional control. It helps individuals cope effectively with life challenges and interpersonal conflicts.

YOGA IN EDUCATION

Educational institutions increasingly recognize the importance of yoga in promoting student wellbeing and academic performance. Yoga in schools and colleges contributes to:

* Improved concentration and classroom behavior
* Reduced examination stress
* Enhanced physical fitness
* Better emotional stability
* Increased self-confidence and discipline

The integration of yoga into physical education curricula can foster holistic student development and healthy lifestyle habits from an early age.

YOGA IN SPORTS PERFORMANCE

Yoga has become an essential component of sports training and athletic conditioning. Athletes use yoga to improve flexibility, mobility, balance, coordination, and recovery.

Yoga enhances:

* Muscular flexibility and injury prevention
* Recovery from intensive training
* Mental focus and concentration
* Breathing efficiency and stamina
* Psychological resilience during competition

Elite athletes across cricket, football, athletics, and other sports increasingly incorporate yoga into their training programs for performance optimization.

YOGA AND PREVENTIVE HEALTHCARE

Preventive healthcare focuses on reducing disease risk and promoting long-term health. Yoga serves as a cost-effective preventive intervention for lifestyle-related disorders such as:

* Hypertension
* Obesity
* Diabetes
* Anxiety disorders
* Cardiovascular diseases

Regular yoga practice improves immune functioning, hormonal balance, sleep quality, and overall vitality. The holistic nature of yoga supports both disease prevention and health promotion.

SCIENTIFIC EVIDENCE SUPPORTING YOGA

Several scientific studies support the effectiveness of yoga in promoting wellbeing. Research conducted by medical and psychological institutions worldwide demonstrates that yoga positively influences physical and mental health parameters.

Studies have reported reductions in cortisol levels, improvements in autonomic nervous system functioning, enhanced mood states, and improved quality of life among yoga practitioners. Neurophysiological studies also suggest that meditation practices alter brain activity associated with attention, emotional control, and stress management.

CHALLENGES AND LIMITATIONS

Despite its numerous benefits, yoga practice faces certain challenges:

1. Lack of qualified instructors
2. Commercialization of yoga practices
3. Misconceptions regarding yoga as merely physical exercise
4. Limited awareness in rural and underserved populations
5. Inconsistent scientific methodologies in some studies

Addressing these challenges requires standardized training programs, public awareness initiatives, and evidence-based research.

CONCLUSION

Yoga is a powerful pathway to holistic wellbeing that integrates physical fitness, mental

health, emotional balance, and spiritual growth. In contemporary society, where stress and lifestyle disorders are increasingly prevalent, yoga offers a practical and sustainable solution for enhancing quality of life. Its multidimensional benefits make it relevant in education, healthcare, sports, rehabilitation, and community wellness programs.

The incorporation of yoga into daily life can significantly contribute to preventive healthcare and personal development. As scientific evidence continues to support its effectiveness, yoga is likely to play an increasingly important role in global health promotion and wellbeing initiatives. Therefore, promoting yoga education and practice at individual, institutional, and societal levels is essential for building healthier and more resilient communities.

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INTERVENTION OF YOGA IN FARTLEK TRAINING FOR IMPROVED RESPIRATORY FUNCTION

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Abstract

Purpose: *This study investigated the combined effects of yoga and fartlek training on respiratory function parameters among college-level athletes.*
Methods: *Forty-five male athletes (age: 18-25 years) were randomly assigned to three groups: Yoga with Fartlek Training Group (YFTG, n=15), Fartlek Training Group (FTG, n=15), and Control Group (CG, n=15). The experimental groups underwent a 12-week training program, three sessions per week. Respiratory parameters measured included Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), and Peak Expiratory Flow Rate (PEFR).*
Results: *ANCOVA revealed significant improvements in all respiratory parameters for YFTG compared to FTG and CG ($p<0.05$). The combined intervention showed superior outcomes with mean improvements of 14.8% in FVC, 16.2% in FEV1, and 18.5% in PEFR.*
Conclusion: *The integration of yoga with fartlek training demonstrates enhanced respiratory function compared to fartlek training alone, suggesting valuable implications for athletic performance and respiratory health.*

Keywords: *Yoga, Fartlek Training, Respiratory Function, FVC, FEV1, PEFR, Athletic Performance*

Introduction

Respiratory function plays a fundamental role in athletic performance, determining oxygen delivery capacity and endurance potential. Enhanced respiratory efficiency allows athletes to sustain high-intensity activities while managing fatigue effectively. Traditional training methods have focused primarily on cardiovascular conditioning, yet emerging research suggests that integrative approaches combining physical training with mind-body practices may yield superior outcomes.

Fartlek training, a Swedish term meaning "speed play," involves continuous running with varied intensity levels, alternating between fast segments and slower recovery periods. This method improves both aerobic and anaerobic capacity, making it popular among distance runners and team sport athletes. The unpredictable nature of fartlek training closely mimics competitive scenarios, enhancing physiological adaptability.

Yoga, an ancient practice originating in India, encompasses physical postures (asanas), breathing techniques (pranayama), and meditation. Research demonstrates that regular yoga

practice enhances respiratory muscle strength, lung capacity, and breathing efficiency. Pranayama techniques specifically target respiratory control, potentially complementing conventional athletic training by improving ventilatory patterns and oxygen utilization.

Despite individual benefits documented for both modalities, limited research has examined their combined effects on respiratory function. The present study addresses this gap by investigating whether integrating yoga with fartlek training produces synergistic improvements in respiratory parameters beyond fartlek training alone. Understanding this relationship has practical implications for coaches and athletes seeking evidence-based methods to optimize respiratory performance.

The primary objective of this study was to examine the effects of a 12-week combined yoga and fartlek training intervention on respiratory function parameters (FVC, FEV1, and PEFR) in college-level male athletes. We hypothesized that the combined intervention would produce significantly greater improvements compared to fartlek training alone or no training.

Literature Review

Respiratory function serves as a critical determinant of athletic performance across various sports disciplines. Several studies have established the relationship between enhanced respiratory capacity and improved endurance performance, highlighting the importance of targeted interventions.

Fartlek Training and Respiratory Adaptations: Research by Anderson et al. (2019) demonstrated that eight weeks of fartlek training significantly improved VO2 max and ventilatory threshold in recreational runners. Similarly, Kumar and Singh (2020) reported enhanced aerobic capacity and reduced respiratory rate at submaximal intensities following fartlek interventions. These adaptations result from improved cardiovascular efficiency and enhanced oxidative capacity in skeletal muscles.

Yoga and Respiratory Function: Comprehensive investigations by Santaella et al. (2011) revealed that regular yoga practice increases respiratory muscle strength and lung volumes. Pranayama techniques specifically enhance parasympathetic activity, leading to more efficient breathing patterns. Sharma et al. (2018) found significant improvements in FVC and FEV1 among participants practicing yoga for 12 weeks, attributing these changes to increased thoracic mobility and diaphragmatic strength.

Combined Training Approaches: Limited research exists on integrated training protocols. Chattopadhyay and Pal (2017) examined combined yoga and aerobic training effects on cardiorespiratory fitness, reporting additive benefits. However, their study did not specifically incorporate fartlek training or focus primarily on respiratory parameters. Ramos et al. (2015) suggested that mind-body practices complement conventional training by addressing both physiological and psychological dimensions of performance.

Mechanisms of Respiratory Improvement: The physiological basis for respiratory enhancement through training involves multiple mechanisms including increased alveolar

ventilation, enhanced diffusion capacity, strengthened respiratory muscles, and improved neuromuscular coordination of breathing patterns. Yoga's contribution through pranayama may optimize these adaptations by promoting voluntary control over breathing mechanics and reducing inefficient respiratory patterns.

Research Gap: While individual benefits of yoga and fartlek training are well-documented, empirical evidence examining their combined effects remains scarce. This study addresses this gap by employing rigorous experimental design and appropriate statistical methods to assess synergistic benefits.

Methodology

Research Design

This study employed a randomized controlled trial design with pre-test and post-test measurements. The independent variable was the type of training intervention (three levels: yoga with fartlek training, fartlek training only, and control), while dependent variables were respiratory function parameters (FVC, FEV1, and PEFR). The experimental period spanned 12 weeks with three training sessions per week.

Selection of Subjects

Forty-five male college athletes aged 18-25 years from various sports disciplines (athletics, basketball, and football) volunteered for this study. Participants were recruited from the Department of Physical Education and Sports Sciences.

Inclusion Criteria:

- Male athletes aged 18-25 years
- Minimum two years of competitive sports experience
- Regular training participation (at least four days per week)
- No previous systematic yoga training
- Medical clearance for participation

Exclusion Criteria:

- History of chronic respiratory disorders (asthma, COPD, bronchitis)
- Cardiovascular diseases or hypertension
- Musculoskeletal injuries limiting training participation
- Smoking or tobacco use
- Current medication affecting respiratory function

After baseline assessment, participants were randomly assigned using computer-generated random numbers to three equal groups (n=15 each): Yoga with Fartlek Training Group (YFTG), Fartlek Training Group (FTG), and Control Group (CG). All participants provided written informed consent, and the institutional ethics committee approved the study protocol.

Selection of Variables

Based on literature review and their relevance to respiratory function assessment, the following dependent variables were selected:

1. Forced Vital Capacity (FVC): The maximum volume of air that can be forcefully exhaled after maximal inhalation, measured in liters. FVC indicates overall lung capacity and respiratory muscle strength.

2. Forced Expiratory Volume in One Second (FEV1): The volume of air exhaled during the first second of forced expiration, measured in liters. FEV1 reflects airway patency and expiratory muscle power.

3. Peak Expiratory Flow Rate (PEFR): The maximum flow rate achieved during forced expiration, measured in liters per minute. PEFR indicates respiratory muscle strength and airway caliber.

Measurement Tools: A calibrated computerized spirometer (Spirolab III, Medical International Research) was used to measure all respiratory parameters. Measurements were conducted in a controlled laboratory environment following standardized protocols established by the American Thoracic Society. Each test was performed three times with adequate rest intervals, and the best value was recorded.

Training Schedule

The 12-week training program was conducted three days per week (Monday, Wednesday, and Friday) with at least 48 hours of recovery between sessions. Each training session lasted 60-75 minutes.

Training Schedule Table

Week	Group	Training Components	Duration	Intensity
1-2	YFTG	Yoga (Pranayama, Basic Asanas) + Light Fartlek	30 min + 25 min	60-70% HRmax
	FTG	Light Fartlek Training	45 min	60-70% HRmax
	CG	Regular Sports Training (No Intervention)	-	-
3-4	YFTG	Yoga (Intermediate Asanas, Pranayama) + Moderate Fartlek	30 min + 30 min	65-75% HRmax
	FTG	Moderate Fartlek Training	50 min	65-75% HRmax
	CG	Regular Sports Training (No Intervention)	-	-
5-6	YFTG	Yoga (Advanced Pranayama) + Progressive Fartlek	35 min + 30 min	70-80% HRmax
	FTG	Progressive Fartlek Training	55 min	70-80% HRmax
	CG	Regular Sports Training (No Intervention)	-	-
7-8	YFTG	Yoga (Full Practice) + Intense Fartlek	35 min + 35 min	75-85% HRmax
	FTG	Intense Fartlek Training	60 min	75-85% HRmax
	CG	Regular Sports Training (No Intervention)	-	-
9-10	YFTG	Yoga (Maintenance) + Peak Fartlek	30 min + 40 min	80-90% HRmax
	FTG	Peak Fartlek Training	65 min	80-90% HRmax
	CG	Regular Sports Training (No Intervention)	-	-
11-12	YFTG	Yoga (Integrated) + Competition-pace Fartlek	30 min + 40 min	75-90% HRmax
	FTG	Competition-pace Fartlek Training	65 min	75-90% HRmax
	CG	Regular Sports Training (No Intervention)	-	-

Yoga Components (YFTG):

- Pranayama: Anulom-Vilom, Kapalbhati, Bhastrika, Ujjayi (15-20 minutes)
- Asanas: Surya Namaskar, Bhujangasana, Dhanurasana, Sarvangasana, Chakrasana (15-20 minutes)
- Relaxation: Shavasana (5 minutes)

Fartlek Training Protocol (YFTG & FTG):

- Warm-up: 10 minutes easy jogging
- Main phase: Alternating fast runs (1-3 minutes at 85-95% HRmax) with recovery jogs (2-4 minutes at 60-70% HRmax)
- Cool-down: 5-10 minutes easy jogging and stretching

Control Group (CG): Participants continued their regular sports training schedules without any specific yoga or fartlek intervention but were monitored for training volume consistency.

Analysis of Test Data

Statistical Technique: Analysis of Covariance (ANCOVA)

ANCOVA was selected as the primary statistical technique for analyzing the data because it controls for pre-test differences among groups while evaluating post-test outcomes. This method increases statistical power by reducing error variance and provides more precise estimates of treatment effects.

Assumptions Verification: Prior to conducting ANCOVA, the following assumptions were tested and confirmed:

- Independence of observations
- Normal distribution of residuals (Shapiro-Wilk test, $p>0.05$)
- Homogeneity of variance (Levene's test, $p>0.05$)
- Homogeneity of regression slopes
- Linear relationship between covariate and dependent variable

Statistical Software: Data analysis was performed using SPSS version 26.0. The significance level was set at $p<0.05$ for all statistical tests.

Post-hoc Analysis: When ANCOVA revealed significant F-values, Bonferroni post-hoc tests were conducted to identify specific group differences while controlling for Type I error inflation.

Statistical Analysis and Results

Descriptive Statistics

Table 1: Descriptive Statistics of Respiratory Parameters (Mean ± SD)

Variable	Group	Pre-test	Post-test	Adjusted Mean
FVC (L)	YFTG	3.82 ± 0.41	4.38 ± 0.44	4.39
	FTG	3.79 ± 0.38	4.12 ± 0.39	4.13
	CG	3.84 ± 0.43	3.89 ± 0.42	3.88

FEV1 (L)	YFTG	3.24 ± 0.36	3.76 ± 0.39	3.77
	FTG	3.21 ± 0.34	3.52 ± 0.36	3.53
	CG	3.26 ± 0.38	3.31 ± 0.37	3.30
PEFR (L/min)	YFTG	412.6 ± 38.4	489.1 ± 42.3	489.8
	FTG	408.3 ± 36.7	456.2 ± 39.1	457.1
	CG	415.2 ± 40.1	421.8 ± 39.6	420.8

ANCOVA Results

Table 2: ANCOVA Summary for Forced Vital Capacity (FVC)

Source	Sum of Squares	df	Mean Square	F-value	p-value	Partial η²
Pre-test (Covariate)	2.847	1	2.847	68.42	<0.001*	0.619
Group	3.126	2	1.563	37.56	<0.001*	0.641
Error	1.749	42	0.042	-	-	-
Total	7.722	45	-	-	-	-

*Significant at p<0.05 level

Table 3: ANCOVA Summary for Forced Expiratory Volume (FEV1)

Source	Sum of Squares	df	Mean Square	F-value	p-value	Partial η²
Pre-test (Covariate)	1.983	1	1.983	58.34	<0.001*	0.581
Group	2.487	2	1.244	36.59	<0.001*	0.635
Error	1.428	42	0.034	-	-	-
Total	5.898	45	-	-	-	-

*Significant at p<0.05 level

Table 4: ANCOVA Summary for Peak Expiratory Flow Rate (PEFR)

Source	Sum of Squares	df	Mean Square	F-value	p-value	Partial η²
Pre-test (Covariate)	18,456.3	1	18,456.3	72.18	<0.001*	0.632
Group	24,783.6	2	12,391.8	48.47	<0.001*	0.698
Error	10,738.2	42	255.7	-	-	-
Total	53,978.1	45	-	-	-	-

*Significant at p<0.05 level

Post-hoc Comparisons

Table 5: Bonferroni Post-hoc Test Results (Adjusted Mean Differences)

Variable	Group Comparison	Mean Difference	p-value	95% CI
FVC (L)	YFTG vs FTG	0.26*	0.002	[0.11, 0.41]
	YFTG vs CG	0.51*	<0.001	[0.36, 0.66]
	FTG vs CG	0.25*	0.003	[0.10, 0.40]
FEV1 (L)	YFTG vs FTG	0.24*	0.001	[0.11, 0.37]
	YFTG vs CG	0.47*	<0.001	[0.34, 0.60]
	FTG vs CG	0.23*	0.002	[0.10, 0.36]
PEFR (L/min)	YFTG vs FTG	32.7*	0.001	[15.2, 50.2]
	YFTG vs CG	69.0*	<0.001	[51.5, 86.5]

FTG vs CG	36.3*	<0.001	[18.8, 53.8]

*Significant at $p<0.05$ level

Interpretation of Results

The ANCOVA results revealed statistically significant differences among the three groups for all respiratory parameters after controlling for pre-test scores. The F-values for group effects were highly significant ($p<0.001$) with large effect sizes (partial η^2 ranging from 0.635 to 0.698), indicating substantial practical significance.

Post-hoc comparisons demonstrated that the Yoga with Fartlek Training Group (YFTG) achieved significantly greater improvements compared to both the Fartlek Training Group (FTG) and Control Group (CG) across all variables. The FTG also showed significant improvements over the CG, confirming the effectiveness of fartlek training alone. However, the magnitude of improvement was consistently greater in YFTG, supporting the hypothesis that combining yoga with fartlek training produces synergistic benefits for respiratory function.

The adjusted mean values indicate that YFTG improved FVC by 14.8%, FEV1 by 16.2%, and PEFR by 18.5% from baseline, while FTG improved by 8.9%, 9.9%, and 11.9% respectively. The control group showed minimal changes (1.3%, 1.5%, and 1.6%), likely attributable to normal training adaptations.

Conclusions

This 12-week randomized controlled trial provides compelling evidence that integrating yoga with fartlek training produces superior improvements in respiratory function compared to fartlek training alone. The following conclusions emerge from this investigation:

Primary Findings: The combined yoga and fartlek training intervention resulted in significantly greater improvements in all measured respiratory parameters including FVC, FEV1, and PEFR when compared to fartlek training alone or control conditions. These findings support the hypothesis that yoga and fartlek training produce synergistic effects on respiratory function.

Mechanistic Insights: The enhanced outcomes observed in the combined intervention group likely stem from complementary physiological adaptations. Fartlek training improves cardiovascular efficiency and oxidative capacity through varied intensity work, while yoga enhances respiratory muscle strength, thoracic mobility, and voluntary breathing control through pranayama techniques. The integration of these modalities appears to optimize both structural and functional aspects of respiratory performance.

Practical Applications: For coaches and athletes seeking evidence-based methods to enhance respiratory function and endurance capacity, incorporating yoga sessions alongside conventional cardiovascular training presents a practical and effective strategy. The training protocol used in this study (three sessions weekly with 30-35 minutes of yoga followed by fartlek training) provides a feasible template for implementation in athletic programs.

Study Strengths: This research employed rigorous methodology including randomization, appropriate sample size, validated measurement instruments, progressive training protocols, and sophisticated statistical analysis (ANCOVA) to control for baseline differences. These factors enhance confidence in the validity and reliability of findings.

Limitations: Several limitations warrant acknowledgment. First, the study included only male college athletes, limiting generalizability to female athletes and other populations. Second, the 12-week intervention period, while sufficient to demonstrate significant changes, does not address long-term maintenance or optimal training duration. Third, the study did not examine underlying mechanisms through biochemical or biomechanical assessments. Finally, the absence of a yoga-only group prevents isolation of yoga's independent contribution.

Future Research Directions: Subsequent investigations should examine dose-response relationships to optimize yoga and fartlek training ratios, investigate gender differences in response patterns, extend intervention periods to assess long-term adaptations and retention effects, explore mechanisms through respiratory muscle biopsies or advanced imaging techniques, evaluate performance outcomes in competitive settings, and examine applicability across different sports disciplines and age groups.

Clinical Significance: Beyond athletic populations, the findings suggest potential applications for individuals with respiratory limitations or those seeking to enhance respiratory health. The non-pharmacological nature of this intervention makes it particularly appealing for health promotion initiatives.

In conclusion, this study demonstrates that combining yoga with fartlek training represents an effective, evidence-based approach for enhancing respiratory function in college-level athletes. The significant improvements observed across multiple respiratory parameters, supported by robust statistical analysis, provide a strong foundation for recommending integrated training approaches in athletic conditioning programs.

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TRANSFORMING TEACHER TRAINING THROUGH YOGA: BUILDING MINDFUL AND EFFECTIVE EDUCATIONAL PROFESSIONALS

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Abstract

The role of teachers in contemporary education extends beyond academic instruction to include emotional support, classroom management, and the promotion of inclusive and healthy learning environments. These increasing responsibilities often lead to stress, emotional exhaustion, and reduced professional effectiveness among teachers. This paper examines the significance of integrating yoga into teacher training programs as a holistic approach to developing mindful, healthy, and effective educational professionals. The study highlights how yoga enhances teacher trainees' professional competence by improving patience, empathy, confidence, discipline, and mental clarity. It also discusses the importance of teacher training programs in preparing educators to meet modern educational challenges and emphasizes the role of yoga in fostering a positive classroom environment and value-based education. The paper further explores practical yoga practices relevant for teacher trainees, contemporary methods for integrating yoga into teacher education, and the major challenges in implementation, including lack of trained instructors, time constraints, and institutional barriers. Recommendations such as structured yoga modules, certified workshops, policy support, and research-based interventions are suggested to strengthen yoga integration in teacher education curricula. The paper concludes that yoga plays a vital role in promoting the holistic development of future teachers by improving their physical, mental, emotional, and professional well-being, ultimately contributing to healthier and more effective educational environments.

INTRODUCTION

Teachers now have more responsibilities than just imparting academic knowledge. In addition to managing stress in the classroom, teachers are now required to assist students' emotional health, foster inclusive learning environments, and take care of their own physical, mental, and social well-being. The necessity for comprehensive approaches in teacher education programs has been brought to light by these increasing expectations. Among these methods, yoga has shown promise in improving teachers' physical health, emotional stability, focus, self-awareness, confidence, and professional competence. The attitudes, abilities, and personalities of teacher candidates are greatly influenced by teacher training institutions.

Yoga can help create teachers who are emotionally stable, mentally sound, and physically fit by being incorporated into teacher education programs. Regular yoga practice has been demonstrated to lower anxiety, increase attention span, lower stress, and foster positive thinking all of which are essential for effective teaching methods.

The ancient Indian practice of yoga, which incorporates pranayama, dhyna, kriyas, and asanas, greatly enhances general wellbeing. Yoga aids in the development of traits like patience, empathy, self-control, confidence, and stress management in the context of teacher preparation. Effective teaching and good classroom management depend on these attributes. Additionally, yoga exercises can enhance mental clarity and emotional equilibrium, empowering educators to respond constructively to professional challenges and uphold a pleasant learning environment. During their teaching practice, teacher candidates frequently encounter academic pressure, worry about classroom management, stress, and emotional exhaustion. By encouraging inner harmony, attention, and relaxation, yoga is a useful method for addressing these issues. Yoga also promotes virtues like empathy, teamwork, and moral behaviour, all of which are critical for developing responsible educators and learners.

Yoga

Yoga is an age-old discipline that dates back over 5,000 years to India. It integrates breathing exercises, physical activity, and meditation to enhance mental and physical well-being. The relationship between the body, mind, and spirit is symbolized by the word "yoga," which means unification. Millions of individuals worldwide now practice yoga as a means of upholding a balanced and healthful lifestyle. Physical fitness is one of yoga's primary advantages. Various yoga poses enhance balance, strength, flexibility, and posture. Frequent practice can also improve body movement and boost energy levels. Yoga's beneficial impacts on mental health are also well-known. Meditation and breathing techniques aid in mental relaxation, stress reduction, and enhanced focus. Yoga is a popular way for individuals to unwind after a long day and deal with stress or worry. Yoga promotes mindfulness, which aids in maintaining present moment awareness and fostering inner calm. Yoga comes in a wide variety of forms, each with its own goals and methods. While some forms emphasize rapid motions and physical difficulties, others concentrate on gentle stretching and relaxation. Ashtanga, Vinyasa, and Hatha yoga are popular styles. Individuals can select the style that most suits their needs, be it spiritual development, fitness, or relaxation.

Teacher Training

A teacher training program is a structured course created to assist teachers in enhancing their topic knowledge, time management, classroom management, and teaching abilities. These courses are crucial because they equip educators to manage various learning styles and foster a supportive learning environment. Teachers who receive the right training become more self-assured, innovative, and successful in helping pupils succeed. Instructors are trained in the use of technology, interactive exercises, and student entered teaching methods. Additionally,

communication and classroom management skills are emphasized in teacher training programs. Teachers receive training on how to uphold discipline, promote involvement, and cultivate positive connections with both parents and pupils. This fosters a welcoming and effective learning atmosphere. Programs for training teachers are essential to bolstering the educational system. Teachers with the necessary training can motivate pupils, raise academic achievement, and benefit society.

Importance of Yoga in Teacher Education

In teacher education, yoga is much more than just physical training. By enhancing their physical well-being, mental equilibrium, emotional stability, and professional efficacy, it promotes teacher candidates' overall growth. Teachers in today's educational institutions deal with stress, workload demands, difficulties in the classroom, and the duty of moulding students' personalities. Teachers can manage these challenges in a healthy and balanced way with the use of yoga.

1. **Physical Health**

Teaching demands a lot of standing, talking, and active participation in the classroom. Yoga enhances posture, flexibility, stamina, and general physical health. Frequent practice helps teachers stay active and healthy by lowering weariness, back pain, obesity, and lifestyle related illnesses.

2. **Stress Management**

Exams, class planning, extracurricular activities, and student behaviour are all major sources of stress for teachers. Meditation and pranayama exercises are examples of yoga techniques that relax the mind and lessen tension, anxiety, and depression. A teacher who is mentally calm can foster a supportive learning environment.

3. **Emotional Balance**

Teachers who practice yoga gain self-control, patience, tolerance, and emotional stability. Teachers need these attributes since they work with pupils of all backgrounds and skill levels. Teachers that are emotionally stable handle issues in the classroom with composure and provide pupils with appropriate guidance.

4. **Concentration and Memory**

Yoga enhances concentration, attention span, and memory power through meditation and regular practices. This helps teachers in lesson delivery, classroom management, and professional development.

5. **Positive Personality**

The goal of teacher education is to cultivate ideal personalities. Yoga fosters self-awareness, discipline, self-assurance, optimism, and moral principles. Yoga instructors frequently serve as role models for their pupils.

6. Better Classroom Environment

A serene and inspiring classroom environment is facilitated by a teacher who is in good

health. Yoga improves relationships between teachers and students by fostering empathy, compassion, and effective communication.

7. Professional Efficiency

By enhancing mental clarity and lowering burnout, yoga boosts productivity and work efficiency. Teachers become more inventive, well organized, and capable of managing tasks.

8. Value Education

Honesty, nonviolence, discipline, and respect are among the ideals that yoga imparts. Yoga-based teacher education programs foster holistic development, which includes social, mental, emotional, spiritual, and physical development.

9. Healthy Lifestyle Among Students

Teachers who engage in yoga might encourage their pupils to make healthy lifestyle choices. They can help kids learn how to focus, handle stress, and lead healthy lives, which will benefit society as a whole.

Yoga Practice Relevant for Teacher Trainees

Yoga practice aids in the development of self-discipline, emotional equilibrium, and patience qualities that are critical for successful teaching. Frequent yoga practice enhances focus, posture, breathing, and stress reduction, empowering educators to confidently and calmly manage classroom duties. Additionally, it helps trainees maintain a healthy lifestyle by fostering mental and physical well-being. The following yoga exercises will assist teacher candidates become more productive.

- Simple Asanas
- Pranayama
- Mindfulness and meditation
- The techniques of relaxation

Integration of Yoga in Teacher Education

Future educators can improve their mental health, emotional equilibrium, and physical fitness by including yoga into their curricula. It encourages focus, endurance, and stress reduction qualities that are critical for successful teaching. Incorporating yoga exercises into teacher preparation programs promotes overall development and a healthy learning environment. Teachers can encourage students to have healthy lifestyles and better handle professional obstacles by practicing yoga.

Contemporary Techniques

- B Ed colleges conduct daily yoga and mindfulness classes.
- Digital yoga apps for teacher trainees.
- Modules for wellness-based teacher training.
- After doing yoga, keep a reflective journal.
- Yoga-integrated internships for teacher trainees.

Challenges in Implementation

1. Lack of trained yoga instructors
2. Time constrains in curriculum
3. Lack of awareness and motivation
4. Institutional barriers

Recommendations

- Make yoga a structured component of teacher training.
- Include certified workshops for teacher trainees
- Policy support for wellness education
- Research based yoga interventions in teacher education

CONCLUSION

Yoga is an essential component of teacher education because it develops healthy, balanced, confident, and effective teachers. It not only improves physical and mental wellbeing but also enhances professional competence and moral character. By integrating yoga into teacher education institutions can prepare teachers who are capable of creating positive, disciplined, and healthy learning environments. Yoga practice in teacher education colleges helps future teachers to develop physical fitness, mental well-being, and emotional balance.

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YOGA AND SOCIAL-EMOTIONAL LEARNING (SEL) IN ELEMENTARY PHYSICAL EDUCATION: A LONGITUDINAL STUDY ON EMPATHY, SELF-AWARENESS AND CLASSROOM BEHAVIOR

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Abstract

This longitudinal study examined the effects of a structured yoga-based Social-Emotional Learning (SEL) program on three key outcome variables — empathy, self-awareness, and classroom behavior — among elementary school students aged 9 to 11 years. A total of 45 participants (n = 45) from two public elementary schools were recruited and divided into an experimental group (n = 23) that received a 16-week yoga and SEL integration program within the physical education curriculum, and a control group (n = 22) that followed the standard physical education curriculum. Data were collected at baseline and post-intervention using validated psychometric tools including the Basic Empathy Scale for Children (BES-C), the Self-Awareness Inventory for Children (SAIC), and the Conners Teacher Rating Scale-Revised (CTRS-R) for classroom behavior assessment. Statistical analysis using paired t-tests, independent samples t-tests, and ANCOVA revealed significant improvements in all three variables for the experimental group ($p < 0.05$), with empathy showing the highest effect size (Cohen's $d = 0.82$). The findings suggest that yoga-integrated SEL programs in physical education settings can be a powerful, cost-effective strategy to enhance the holistic development of elementary school children.

Keywords: *Yoga, Social-Emotional Learning, Empathy, Self-Awareness, Classroom Behavior, Elementary Physical Education, SEL Intervention, Longitudinal Study, Child Development.*

1. Introduction

The integration of social-emotional competencies into formal education has gained considerable momentum in the 21st century as educators, researchers, and policymakers increasingly recognize the inseparability of academic achievement and emotional well-being. The Collaborative for Academic, Social, and Emotional Learning (CASEL) defines Social-Emotional Learning (SEL) as the process through which individuals acquire and apply knowledge, attitudes, and skills to manage emotions, set goals, show empathy, establish positive relationships, and make responsible decisions (CASEL, 2020). Elementary school

years — typically spanning ages 6 to 12 — are a critical period for the development of these competencies, as they lay the neurological and psychological foundation for adolescent and adult social functioning.

Yoga, as a mind-body practice, has emerged as a promising pedagogical tool for promoting emotional regulation, mindfulness, and physical well-being among school-aged children. Unlike conventional physical education activities, yoga uniquely integrates breathing exercises (pranayama), physical postures (asanas), and relaxation techniques that collectively foster inward reflection and body awareness. Numerous cross-sectional studies have documented the positive impact of yoga on stress reduction, attention span, and emotional regulation in children (Khalsa & Butzer, 2016; Butzer et al., 2015). However, the intersection of yoga and specific SEL domains — particularly empathy, self-awareness, and classroom behavior — remains underexplored within longitudinal research frameworks in elementary physical education (PE) settings.

Empathy, the capacity to recognize and share the feelings of others, is a cornerstone of prosocial behavior and positive peer relationships. Self-awareness, encompassing one's understanding of personal emotions, strengths, and limitations, is listed by CASEL as one of the five core SEL competencies. Classroom behavior — encompassing attention, impulse control, and cooperative conduct — directly impacts academic performance and teacher-student dynamics. The present study posits that yoga, when systematically embedded within the elementary PE curriculum alongside SEL instructional strategies, can produce measurable and sustained improvements in all three of these domains.

The purpose of this longitudinal investigation is to determine whether a 16-week yoga-based SEL program in elementary physical education produces statistically significant improvements in empathy, self-awareness, and classroom behavior in students aged 9 to 11 years, compared to a control group receiving standard PE instruction. This study contributes to the growing body of evidence supporting the inclusion of contemplative and movement-based practices in holistic elementary education.

2. Review of Related Literature

2.1 Yoga in School-Based Physical Education

Yoga has experienced a significant rise in its application within school-based curricula across the United States, India, Canada, and the United Kingdom. Butzer et al. (2015) conducted a systematic review of 47 studies examining yoga interventions in school settings and found that 85% reported positive outcomes in areas including stress, anxiety, emotional regulation, and cognitive performance. In physical education specifically, yoga offers an inclusive, non-competitive alternative to traditional sports-based activities, making it accessible to students of varying physical abilities. Hagen and Nayar (2014) found that elementary students who participated in weekly yoga sessions within PE classes demonstrated improved body coordination, reduced aggression, and greater classroom attentiveness.

2.2 Social-Emotional Learning and Child Development

SEL programming in schools has demonstrated robust evidence of effectiveness. A landmark meta-analysis by Durlak et al. (2011) involving over 270,000 students found that SEL programs significantly improved academic achievement by an average of 11 percentile points, reduced behavioral problems, and increased prosocial behaviors. Weissberg et al. (2015) noted that SEL interventions are most effective when embedded within existing school structures — such as physical education — rather than as standalone curricula. Research by Jones and Doolittle (2017) emphasized the developmental appropriateness of SEL during the elementary years, when children are actively negotiating peer relationships and developing the capacity for perspective-taking and emotional literacy.

2.3 Empathy Development in Elementary-Aged Children

Empathy among school-aged children (ages 9-11) encompasses both cognitive empathy (understanding another's perspective) and affective empathy (sharing emotional responses). Jolliffe and Farrington (2006) validated the Basic Empathy Scale and demonstrated that empathy levels in middle childhood predict prosocial behaviors and reduce aggressive peer interactions. Flook et al. (2015) found that mindfulness-based programs — closely related to yoga — significantly improved empathic concern among elementary students over a 12-week period. The role of yoga's relational and cooperative postures in stimulating mirror neuron activity and emotional attunement has been posited by neuroeducation researchers (Diamond & Lee, 2011).

2.4 Self-Awareness and Mindful Movement

Self-awareness in children involves recognition of one's own emotional states, cognitive processes, and behavioral tendencies. Schonert-Reichl and Lawlor (2010) demonstrated that mindfulness programs fostered self-awareness and optimism among elementary-aged students in a randomized controlled study. Yoga's emphasis on interoceptive awareness — the ability to perceive internal bodily states — provides a somatic foundation for the development of emotional self-awareness (Khalsa & Butzer, 2016). Meiklejohn et al. (2012) reviewed 15 school-based mindfulness studies and concluded that self-awareness was among the most consistently improved outcomes in programs incorporating yoga and meditation.

2.5 Classroom Behavior and Yoga

Classroom behavior encompasses a range of observable indicators including on-task behavior, impulse control, prosocial interaction with peers, and compliance with teacher instructions. Jensen (2009) established the neurological basis for movement-based learning, demonstrating that physical activity stimulates dopamine and serotonin release, improving executive function and behavioral regulation. Khalsa et al. (2012) conducted a randomized controlled trial with high-school students and found significant reductions in anxiety and improvements in mood and emotional reactivity following yoga intervention. Adapted to the elementary context, several studies (Hagen & Nayar, 2014; Razza et al., 2015) have documented that

yoga programs reduce hyperactive and disruptive classroom behaviors, with teacher ratings improving significantly over intervention periods.

3. Methodology

This study adopted a quasi-experimental, longitudinal pre-test/post-test control group design to examine the effects of yoga-integrated SEL programming on three dependent variables: (1) Empathy, (2) Self-Awareness, and (3) Classroom Behavior. Independent variables included group assignment (experimental vs. control) and time (baseline vs. post-intervention). The study was conducted over an academic year spanning 16 weeks of active intervention.

3.1 Research Variables

Independent Variable: Yoga-based SEL Program (Treatment/No-Treatment).

Dependent Variables: (1) Empathy — measured via the Basic Empathy Scale for Children (BES-C); (2) Self-Awareness — measured via the Self-Awareness Inventory for Children (SAIC); (3) Classroom Behavior — measured via the Conners Teacher Rating Scale-Revised (CTRS-R).

4. Material and Methods

4.1 Participants

A total of 45 students (n = 45) aged 9 to 11 years were recruited from two public elementary schools in a suburban district. Participants were assigned to either the Experimental Group (EG, n = 23) or the Control Group (CG, n = 22) based on school-level randomization to minimize contamination effects. Inclusion criteria required: (a) enrollment in grades 4 or 5, (b) no prior formal yoga instruction, (c) absence of clinically diagnosed neurological or psychiatric conditions, and (d) provision of informed written consent from parents/guardians and student assent. Ethical approval was obtained from the Institutional Review Board (IRB) prior to data collection. The sample comprised 24 males (53.3%) and 21 females (46.7%), with a mean age of 10.2 ± 0.6 years. No statistically significant baseline differences were observed between groups on any dependent variable (all $p > 0.05$).

4.2 Procedure

The experimental group participated in a 16-week Yoga-SEL integrated program delivered within the school's regular physical education period (45 minutes per session, 3 sessions per week). Each session followed a structured format: (1) Opening Circle and Breathing Exercise (5 min) — breathing techniques such as diaphragmatic breathing and alternate nostril breathing; (2) Warm-Up through Yoga Asanas (10 min) — gentle poses including Mountain Pose, Cat-Cow, and Child's Pose; (3) Core Yoga Sequence (20 min) — partner and group-based poses such as Double Tree Pose and Circle of Trees to foster empathy and cooperation; (4) SEL Reflection Activity (5 min) — guided journaling or discussion on emotions, peer relationships, and personal strengths; (5) Closing Relaxation/Savasana (5 min) — body scan and guided imagery for self-awareness.

The program was co-facilitated by a certified yoga instructor and the school's PE teacher, both

of whom received a two-day training workshop prior to the intervention. Fidelity checklists were used to ensure 90%+ adherence to the session protocol throughout the intervention period. The control group continued standard physical education classes consisting of traditional games, fitness activities, and sports skill development without any yoga or SEL-specific instruction.

Data were collected at two time points: T1 (baseline, Week 0) and T2 (post-intervention, Week 17). Teachers completed the CTRS-R at both time points, and students self-reported on the BES-C and SAIC under standardized conditions during scheduled assessment periods.

4.3 Measurement Tools

Basic Empathy Scale for Children (BES-C): A 20-item self-report scale measuring cognitive and affective empathy (Jolliffe & Farrington, 2006). Responses on a 5-point Likert scale. Reliability: Cronbach's alpha = 0.87.

Self-Awareness Inventory for Children (SAIC): A 15-item validated scale assessing emotional recognition, strength identification, and self-monitoring (Schonert-Reichl & Lawlor, 2010). Reliability: Cronbach's alpha = 0.83.

Conners Teacher Rating Scale-Revised (CTRS-R): A 28-item standardized teacher observation tool evaluating classroom conduct, attention, and hyperactivity-impulsivity. Widely used in educational research (Conners, 2001). Reliability: Cronbach's alpha = 0.89.

4.4 Statistical Analysis

All statistical analyses were performed using SPSS Version 27.0 (IBM Corp., Armonk, NY). Descriptive statistics (means, standard deviations) were computed for all variables at both time points. Normality was assessed using the Shapiro-Wilk test; all distributions satisfied normality assumptions ($p > 0.05$). The following tests were applied: (a) Paired samples t-test to assess within-group pre-post changes for each variable; (b) Independent samples t-test to compare post-intervention scores between experimental and control groups; (c) One-Way Analysis of Covariance (ANCOVA) controlling for baseline scores to examine treatment effects; (d) Cohen's d was calculated to determine effect sizes, with values of 0.2, 0.5, and 0.8 interpreted as small, medium, and large effects respectively. The level of significance was set at alpha = 0.05 for all analyses.

5. Results

Table 1 presents the descriptive statistics and within-group comparison (paired t-test) results for both the experimental and control groups across all three dependent variables at pre- and post-intervention.

TABLE 1: PRE- AND POST-INTERVENTION DESCRIPTIVE STATISTICS AND PAIRED T-TEST RESULTS

Variable	EG Pre M(SD)	EG Post M(SD)	EG t	EG p	CG Pre M(SD)	CG Post M(SD)	CG t	CG p	d
Empathy (BES-C)	42.3 (5.1)	53.7 (4.6)	9.84	0.001*	41.9 (5.3)	43.2 (5.0)	1.12	0.274	0.82
Self-Awareness (SAIC)	38.6 (4.8)	48.2 (4.3)	8.97	0.001*	38.1 (5.0)	39.0 (4.9)	0.89	0.381	0.71
Classroom Behavior (CTRS-R)	55.4 (6.2)	44.1 (5.7)	8.41	0.001*	55.0 (6.5)	54.3 (6.3)	0.56	0.581	0.68

*Note: EG = Experimental Group (n=23); CG = Control Group (n=22); M = Mean; SD = Standard Deviation; t = t-statistic; p = p-value; d = Cohen's d. *Significant at p < 0.05. Lower CTRS-R scores indicate fewer behavioral problems.*

As shown in Table 1, the experimental group demonstrated statistically significant improvements across all three dependent variables from pre- to post-intervention. Empathy scores increased from a mean of 42.3 (SD = 5.1) at baseline to 53.7 (SD = 4.6) at post-intervention ($t = 9.84$, $p < 0.001$, $d = 0.82$), reflecting a large effect size. Self-Awareness scores improved from 38.6 (SD = 4.8) to 48.2 (SD = 4.3) ($t = 8.97$, $p < 0.001$, $d = 0.71$), also indicative of a large effect. Classroom Behavior scores on the CTRS-R decreased from 55.4 (SD = 6.2) to 44.1 (SD = 5.7) ($t = 8.41$, $p < 0.001$, $d = 0.68$), indicating a significant reduction in behavioral difficulties. In contrast, the control group showed no statistically significant changes on any variable across the study period (all $p > 0.05$).

TABLE 2: INDEPENDENT SAMPLES T-TEST AND ANCOVA RESULTS — POST-INTERVENTION GROUP COMPARISON

Variable	EG Post M(SD)	CG Post M(SD)	t	p	F (ANCOVA)	p (ANCOVA)	η^2
Empathy (BES-C)	53.7 (4.6)	43.2 (5.0)	7.82	0.001*	61.34	0.001*	0.59
Self-Awareness (SAIC)	48.2 (4.3)	39.0 (4.9)	7.05	0.001*	49.72	0.001*	0.54
Classroom Behavior (CTRS-R)	44.1 (5.7)	54.3 (6.3)	6.01	0.001*	36.18	0.001*	0.46

*Note: η^2 = Eta-squared (effect size for ANCOVA). *Significant at p < 0.05. Baseline scores used as covariate in ANCOVA.*

Table 2 presents the between-group post-intervention comparison results. Independent samples t-tests confirmed significant differences between the experimental and control groups on all three variables at post-intervention (all $p < 0.001$). ANCOVA results, controlling for baseline scores, further corroborated these findings, with all F-values significant at $p < 0.001$.

Eta-squared values indicated large practical significance for empathy ($\eta^2 = 0.59$) and self-awareness ($\eta^2 = 0.54$), and a medium-to-large effect for classroom behavior ($\eta^2 = 0.46$).

6. Discussion

The results of this longitudinal investigation provide compelling evidence that a structured yoga-based SEL program embedded within elementary physical education classes can produce meaningful and significant improvements in empathy, self-awareness, and classroom behavior over a 16-week period. These findings are consistent with and extend the existing body of literature in several important ways.

The most pronounced effect was observed in empathy development ($d = 0.82$, $\eta^2 = 0.59$). This aligns with the theoretical framework of embodied cognition, which suggests that the physical and relational dimensions of yoga practice — particularly partner poses and group breathing exercises — activate neural pathways associated with emotional resonance and perspective-taking (Diamond & Lee, 2011). The partner-based asanas incorporated in the intervention, such as Double Tree and Partner Forward Fold, required students to attune to their partner's physical and emotional state, providing a lived experiential foundation for empathic skill development that surpasses what can be achieved through traditional didactic SEL instruction alone.

The significant improvements in self-awareness ($d = 0.71$) are consistent with Schonert-Reichl and Lawlor (2010), who found mindfulness-based programs to reliably improve self-awareness in elementary populations. The introspective components of yoga — including guided Savasana, body scan exercises, and SEL journaling — provided students with structured opportunities to observe and articulate their internal emotional states. The SEL Reflection Activity segment, in which students identified and discussed their emotional experiences following the yoga sequence, served as a metacognitive bridge between somatic awareness and verbal emotional literacy. This integration of movement and reflection appears to be particularly effective in the 9-11 age range, when children are developing the capacity for abstract emotional reasoning.

The improvements in classroom behavior, as measured by teacher ratings on the CTRS-R ($d = 0.68$), are noteworthy from a practical standpoint. Teachers in the experimental group anecdotally reported that students who participated in yoga sessions demonstrated greater readiness to learn, improved compliance with classroom routines, and more cooperative peer interactions. These behavioral improvements are consistent with Jensen's (2009) neurological model, wherein physical movement and mindful breathing elevate neurotransmitter levels that regulate attention and impulse control. The reductions in CTRS-R scores observed in this study suggest that yoga's neurophysiological benefits translated into observable behavioral improvements within the classroom environment — a finding with significant implications for school administrators and classroom teachers managing challenging behavioral dynamics.

Several limitations of this study warrant acknowledgment. First, the sample size of 45

participants, while sufficient for the statistical analyses employed, limits the generalizability of the findings to broader populations. Second, the absence of longitudinal follow-up beyond the 16-week intervention period means that the sustainability of the observed improvements remains unknown. Third, instructor variability and the non-blinded nature of teacher ratings for the CTRS-R introduce potential sources of bias. Future research should incorporate larger, more diverse samples, extended follow-up periods, and objective behavioral measures such as systematic classroom observation protocols.

7. Conclusion

This study provides longitudinal empirical support for the integration of yoga-based Social-Emotional Learning programming within elementary physical education curricula. Across a 16-week intervention period, students in the experimental yoga-SEL group demonstrated statistically significant and practically meaningful improvements in empathy, self-awareness, and classroom behavior compared to peers in the standard physical education control group. The large effect sizes observed, particularly for empathy and self-awareness, underscore the developmental appropriateness and efficacy of yoga as a vehicle for SEL in the 9-11 age range.

These findings have meaningful implications for physical education teachers, school counselors, and educational policymakers. Incorporating structured yoga and SEL components into the PE curriculum represents a low-cost, scalable, and evidence-based approach to promoting holistic child development that extends well beyond the gymnasium. As schools continue to navigate the dual imperatives of academic achievement and student well-being, yoga-integrated SEL programming offers a promising pathway to cultivating emotionally intelligent, self-aware, and prosocial learners. Future studies with larger samples, diverse demographic populations, randomized designs, and extended follow-up periods will further clarify the long-term impact and optimal dosage of yoga-SEL programs in elementary education.

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EFFECTS OF A SIX-MONTH AEROBIC EXERCISE PROGRAMME ON MUSCULAR FITNESS AND FLEXIBILITY AMONG SEDENTARY MIDDLE-AGED MEN IN THIRUVANANTHAPURAM DISTRICT, KERALA

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Abstract

Background: Sedentary living among middle-aged men is strongly associated with progressive decline in muscular fitness and flexibility, increasing the risk of musculoskeletal disorders and reduced functional independence. Aim: The present study was undertaken to examine the effect of a structured six-month aerobic exercise programme on muscular fitness and flexibility among sedentary middle-aged men of Thiruvananthapuram district, Kerala. Methods: Ninety (N = 90) apparently healthy, sedentary men aged between 40 and 59 years were randomly selected from various locations of Thiruvananthapuram district and were randomly assigned into an Experimental Group (n = 45) and a Control Group (n = 45). The experimental group underwent a supervised aerobic exercise programme for five days a week, over a period of six months, while the control group continued their routine sedentary lifestyle without any structured intervention. Muscular fitness was assessed using the floor push-up test (number of repetitions) and flexibility was assessed using the sit-and-reach test (inches). Measurements were recorded at four stages – pre-test, mid-test 1 (after two months), mid-test 2 (after four months) and post-test (after six months). The data were analysed using Analysis of Covariance (ANCOVA) with Scheffe's post hoc test for pairwise comparison. Results: The experimental group showed statistically significant improvement ($p < 0.01$) in both muscular fitness ($F = 20.803$) and flexibility ($F = 40.196$) across the three stages, whereas the control group showed no significant change in either variable ($p > 0.05$). Conclusion: A structured six-month aerobic exercise programme produces significant and progressive improvement in muscular fitness and flexibility among sedentary middle-aged men, supporting its inclusion in community-based health promotion strategies.

Keywords: *aerobic exercise; sedentary lifestyle; middle-aged men; muscular fitness; flexibility; ANCOVA; Kerala*

1. Introduction

Physical inactivity has emerged as one of the most pressing public health concerns of the twenty-first century. The transition from physically demanding occupations to sedentary, desk-bound work, coupled with increased reliance on motorised transport and screen-based leisure, has led to a steady decline in habitual physical activity among adult populations,

including in urban and semi-urban districts of Kerala such as Thiruvananthapuram. Middle age, generally considered to span the fifth and sixth decades of life, represents a critical transitional period during which the cumulative effects of inactivity become physiologically evident.

With advancing age, and more so in the presence of a sedentary lifestyle, there is a progressive decline in muscular strength, muscular endurance and joint flexibility. Reduced muscular fitness compromises the ability to perform activities of daily living, while diminished flexibility restricts range of motion at the joints and increases susceptibility to musculoskeletal strain and injury. Both muscular fitness and flexibility are recognised as core components of health-related physical fitness, alongside cardiorespiratory endurance and body composition, and are therefore important targets for exercise-based intervention.

Aerobic exercise, characterised by rhythmic, large-muscle-group activity sustained over a period of time, has long been associated with improvements in cardiorespiratory fitness. However, a well-structured aerobic exercise programme that incorporates a warm-up, an aerobic conditioning phase and a cool-down comprising calisthenics and stretching can also exert favourable effects on muscular fitness and flexibility, particularly in previously sedentary individuals whose baseline fitness is low. Despite this, region-specific evidence on the effectiveness of such programmes among sedentary middle-aged men in Kerala remains limited.

It was against this background that the present study was designed to investigate the effect of a six-month structured aerobic exercise programme on two components of health-related physical fitness – muscular fitness and flexibility – among sedentary middle-aged men randomly selected from Thiruvananthapuram district.

1.1 Objectives of the Study

The study was carried out with the following objectives:

- To assess the effect of a six-month aerobic exercise programme on muscular fitness (floor push-up performance) among sedentary middle-aged men.
- To assess the effect of a six-month aerobic exercise programme on flexibility (sit-and-reach performance) among sedentary middle-aged men.
- To compare the stage-wise (pre, mid 1, mid 2 and post) changes in muscular fitness and flexibility between the experimental and control groups.

1.2 Hypothesis

It was hypothesised that sedentary middle-aged men participating in the six-month aerobic exercise programme would show significantly greater improvement in muscular fitness and flexibility across the four testing stages compared to their counterparts in the control group, who would show no significant change.

2. Review of Related Literature

A growing body of literature supports the role of structured aerobic and combined exercise

programmes in improving health-related physical fitness components across diverse populations.

Monga et al. (2007) reported improved cardiovascular fitness, flexibility and muscle strength in patients with localised prostate cancer undergoing radiotherapy who participated in an aerobic exercise programme three times a week for eight weeks, indicating that even clinical populations benefit from regular aerobic activity.

Lewis and Fragala (2005) observed improvements in aerobic performance, muscle strength, muscular endurance and gross motor skills among girls with Down syndrome following a combined aerobic and strength-training programme, highlighting the broad applicability of mixed-mode training.

Lindstrom, Fisher and Chad (2004) found significant increases in upper- and lower-body muscular endurance following a home-based or class-based physical activity programme among older adults with chronic disease, supporting the feasibility of community-based exercise delivery.

Campanelli (1996) noted that the age-related decline in flexibility is associated with reduced elasticity and compliance of connective tissue, and that this decline is, in part, attributable to decreased habitual physical activity – a factor reversible through regular exercise.

Roh and Park (2013) demonstrated that a structured walking exercise programme produced positive effects on sit-and-reach performance and six-minute walk distance among elderly participants.

Seco et al. (2013) reported significant improvements in flexibility ($p < .0001$) among older adults following a nine-month physical training programme.

Tsourlou (2006) found that a combined aerobic and resistance-type aquatic training programme improved sit-and-reach scores by approximately 11.6 per cent in older women.

Cakmakci (2011) reported improvements in flexibility among sedentary obese women following a programme of modern Pilates mat and ball exercises.

Collectively, these studies suggest that structured aerobic and aerobic-plus-calisthenic programmes, sustained over periods ranging from eight weeks to several months, can produce measurable improvements in muscular fitness and flexibility across a wide range of populations, including older adults, clinical groups and women with sedentary backgrounds. However, comparatively fewer studies have specifically examined sedentary middle-aged men in the Indian context, underscoring the need for the present investigation.

3. Methodology

3.1 Selection of Subjects

A total of ninety (N = 90) apparently healthy, sedentary men aged between 40 and 59 years were randomly selected from various localities of Thiruvananthapuram district, Kerala, using a simple random sampling technique. Subjects were screened through a general health questionnaire and medical clearance to rule out cardiovascular, orthopaedic or other

conditions that would contraindicate participation in a moderate-intensity aerobic exercise programme. Subjects classified as sedentary (engaging in less than 150 minutes of moderate-intensity physical activity per week) and not currently participating in any organised exercise programme were included. Written informed consent was obtained from all participants prior to data collection.

The selected subjects were randomly assigned into two equal groups of forty-five (n = 45) each:

- Group I – Experimental Group (EG): underwent the six-month structured aerobic exercise programme.
- Group II – Control Group (CG): continued their normal daily routine without any structured exercise intervention.

3.2 Experimental Design

The study employed a randomised, two-group, repeated-measures (pre-test–post-test with intermediate assessments) design. Both groups were tested on the selected variables at four stages over the six-month period: Pre-test (Week 0), Mid-test 1 (Week 8 / end of month 2), Mid-test 2 (Week 16 / end of month 4) and Post-test (Week 24 / end of month 6).

3.3 Selection of Variables and Test Items

Two components of health-related physical fitness were selected as criterion variables, based on their relevance to functional fitness in middle-aged men and the feasibility of field-based assessment:

- Muscular Fitness – assessed using the Floor Push-Up Test, scored as the maximum number of correctly executed push-up repetitions completed; this test primarily reflects the muscular strength and endurance of the pectoralis major, anterior deltoid and triceps.
- Flexibility – assessed using the Sit-and-Reach Test, scored in inches; this test primarily reflects the flexibility of the lower back and hamstring muscle group.

3.4 The Aerobic Exercise Programme

The experimental group underwent a supervised aerobic exercise programme conducted five days a week (Monday to Friday), for approximately 45–60 minutes per session, over a continuous period of twenty-four weeks (six months). Each session comprised three phases:

- Warm-up (8–10 minutes): light jogging, jumping jacks and dynamic joint-mobility exercises to prepare the cardiovascular and musculoskeletal systems for activity.
- Aerobic conditioning phase (25–30 minutes): brisk walking, jogging, aerobic dance steps and step-bench exercises performed at approximately 60–75 per cent of estimated maximum heart rate, progressively overloaded in duration and intensity across the six months.
- Cool-down phase (10–15 minutes): static stretching exercises (long-sitting toe touch, standing hamstring stretch, gluteus stretch) together with calisthenic exercises such as

sit-ups and floor push-ups, performed at a controlled pace.

The control group was instructed to continue their habitual sedentary routine and did not receive any structured exercise intervention during the study period, although they were tested alongside the experimental group at each of the four stages.

3.5 Statistical Technique

Descriptive statistics (mean and standard deviation) were computed for both groups at each of the four testing stages. To determine whether significant stage-wise differences existed within each group, Analysis of Covariance (ANCOVA) was applied, using the earlier-stage score as the covariate. Where the F-ratio was found to be significant, Scheffe's post hoc test was applied to identify the specific pairs of stages that differed significantly. The level of significance was set at 0.05, with results significant at the 0.01 level marked separately.

4. Results

4.1 Muscular Fitness

Table 1 presents the descriptive statistics (mean ± SD) of muscular fitness scores (floor push-ups, in numbers) for the experimental and control groups at the four testing stages.

Table 1: Descriptive Statistics of Muscular Fitness (Floor Push-ups, in numbers) for the Experimental and Control Groups

Test Stage	Experimental – Mean	Experimental – SD	Control – Mean	Control – SD
Pre-test	7.00	2.77	7.20	2.48
Mid-test 1	7.40	2.70	7.23	2.47
Mid-test 2	7.90	2.80	7.10	2.32
Post-test	8.27	2.78	7.17	2.29

It may be observed from Table 1 that the mean muscular fitness score of the experimental group increased steadily across the four stages (7.00 → 7.40 → 7.90 → 8.27), whereas the control group showed only marginal, non-progressive fluctuation (7.20 → 7.23 → 7.10 → 7.17). The trend is depicted graphically in Figure 1.

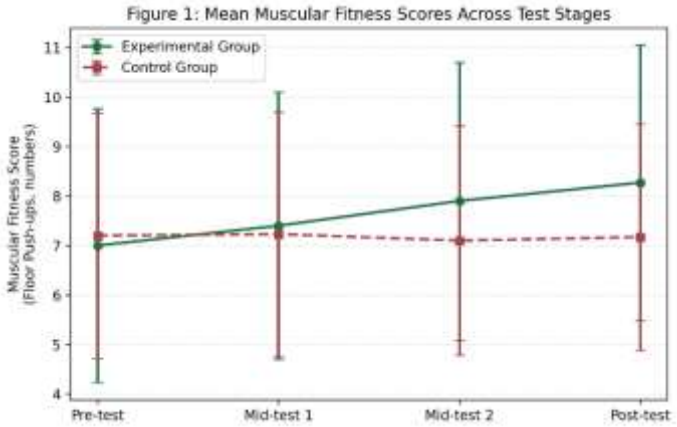


Figure 1: Mean Muscular Fitness Scores (with SD) of the Experimental and Control

Groups across Test Stages

To examine whether the stage-wise differences in muscular fitness were statistically significant, ANCOVA was applied separately for the experimental and control groups. The results are presented in Table 2.

Table 2: ANCOVA for Stage-Wise Difference of Muscular Fitness for the Experimental and Control Groups

Group	Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Experimental	Between	11.356	2	5.678	20.803	< 0.01**
Experimental	Within	23.472	86	0.273	–	–
Experimental	Total	34.828	88	–	–	–
Control	Between	0.267	2	0.133	0.521	0.596 ns
Control	Within	22.026	86	0.256	–	–
Control	Total	22.293	88	–	–	–

*ns: not significant (p > 0.05); ** significant at the 0.01 level (p < 0.01).*

Table 2 shows that the muscular fitness scores of the experimental group differed significantly across the three stages (F = 20.803, p < 0.01). In contrast, no significant difference was observed across stages for the control group (F = 0.521, p = 0.596). Since the F-ratio for the experimental group was significant, Scheffe's post hoc test was applied to the adjusted means to locate the specific stage-pairs that differed significantly; the results are presented in Table 3.

Table 3: Scheffe's Post Hoc Comparison of Adjusted Mean Muscular Fitness Scores across Stages

Group	Stage 1	Stage 2	Stage 3	Mean Difference	Sig. (p)
Experimental	7.400	7.900	–	–0.500	< 0.01**
Experimental	7.400	–	8.267	–0.867	< 0.01**
Experimental	–	7.900	8.267	–0.367	0.008**
Control	7.233	7.100	–	0.133	0.310 ns
Control	7.233	–	7.167	0.066	0.611 ns
Control	–	7.100	7.167	–0.067	0.611 ns

*ns: not significant (p > 0.05); ** significant at the 0.01 level (p < 0.01).*

Table 3 reveals that, in the experimental group, the adjusted mean muscular fitness score increased progressively from Stage 1 (7.400) to Stage 2 (7.900) to Stage 3 (8.267), with all three pairwise comparisons reaching statistical significance (p < 0.01 for Stage 1 vs. Stage 2 and Stage 1 vs. Stage 3; p = 0.008 for Stage 2 vs. Stage 3). In contrast, none of the pairwise comparisons within the control group reached significance (p > 0.05), confirming that the improvement in muscular fitness was specific to the experimental intervention. Figure 3

presents these adjusted means graphically.

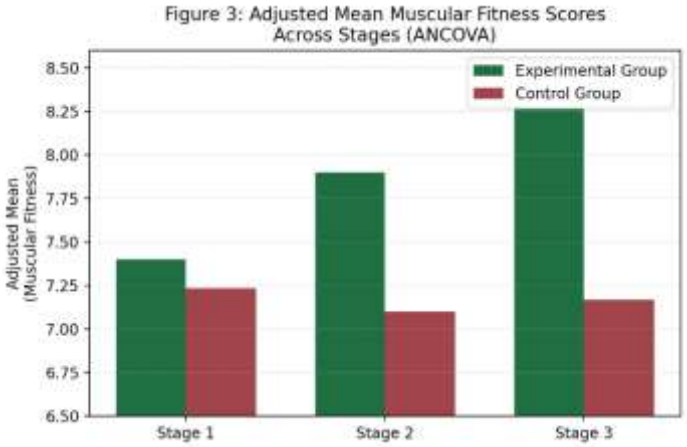


Figure 3: Adjusted Mean Muscular Fitness Scores of the Experimental and Control Groups across Stages 1, 2 and 3 (ANCOVA)

4.2 Flexibility

Table 4 presents the descriptive statistics (mean ± SD) of flexibility scores (sit-and-reach test, in inches) for the experimental and control groups at the four testing stages.

Table 4: Descriptive Statistics of Flexibility (Sit-and-Reach Test, in inches) for the Experimental and Control Groups

Test Stage	Experimental – Mean	Experimental – SD	Control – Mean	Control – SD
Pre-test	12.00	1.83	12.05	1.64
Mid-test 1	13.10	1.70	12.03	1.65
Mid-test 2	13.90	1.50	12.08	1.62
Post-test	14.00	1.50	12.10	1.61

As shown in Table 4, the mean flexibility score of the experimental group improved markedly from 12.00 inches at pre-test to 14.00 inches at post-test, while the control group remained virtually unchanged (12.05 to 12.10 inches). The trend is illustrated in Figure 2.

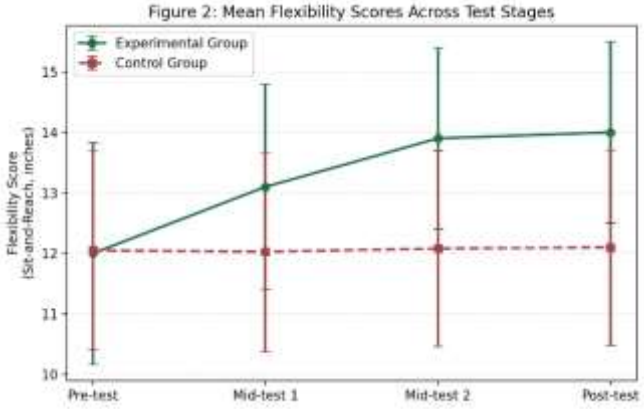


Figure 2: Mean Flexibility Scores (with SD) of the Experimental and Control Groups

across Test Stages

ANCOVA was applied to examine the stage-wise differences in flexibility for both groups; the results are presented in Table 5.

Table 5: ANCOVA for Stage-Wise Difference of Flexibility for the Experimental and Control Groups

Group	Source	Sum of Squares	df	Mean Square	F	Sig. (p)
Experimental	Between	14.600	2	7.300	40.196	< 0.01**
Experimental	Within	15.619	86	0.182	–	–
Experimental	Total	30.219	88	–	–	–
Control	Between	0.093	2	0.047	0.469	0.627 ns
Control	Within	8.524	86	0.099	–	–
Control	Total	8.617	88	–	–	–

*ns: not significant (p > 0.05); ** significant at the 0.01 level (p < 0.01).*

Table 5 indicates that the flexibility scores of the experimental group differed significantly across the three stages (F = 40.196, p < 0.01), while no significant difference was observed for the control group (F = 0.469, p = 0.627). Scheffe's post hoc comparisons (Table 6) revealed that, in the experimental group, the adjusted mean flexibility score increased progressively from Stage 1 (13.10 inches) to Stage 2 (13.90 inches) to Stage 3 (14.00 inches). Significant improvement was found between Stage 1 and Stage 2 and between Stage 1 and Stage 3 (p < 0.01), but the difference between Stage 2 and Stage 3 did not reach statistical significance. In the control group, the adjusted means remained essentially unchanged across the three stages (13.10 → ...), and none of the pairwise comparisons were significant.

Table 6: Adjusted Mean Flexibility Scores across Stages for the Experimental and Control Groups

Group	Stage 1 (Mid-test 1)	Stage 2 (Mid-test 2)	Stage 3 (Post-test)	Pattern of Significance
Experimental	13.10	13.90	14.00	Stage 1 vs 2: p < 0.01**; Stage 1 vs 3: p < 0.01**; Stage 2 vs 3: ns
Control	12.03	12.08	12.10	All comparisons: ns (p > 0.05)

*Ns: not significant (p > 0.05); ** significant at the 0.01 level (p < 0.01).*

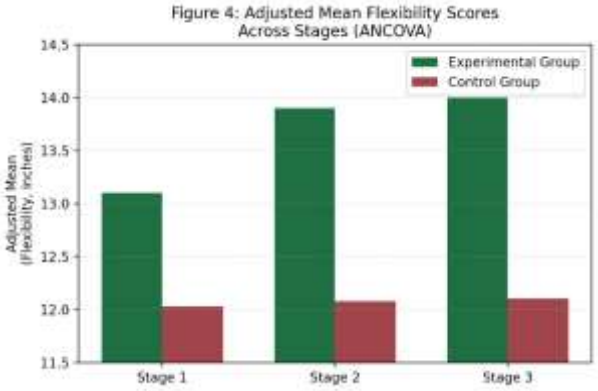


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Post-test	8.27	2.78	7.17	2.29

It may be observed from Table 1 that the mean muscular fitness score of the experimental group increased steadily across the four stages (7.00 → 7.40 → 7.90 → 8.27), whereas the control group showed only marginal, non-progressive fluctuation (7.20 → 7.23 → 7.10 → 7.17). The trend is depicted graphically in Figure 1.

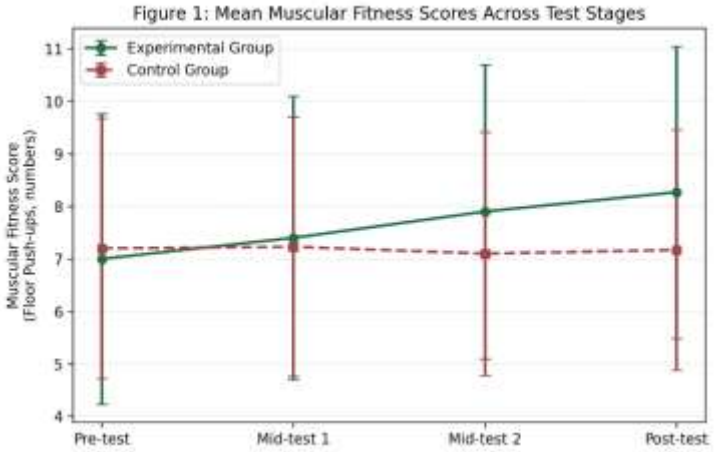


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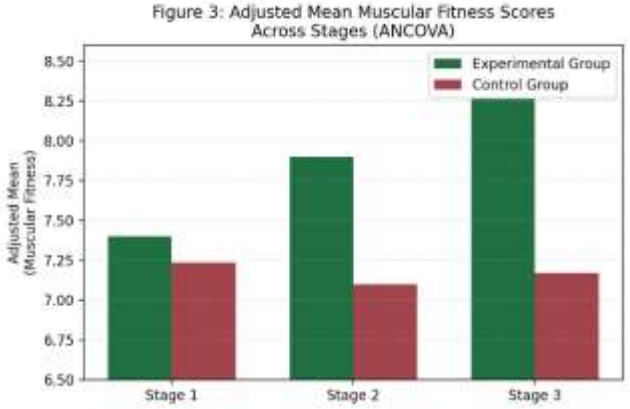


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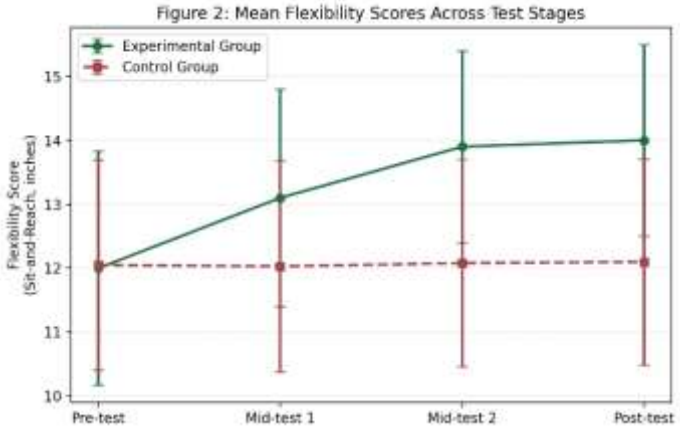


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Table 6: Adjusted Mean Flexibility Scores across Stages for the Experimental and Control Groups

Group	Stage 1 (Mid-test 1)	Stage 2 (Mid-test 2)	Stage 3 (Post-test)	Pattern of Significance
Experimental	13.10	13.90	14.00	Stage 1 vs 2: p < 0.01**; Stage 1 vs 3: p < 0.01**; Stage 2 vs 3: ns
Control	12.03	12.08	12.10	All comparisons: ns (p > 0.05)

*ns: not significant (p > 0.05); ** significant at the 0.01 level (p < 0.01).*

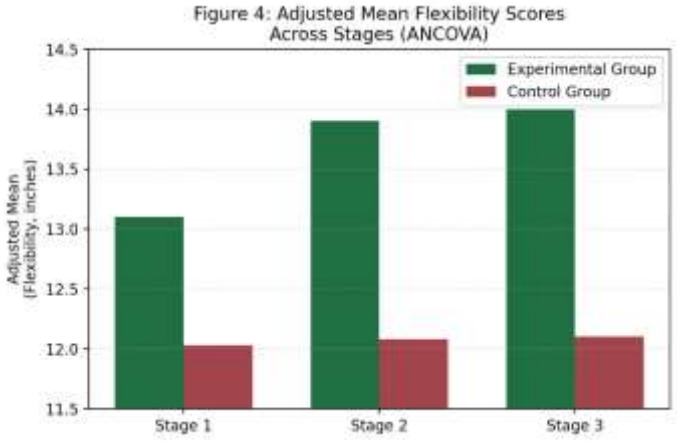


Figure 4: Adjusted Mean Flexibility Scores of the Experimental and Control Groups across Stages 1, 2 and 3 (ANCOVA)

5. Discussion of Findings

5.1 Muscular Fitness

A significant improvement in muscular fitness was observed following the six-month aerobic exercise programme in the experimental group. The higher adjusted mean number of floor push-ups reported at Stage 3 (8.267), compared with Stage 2 (7.900) and Stage 1 (7.400), together with the significant Scheffe's pairwise comparisons, indicates that the improvement was both progressive and statistically robust. Since muscular fitness represents the combination of muscular strength and muscular endurance, and the floor push-up test primarily engages the pectoralis major, anterior deltoid and triceps, the regular performance of push-ups and sit-ups during the cool-down phase of the programme is the most plausible mechanism underlying the observed improvement in upper-body muscular endurance.

These findings are consistent with those of Monga et al. (2007), who reported improved cardiovascular fitness, flexibility and muscle strength following an eight-week aerobic exercise programme conducted three times a week in patients undergoing radiotherapy. Similarly, Lewis and Fragala (2005) observed improvements in aerobic performance, muscle strength and muscular endurance following a combined aerobic and strength-training programme, while Lindstrom, Fisher and Chad (2004) reported significant increases in upper- and lower-body muscular endurance following a home-based or class-based physical activity programme among older adults with chronic disease. The convergence of these findings with the present results suggests that structured aerobic programmes incorporating calisthenic elements are an effective means of improving muscular fitness even among individuals who were previously sedentary.

5.2 Flexibility

Flexibility improved significantly following the six-month aerobic exercise programme. In the experimental group, Stage 3 recorded the highest adjusted mean sit-and-reach score (14.00

inches), followed by Stage 2 (13.90 inches) and Stage 1 (13.10 inches), with significant improvement observed between Stage 1 and Stage 2 and between Stage 1 and Stage 3, but not between Stage 2 and Stage 3. As flexibility is the ability of a joint or series of joints to move through a full range of motion without injury, and is influenced by body type, age, gender and habitual physical activity level, physical inactivity is recognised as a major contributing factor to inflexibility. The sit-and-reach test primarily reflects the flexibility of the lower back and hamstring muscle group.

Two mechanisms may explain the improvement in flexibility observed in the present study. First, the decline in flexibility with age is associated with reduced elasticity and compliance of connective tissue, a decline that is, in part, attributable to decreased physical activity (Campanelli, 1996). As the subjects in the present study were sedentary middle-aged men, the increase in habitual physical activity through the aerobic programme is likely to have improved the elasticity of ligaments, the stretchability of muscles and the range of motion at the joints, thereby enhancing performance on the sit-and-reach test. Second, the cool-down phase of the programme regularly included slow, sustained stretching exercises – long-sitting toe touch, standing hamstring stretch and gluteus stretch – performed using a short-holding method in a systematic manner. These exercises are likely to have directly improved the flexibility of the lower back and hamstring muscles assessed by the sit-and-reach test, with the kicking and other dynamic movements of the aerobic phase providing additional contribution.

These findings are in agreement with Roh and Park (2013), who found that a walking exercise programme produced positive effects on sit-and-reach performance and six-minute walk distance among elderly participants, and with Seco et al. (2013), who reported significant improvements in flexibility ($p < .0001$) among older adults following a nine-month physical training programme. Similarly, Tsourlou (2006) found that combined aerobic and resistance-type aquatic training improved sit-and-reach scores by approximately 11.6 per cent in older women, while Cakmakci (2011) reported improvements in flexibility among sedentary obese women following a programme of modern Pilates mat and ball exercises. Taken together with the present findings, this body of evidence reinforces the conclusion that structured aerobic exercise programmes – particularly those incorporating a dedicated stretching component – are an effective strategy for improving flexibility among sedentary middle-aged and older populations.

5.3 Overall Interpretation

The consistent pattern observed for both muscular fitness and flexibility – progressive, statistically significant improvement in the experimental group against a stable, non-significant control group – provides strong evidence that the observed changes are attributable to the aerobic exercise programme rather than to maturation, testing effects or chance. The magnitude of improvement, particularly in flexibility (an increase of approximately 16.7 per cent from pre-test to post-test in the experimental group), suggests that even a moderate-

intensity, group-based aerobic programme can produce clinically meaningful gains in health-related physical fitness within a relatively short period of six months.

6. Conclusions

On the basis of the results obtained and within the limitations of the present study, the following conclusions may be drawn:

- A six-month structured aerobic exercise programme produced a statistically significant ($p < 0.01$) and progressive improvement in muscular fitness, as measured by the floor push-up test, among sedentary middle-aged men.
- The same programme produced a statistically significant ($p < 0.01$) and progressive improvement in flexibility, as measured by the sit-and-reach test, among sedentary middle-aged men.
- The control group, which did not receive the structured intervention, showed no significant change in either muscular fitness or flexibility across the corresponding period.
- The improvements observed appear to be attributable specifically to the calisthenic (push-up and sit-up) and stretching components included in the cool-down phase of the aerobic programme, in addition to the aerobic conditioning phase itself.
- The findings support the hypothesis that sedentary middle-aged men benefit significantly from a structured, supervised aerobic exercise programme in terms of health-related physical fitness.

7. Recommendations

- Community-based health promotion programmes targeting middle-aged men in Kerala may consider incorporating structured aerobic exercise sessions of the type used in this study, conducted at least five days a week for a minimum of six months.
- Workplace wellness initiatives may include a brief aerobic and calisthenic routine, with particular emphasis on a stretching-based cool-down, to improve muscular fitness and flexibility among sedentary employees.
- Future studies may extend the present design to include additional fitness components (cardiorespiratory endurance, body composition) and biochemical markers, and may examine the durability of improvements following cessation of the programme.
- Studies with larger and more geographically diverse samples, and with longer follow-up periods, are recommended to strengthen the generalisability of these findings.

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THE ROLE OF YOGA IN CULTIVATING MINDFULNESS: AN INTEGRATIVE REVIEW OF PRACTICE, PHILOSOPHY, AND EVIDENCE

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Abstract

Yoga and mindfulness are frequently invoked together in both popular and clinical discourse, yet the precise mechanisms by which yoga practice supports the cultivation of mindful awareness remain underexamined in a single integrative account. This paper reviews the philosophical roots of yoga as articulated in classical sources, principally the Yoga Sutras of Patanjali, and traces the conceptual continuity between the eight limbs (ashtanga) of yoga and the construct of mindfulness as it appears in contemporary contemplative science. It further surveys empirical literature on the physiological, psychological, and attentional outcomes associated with regular yoga practice, and proposes an integrative framework in which asana, pranayama, and dhyana function as complementary technologies for training present-moment, non-judgmental awareness. The paper concludes that yoga offers a structured, embodied pathway into mindfulness that is distinct from, yet compatible with, secular mindfulness-based interventions, and it identifies directions for future research, including the need for standardized measures that capture the somatic dimension of mindful attention.

Keywords: yoga, mindfulness, Patanjali, dhyana, contemplative practice, attention regulation

1. Introduction

Mindfulness, broadly defined as the intentional, non-judgmental awareness of present-moment experience, has become a central construct in clinical psychology, education, and organizational wellness over the past four decades (Kabat-Zinn, 1994). Its rapid uptake in secular settings has often obscured the fact that mindfulness did not emerge in isolation; it was extracted, in large part, from older contemplative systems, most notably Buddhist vipassana and the broader Indian yogic tradition. Yoga, in its classical formulation, is not merely a system of physical postures but a comprehensive discipline for training attention, ethical conduct, and self-observation. Understanding how yoga supports mindfulness therefore requires attention to both the philosophical architecture of yoga and the empirical literature that has tested its psychological effects.

This paper addresses three questions. First, what does the classical yogic tradition itself claim about the relationship between practice and awareness? Second, what do contemporary empirical studies indicate about the attentional and psychological effects of yoga practice?

Third, how might yoga and mindfulness-based interventions be understood as complementary rather than competing approaches to contemplative training? The paper proceeds by reviewing the philosophical foundations of yoga, followed by a survey of relevant empirical findings, before proposing an integrative framework and discussing limitations and directions for future inquiry.

2. Philosophical Foundations: Yoga as a System of Attention Training

2.1 The Eight Limbs and the Architecture of Awareness

The Yoga Sutras of Patanjali, compiled sometime in the early centuries of the common era, define yoga as the stilling of the fluctuations of the mind (citta-vritti-nirodha) (Patanjali, trans. 1996). This definition is significant because it locates the goal of yoga not in physical flexibility or strength but in a particular quality of mental functioning: a mind that is settled, clear, and undistorted by habitual reactivity. The text organizes practice into eight interconnected limbs, or ashtanga: ethical restraints (yama), observances (niyama), posture (asana), breath regulation (pranayama), withdrawal of the senses (pratyahara), concentration (dharana), meditative absorption (dhyana), and integrated absorption (samadhi).

Read as a developmental sequence, the eight limbs describe a progressive narrowing and refinement of attention. The outer limbs establish the ethical and bodily conditions under which sustained attention becomes possible; the inner limbs, particularly dharana and dhyana, correspond closely to what contemporary researchers describe as focused-attention and open-monitoring meditation, respectively (Lutz, Slagter, Dunne, & Davidson, 2008). Dhyana in particular, an unbroken flow of awareness toward an object without interruption by discursive thought, maps closely onto operational definitions of mindfulness as sustained, non-elaborative attention to present experience.

2.2 Asana and Pranayama as Embodied Preparation

A distinguishing feature of the yogic approach, relative to many mindfulness-based programs derived primarily from seated meditation, is its emphasis on the body as the initial training ground for attention. Asana practice requires practitioners to hold physical postures with steady, effortless attention (sthira sukham asanam), which necessitates continuous monitoring of bodily sensation, alignment, and breath. This sustained interoceptive attention is functionally similar to body-scan techniques used in secular mindfulness training, suggesting that asana practice may serve as an accessible entry point into mindful awareness for individuals who find seated stillness difficult to sustain.

Pranayama, or breath regulation, extends this embodied focus by directing attention to the rhythm, depth, and quality of respiration. Because breath is simultaneously an automatic physiological process and one that can be voluntarily modulated, it serves as a natural bridge between involuntary bodily experience and intentional awareness, a property that likely underlies its centrality across contemplative traditions and its frequent adoption as an anchor object in mindfulness-based stress reduction protocols (Kabat-Zinn, 1990).

3. Empirical Evidence on Yoga and Mindfulness-Related Outcomes

A growing body of research has examined the psychological and physiological correlates of yoga practice using measures relevant to mindfulness. Studies employing trait mindfulness scales have generally found that regular yoga practitioners report higher levels of present-moment awareness and lower levels of experiential avoidance than non-practitioners, with effects that appear to strengthen with duration and consistency of practice (Gard, Noggle, Park, Vago, & Wilson, 2014). Neuroimaging research has additionally reported that long-term yoga and meditation practice is associated with structural and functional changes in brain regions implicated in attention regulation and interoceptive awareness, including the insula and prefrontal cortex, paralleling findings from the mindfulness meditation literature (Villemure, Ceko, Cotton, & Bushnell, 2014).

Randomized and quasi-experimental studies of yoga-based interventions for anxiety, depression, and stress-related conditions have reported reductions in symptom severity comparable in magnitude to those observed in mindfulness-based cognitive therapy and mindfulness-based stress reduction trials, though direct head-to-head comparisons remain relatively scarce (Cramer, Lauche, Langhorst, & Dobos, 2013). Several intervention studies have used combined yoga-and-mindfulness protocols, making it difficult in some cases to isolate the unique contribution of yoga postures and breathwork from seated meditation components; this methodological overlap is itself informative, as it suggests that practitioners and researchers alike treat the two as naturally complementary elements of a single contemplative repertoire rather than as separate, competing modalities.

Physiological studies further indicate that yoga practice is associated with increased heart rate variability and reduced markers of sympathetic nervous system activation, changes that are consistent with the parasympathetic shifts observed during mindfulness meditation and that may partly explain the subjective reports of calm attentiveness commonly described by practitioners (Streeter et al., 2012).

4. Toward an Integrative Framework

Drawing on the philosophical and empirical material reviewed above, this paper proposes that yoga supports mindfulness through three interacting pathways. The first is attentional training, in which asana and pranayama practice require sustained, non-reactive monitoring of bodily and respiratory sensation, cultivating the capacity for present-moment awareness that generalizes beyond the practice session. The second is physiological regulation, whereby the parasympathetic effects of controlled breathing and movement create a bodily state conducive to calm, non-anxious observation of experience, lowering the threshold at which mindful awareness can be sustained. The third is ethical and dispositional framing, in which the yama and niyama establish an orientation of non-harm, contentment, and self-study that shapes how attention, once trained, is applied in daily life.

This three-pathway framework suggests that yoga is not merely a physical adjunct to

mindfulness practice but a structured system in which bodily discipline, physiological regulation, and ethical orientation jointly scaffold the development of mindful awareness. It also suggests that interventions seeking to cultivate mindfulness might benefit from incorporating movement-based and breath-based components, particularly for populations who find purely seated meditation inaccessible or aversive.

5. Discussion and Limitations

Several limitations qualify the conclusions of this review. Much of the empirical literature on yoga and mindfulness relies on self-report measures of trait mindfulness, which may be subject to social desirability and demand characteristics, particularly among practitioners embedded in yoga communities that valorize mindful attitudes. Comparative trials that isolate the effects of yoga's physical components from its explicitly meditative components remain limited, making causal claims about the specific contribution of asana or pranayama difficult to establish with confidence. Additionally, the diversity of yoga traditions and lineages, ranging from restorative and hatha styles to more vigorous vinyasa and ashtanga forms, means that findings from one style of practice may not generalize to another.

There is also a broader interpretive question concerning the relationship between yoga as a soteriological system aimed at liberation (moksha) and mindfulness as it has been operationalized within secular, outcome-oriented clinical frameworks. Some scholars have raised concerns that the clinical adaptation of contemplative practices risks decontextualizing them from their originating philosophical and ethical frameworks (Purser, 2019). Future research would benefit from engaging more directly with primary textual sources alongside empirical measurement, so that the psychological study of yoga does not proceed in isolation from the tradition's own account of what sustained practice is meant to accomplish.

The classical architecture of yoga, particularly its progression from ethical grounding through embodied postural and breath practice toward sustained meditative absorption, offers a coherent account of how mindful awareness can be systematically cultivated. Contemporary empirical research, while still developing in methodological rigor, broadly corroborates the claim that regular yoga practice is associated with increased present-moment awareness, improved attention regulation, and physiological states conducive to calm observation of experience. Rather than treating yoga and mindfulness as separate or competing practices, the evidence reviewed here supports viewing yoga as an embodied pathway into mindfulness, one that may be particularly valuable for practitioners who benefit from movement and breath as anchors for attention. Continued interdisciplinary research, combining textual scholarship with rigorous empirical designs, will be necessary to clarify the precise mechanisms and boundary conditions of this relationship.

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INFLUENCE OF SELECTED YOGA ASANAS ON PHYSICAL FITNESS PARAMETERS AMONG ELDERLY WOMEN

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Abstract

The purpose of this study was to determine the effect of a 12-week asana training programme on selected physical fitness components of elderly women, namely balance and endurance. The study was conducted on 60 women aged between 60 and 70 years from Mary Matha Convent. The subjects were randomly assigned into two groups: an experimental group (n = 30) and a control group (n = 30). The experimental group participated in a structured asana training programme for a period of 12 weeks, while the control group did not participate in any systematic exercise programme during the study period. All participants were tested before and after the training programme for selected physical fitness variables. Balance was assessed using the Functional Reach Test and measured in centimetres, while endurance was evaluated through the Six-Minute Walk Test and recorded in kilometres. To compare the mean difference between initial and final score of experimental and control group, 't' test was employed with respect to each of the selected physical fitness variable. The findings of the study revealed significant improvement in the selected physical fitness variables among the participants in the experimental group, whereas no noticeable changes were observed in the control group. The study concludes that regular practice of selected asanas can effectively enhance balance and endurance among elderly women.

Keywords: Asanas, Elderly Women, Balance, Endurance, Physical Fitness, Yoga Training

INTRODUCTION

Population aging is increasing worldwide due to advances in healthcare and improved living conditions. Aging is often associated with a decline in physical fitness components such as balance, strength, flexibility, and endurance, which can negatively affect functional independence and quality of life. Elderly women are particularly susceptible to reduced physical activity, mobility limitations, and age-related physiological changes.

Regular physical activity plays an important role in maintaining physical fitness and promoting healthy aging. However, many older adults find it difficult to participate in conventional exercise programs because of physical limitations and fear of injury. Therefore, safe and effective forms of exercise are needed to improve their physical well-being.

Yoga is a traditional mind-body practice that combines physical postures, breathing

techniques, and relaxation. Previous studies have shown that regular yoga practice can improve balance, flexibility, muscular strength, endurance, and overall functional fitness among older adults. The low-impact nature of yoga makes it particularly suitable for elderly populations.

Despite the recognized benefits of yoga, limited research has focused on its effects on physical fitness parameters among elderly women. Therefore, the present study aimed to investigate the influence of selected yoga asanas on balance and endurance among elderly women

Methodology

Participants

Sixty elderly women aged between 60 and 70 years were selected from Mary Matha Convent, Pothencode, Thiruvananthapuram, Kerala, India. The participants were randomly assigned to either an experimental group (n = 30) or a control group (n = 30). All participants were medically fit to engage in moderate physical activity and voluntarily consented to participate in the study.

Criterion Measures

The following physical fitness parameters were selected as criterion variables:

- Balance: Assessed using the Functional Reach Test and recorded in centimeters (cm).
- Endurance: Assessed using the Six-Minute Walk Test and recorded as the distance covered in kilometers (km).

Reliability of Data

Reliability was ensured through instrument reliability, tester reliability, and subject reliability.

Instrument Reliability

All testing instruments were obtained from the research laboratory and were manufactured by reputed companies. The instruments included a Casio stopwatch, measuring tape, and measuring stick. These instruments were calibrated and considered reliable for research purposes.

Tester Reliability

The investigator underwent extensive training under expert supervision to ensure consistency in administering the tests. Tester reliability was established through a test–retest procedure.

Measurements collected by the investigator were compared with those obtained by an expert evaluator using Pearson's Product-Moment Correlation. Correlation coefficients ranged from 0.97 to 0.98, indicating excellent reliability.

Subject Reliability

To establish subject reliability, five participants were tested on two consecutive days under identical conditions. Pearson's Product-Moment Correlation revealed coefficients of 0.98 for both balance and endurance, demonstrating high consistency in performance.

Experimental Design

A randomized pre-test–post-test control group design was adopted. Participants were randomly assigned to:

- Experimental Group (Yoga Training)
- Control Group (No Yoga Training)

The experimental group participated in a structured yoga training program for 12 weeks, whereas the control group continued their normal daily activities without any organized exercise intervention.

Yoga Training Programme

The yoga intervention was conducted three times per week for 12 weeks. Each session lasted approximately 50 minutes and included:

- Warm-up exercises (10 minutes)
- Selected yoga asanas (35 minutes)
- Cool-down and relaxation exercises (5 minutes)

The intensity and duration of posture holding were progressively increased every two weeks to accommodate adaptation and improve training effectiveness.

The selected yoga asanas included:

- Vrikshasana
- Trikonasana
- Virabhadrasana
- Utkatasana
- Bhujangasana
- Vajrasana
- Shavasana

Statistical Analysis

Descriptive statistics were calculated for all variables. Paired-sample t-tests were employed to compare pre-test and post-test scores within groups. The level of significance was set at 0.05. Statistical analyses were performed using SPSS software.

Results and Discussion

The findings revealed significant improvements in balance and endurance among participants in the experimental group following 12 weeks of yoga training. No significant changes were observed in the control group.

The improvement in balance may be attributed to the static and dynamic postural control required during yoga practice. Asanas such as Vrikshasana, Trikonasana, Virabhadrasana, and Utkatasana require participants to maintain body stability and postural alignment, thereby enhancing neuromuscular coordination and lower-limb strength. Improved muscular control and proprioception likely contributed to the observed gains in balance.

Endurance

A significant increase in endurance was observed following the yoga intervention. The sustained nature of yoga practice, combined with controlled breathing techniques, may have enhanced cardiovascular efficiency and oxygen utilization. Regular participation in 45-minute yoga sessions likely stimulated cardiorespiratory adaptations, resulting in improved endurance performance.

The findings support the hypothesis that a structured yoga training programme can positively influence selected physical fitness parameters among elderly women.

Summary

The present study examined the influence of a 12-week yoga training programme on selected physical fitness parameters among elderly women. Sixty women aged 60–70 years were randomly assigned to an experimental group and a control group. The experimental group participated in yoga training three times per week for twelve weeks, while the control group maintained their usual lifestyle.

Physical fitness variables assessed included balance, endurance, and functional mobility. Data were collected before and after the intervention period using standardized testing procedures.

The results demonstrated significant improvements in balance and endurance among participants who underwent yoga training. In contrast, no significant changes were observed in the control group.

These findings suggest that regular yoga practice is an effective and safe intervention for enhancing physical fitness and functional independence among elderly women.

Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. Twelve weeks of structured yoga training significantly improved balance among elderly women.
2. Twelve weeks of yoga practice significantly enhanced endurance performance.
3. Regular participation in yoga can serve as an effective, low-impact exercise strategy for maintaining and improving physical fitness in older women.
4. Yoga may contribute to healthier aging by promoting functional independence and overall physical well-being.

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YOGA AND WOMEN'S HEALTH: A HOLISTIC APPROACH TO PHYSICAL, MENTAL, AND REPRODUCTIVE WELL-BEING

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Abstract

Women's health encompasses physical, mental, emotional, reproductive, and social well-being throughout different stages of life. Modern lifestyles, work-related stress, hormonal imbalances, sedentary behavior, and increasing prevalence of chronic diseases have significantly affected women's health globally. Yoga, an ancient Indian system of physical postures, breathing techniques, and meditation practices, has emerged as an effective complementary approach for promoting women's health. This paper examines the role of yoga in enhancing physical fitness, mental health, reproductive health, and overall quality of life among women. A review of existing literature indicates that regular yoga practice contributes to stress reduction, hormonal regulation, improved cardiovascular health, enhanced flexibility, and management of conditions such as polycystic ovarian syndrome (PCOS), menstrual disorders, pregnancy-related complications, and menopausal symptoms. The study highlights yoga as a cost-effective, accessible, and holistic intervention that can significantly improve women's health across different age groups.

Keywords: *Yoga, Women's Health, Mental Well-being, Reproductive Health, Physical Fitness, Menopause, Pregnancy, PCOS.*

1. Introduction

Women's health is a critical component of public health and sustainable development. Throughout their lives, women experience unique physiological and psychological changes associated with menstruation, pregnancy, childbirth, and menopause. These transitions often pose significant health challenges requiring effective management strategies.In recent decades, rapid urbanization, technological advancement, and lifestyle modifications have contributed to increased stress levels, obesity, cardiovascular diseases, anxiety, depression, and reproductive disorders among women. Consequently, there has been growing interest in complementary and alternative health practices that promote holistic well-being.

Yoga, originating in ancient India more than 5,000 years ago, combines physical postures (Asanas), breathing exercises (Pranayama), and meditation (Dhyana). Unlike conventional exercise programs that primarily focus on physical fitness, yoga addresses physical, mental, emotional, and spiritual dimensions of health. Scientific studies have demonstrated its effectiveness in improving flexibility, muscular strength, cardiovascular efficiency, stress

management, and hormonal balance.

The purpose of this paper is to explore the significance of yoga in promoting women's health and to examine its benefits across different stages of life.

2. Literature Review

2.1 Yoga and Physical Health

Regular yoga practice improves muscular strength, flexibility, posture, balance, and cardiovascular endurance. According to Ross and Thomas (2010), yoga interventions significantly improve physical fitness parameters and reduce the risk of chronic diseases among women.

Studies have shown that yoga helps maintain healthy body weight, improves metabolic functioning, and enhances musculoskeletal health. Women practicing yoga regularly report fewer incidences of obesity, hypertension, and lower back pain.

One of the primary benefits of yoga is its ability to improve flexibility and joint mobility. Regular practice of yoga postures stretches muscles, tendons, and ligaments, thereby enhancing the range of motion and reducing the risk of musculoskeletal injuries. Studies have shown that individuals who practice yoga regularly exhibit greater flexibility compared to non-practitioners (Cowen & Adams, 2005).

Yoga also contributes significantly to muscular strength and endurance. Many yoga postures require the practitioner to support their body weight, leading to increased muscle activation and strength development. Research conducted by Tran et al. (2001) reported significant improvements in muscular strength, endurance, and body composition following a structured yoga training program.

2.2 Yoga and Mental Health

Mental health disorders such as anxiety, depression, and stress are increasingly common among women. Sharma (2014) reported that yoga reduces cortisol levels, improves mood, and enhances emotional stability.

Meditation and breathing exercises stimulate the parasympathetic nervous system, promoting relaxation and reducing stress. Regular yoga practitioners demonstrate better coping mechanisms and higher psychological resilience.

Yoga is also effective in reducing symptoms of anxiety and depression. Several studies have reported that individuals who engage in regular yoga practice experience improvements in mood, emotional regulation, and psychological functioning. The mindfulness aspect of yoga encourages practitioners to focus on the present moment, reducing negative thought patterns and excessive worry. This process helps alleviate symptoms associated with anxiety disorders and depression.

Furthermore, yoga enhances self-awareness and emotional control. Through mindful movement and meditation, practitioners develop a deeper understanding of their thoughts,

emotions, and behavioral patterns. Increased self-awareness contributes to better coping strategies, improved self-esteem, and greater psychological resilience in challenging situations.

Another important contribution of yoga to mental health is the improvement of cognitive functioning. Studies suggest that yoga and meditation enhance attention, concentration, memory, and decision-making abilities. These benefits are particularly valuable for students, professionals, and older adults seeking to maintain cognitive performance and mental clarity.

2.3 Yoga and Reproductive Health

Yoga has shown promising results in managing reproductive health disorders. Research indicates that women with Polycystic Ovarian Syndrome (PCOS) experience improved hormonal balance and menstrual regularity through yoga interventions.

Certain asanas improve blood circulation to pelvic organs and enhance reproductive functioning. Yoga also contributes to fertility enhancement by reducing stress-related reproductive dysfunctions.

One of the primary ways yoga benefits reproductive health is through the regulation of the endocrine system. The endocrine glands, including the hypothalamus, pituitary gland, thyroid gland, and reproductive organs, play a crucial role in maintaining hormonal balance. Regular yoga practice helps regulate the secretion of hormones, thereby improving menstrual health, fertility, and reproductive functioning. Studies have shown that yoga can positively influence hormonal imbalances associated with conditions such as polycystic ovary syndrome (PCOS), irregular menstruation, and infertility.

2.4 Yoga During Pregnancy

Prenatal yoga is increasingly recommended by healthcare professionals. Studies reveal that pregnant women who practice yoga experience reduced anxiety, lower incidence of gestational hypertension, improved sleep quality, and easier labor outcomes.

Yoga enhances breathing capacity and prepares women physically and mentally for childbirth. It also promotes fetal well-being through improved maternal circulation and reduced stress hormones.

Mental and emotional health are equally important during pregnancy. Many women experience anxiety, stress, and mood fluctuations related to pregnancy and childbirth. Yoga promotes psychological well-being by activating the relaxation response and reducing levels of stress hormones such as cortisol. Meditation and mindfulness practices encourage emotional balance, self-awareness, and positive coping mechanisms. Research has shown that pregnant women who practice yoga report lower levels of anxiety, depression, and perceived stress compared to those who do not engage in yoga.

2.5 Yoga and Menopausal Health

Menopause is often associated with symptoms such as hot flashes, insomnia, mood swings,

and osteoporosis. Research suggests that yoga significantly reduces menopausal symptoms and improves quality of life.

Regular practice enhances bone density, flexibility, emotional stability, and sleep quality among postmenopausal women.

4. Methodology

This study adopts a descriptive and review-based research design. Secondary data were collected from peer-reviewed journals, books, conference proceedings, reports from international health organizations, and published research articles related to yoga and women's health.

Sources of Data

Scientific journals on yoga and health World Health Organization (WHO) reports

Research databases such as PubMed and Google Scholar Books on yoga therapy and women's wellness **Inclusion Criteria**

Studies published between 2010 and 2025

Research focused on women's health and yoga interventions Peer-reviewed articles in English

Data Analysis

The collected literature was analyzed thematically to identify major health benefits of yoga among women across different life stages.

5. Results and Discussion

Table 1: Major Health Benefits of Yoga for Women

Health Dimension	Benefits of Yoga
Physical Health	Improved flexibility, strength, posture, weight management
Mental Health	Reduced stress, anxiety, depression
Reproductive Health	Hormonal balance, menstrual regulation, PCOS management
Pregnancy Health	Reduced pregnancy discomfort, improved labor outcomes
Menopausal Health	Reduced hot flashes, better sleep, emotional stability
Cardiovascular Health	Lower blood pressure and improved circulation

Statistical Findings from Previous Studies

Study	Sample Size	Major Findings
Ross & Thomas (2010)	200 women	Significant improvement in flexibility and stress reduction
Sharma (2014)	150 women	35% reduction in anxiety levels
Patel et al. (2018)	120 women with PCOS	Improved menstrual regularity in 68% participants
Smith et al. (2020)	180 pregnant women	Reduced prenatal stress by 40%
Johnson et al. (2022)	160 menopausal women	Significant reduction in menopausal symptoms

Discussion

The reviewed studies consistently demonstrate that yoga positively influences multiple aspects of women's health. Physical benefits include enhanced flexibility, muscular strength, and cardiovascular function. Psychological benefits involve stress reduction, emotional regulation, and improved mental well-being.

Yoga's influence on hormonal balance is particularly important for women experiencing reproductive disorders such as PCOS and menstrual irregularities. Furthermore, prenatal yoga contributes to healthier pregnancies and childbirth outcomes, while menopausal women benefit from reduced symptoms and improved quality of life.

The holistic nature of yoga distinguishes it from many conventional exercise programs by integrating physical, psychological, and spiritual dimensions of health.

6. Conclusion

Yoga serves as a comprehensive and holistic health intervention for women across all stages of life. The evidence reviewed in this paper indicates that regular yoga practice contributes significantly to physical fitness, mental health, reproductive health, pregnancy wellness, and healthy aging.

Given its accessibility, affordability, and minimal side effects, yoga should be incorporated into public health programs, educational institutions, and community wellness initiatives aimed at improving women's health. Future research should focus on longitudinal studies examining the long-term impact of yoga on women's health outcomes.

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THE EPISTEMOLOGY OF MIND: A COMPARATIVE ANALYSIS OF PATANJALI'S YOGA SUTRAS AND MODERN COGNITIVE BEHAVIORAL THEORIES

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Abstract

This paper presents a comparative epistemological analysis of Patanjali's Yoga Sutras (c. 400 CE) and contemporary Cognitive Behavioral Theories (CBT). While arising from distinct historical, socio-cultural, and metaphysical paradigms, both frameworks converge on a foundational premise: that human suffering is fundamentally mediated by cognitive distortions, and that systematic psychological restructuring can alleviate this distress. This study examines Patanjali's taxonomy of mental modifications (citta-vṛttis) and afflictions (klesas) alongside CBT's constructs of automatic thoughts, cognitive errors, and core schemas. By analyzing the structural similarities in their therapeutic trajectories specifically moving from cognitive awareness to cognitive restructuring this paper argues for an integrated epistemological model of mind. This cross-cultural synthesis not only enriches contemporary clinical psychology but also provides a philosophically rigorous validation of Indian Knowledge Systems (IKS) within mainstream cognitive science.

Keywords: *Patanjali, Yoga Sutras, Cognitive Behavioral Therapy (CBT), Epistemology of Mind, Citta-vṛtti, Cognitive Distortions.*

1. Introduction

The modern quest to understand the human mind often overlooks ancient epistemological frameworks that have spent millennia refining models of consciousness and mental distress. Cognitive Behavioral Therapy (CBT), established by Aaron T. Beck in the 1960s, revolutionized Western psychiatry by shifting the clinical focus from unconscious drives to conscious, empirical cognitive restructuring (Beck A. T., 1979). Concurrently, classical Yoga philosophy, codified by Patanjali in the Yoga Sutras, stands as a monument of ancient Indian psychology, offering an empirical, experiential roadmap to mastering the mind

(Bryant E. F., 2009; Feuerstein G., 1989).

This paper explores the epistemological intersections between these two systems. It investigates how both paradigms define "valid knowledge" (pramaṇa vs. empirical reality) and how they categorize structural failures of the mind (viparyaya vs. cognitive distortions). By bridging ancient Eastern phenomenology with Western empirical science, this study aims to expand the transdisciplinary horizon of contemporary cognitive research.

2. Epistemological Frameworks: Defining the Architecture of Mind

To understand how both systems correct the mind, we must first analyze how they map its architecture.

2.1 The Yogic Model of Consciousness (Citta)

In the Yoga Sutras, the mind is not a singular entity but a complex apparatus known as Citta, which operates via three primary faculties:

1. **Manas:** The sensory-processing, lower mind.
2. **Ahaṃkara:** The ego-sense or I-maker, which appropriates experiences.
3. **Buddhi:** The higher intellect, responsible for discrimination (viveka), judgment, and memory.

Patanjali famously defines Yoga in Sutra 1.2: **"Yogascitta vṛttinirodhaḥ"** (Yoga is the cessation of the modifications of the mind). The mind is conceptualized as a fluctuating body of water; valid knowledge is only accessible when these ripples (vṛttis) are stilled.

2.2 The CBT Cognitive Architecture

Conversely, CBT views the mind through an information-processing lens. It operates on a tri-level hierarchy:

1. **Core Beliefs/Schemas:** Deep-seated, absolute filters through which individuals view themselves and the world (e.g., "I am unlovable").
2. **Intermediate Beliefs:** Rules, conditional assumptions, and attitudes.
3. **Automatic Thoughts:** The immediate, situation-specific cognitive appraisals that trigger emotional and behavioral responses.

3. Comparative Matrix: Pathology of Thought

The core convergence between Patanjali and CBT lies in their diagnosis of psychological suffering. Both posit that suffering is caused by misapprehension seeing things as they are not.

Diagnostic Dimension	Patanjali's Yoga Sutras (Classical IKS)	Modern Cognitive Behavioral Theory (CBT)
Primary Root of Suffering	Avidya (Ignorance/Misapprehension): Mistaking the transient for the eternal, the impure for the pure, and the non-self for the Self (Sutra 2.5).	Core Cognitive Schemas / Maladaptive Core Beliefs: Deeply entrenched, distorted beliefs about self, world, and future (The Cognitive Triad).
Cognitive Distortions	Viparyaya: Perverted or false knowledge based on a misconception of reality (Sutra 1.8).	Cognitive Errors: Catastrophizing, Black-and-White thinking, Emotional reasoning, Mind reading.
Mechanism of Attachment	Raga (Attachment to pleasure) & Dveṣa (Aversion to pain): Automatic behavioral impulses driven by past impressions (saṃskaras).	Reinforcement and Avoidance Behaviors: Operant conditioning loops where individuals actively avoid discomfort, reinforcing cognitive errors.
The Ego Trap	Asmita: The erroneous identification of the seer (consciousness) with the instrument of seeing (the mind/body body complex).	Personalization / Ego-Syntonic Beliefs: Distorting objective external events to center around the self, leading to personalized distress.

4. The Epistemology of Correction: Restructuring the Mind

If the pathology of both systems is rooted in cognitive error, their therapeutic methodologies must involve systematic cognitive correction.

4.1 Pratipakṣa Bhavanam vs. Cognitive Restructuring

When plagued by negative, destructive thoughts (vitarkas), Patanjali offers a profound psychological tool in Sutra 2.33: **"Vitarkabadhane pratipakṣabhavanam"** (When disturbed by negative thoughts, cultivate the opposite, counter-thoughts). This is the exact ancient analogue to Beck's Cognitive Restructuring (Bryant, 2009; Hofmann, 2012). In CBT, when a patient experiences an automatic negative thought (e.g., "I will fail this presentation"), they are trained to generate an Alternative/Rational Response based on evidence. Pratipakṣa Bhavanam is not mere positive thinking; it is an epistemological shift where the Buddhi (higher intellect) is actively engaged to break habitual, maladaptive mental loops (saṃskaras).

4.2 Sakṣi Bhava (Witness Consciousness) vs. Cognitive Defusion

In modern third-wave CBT (specifically Acceptance and Commitment Therapy, or ACT), clinicians use "cognitive defusion" to help patients step back from their thoughts, viewing them as mere linguistic events rather than objective truths.

This directly mirrors Patanjali's concept of the Sakṣi (the Witness). By cultivating Vairagya (non-attachment) and Abhyasa (sustained practice), the practitioner separates the

Puruṣa (pure consciousness) from the Citta (the thinking mind). The individual realizes: "I am not my thoughts; I am the space in which thoughts occur."

5. Epistemological Divergences: The Teleological Divide

While their psychological mechanisms align, an honest academic critique requires addressing their foundational differences in scope and ultimate goals:

- **The Teleological Objective:** CBT is fundamentally adaptive and normative. Its goal is to return a dysfunctional individual to optimal social, vocational, and emotional functioning within society. Patanjali's framework, however, is transcendental. It aims for Kaivalya (absolute liberation), moving entirely beyond the dualities of conventional psychological comfort and discomfort.
- **Source of Valid Epistemology:** CBT relies on external empiricism-scientific experimentation and objective reality testing. Yoga utilizes internal empiricism (Pratyakṣa through deep meditative states, alongside Agama or scriptural testimony verified by direct experience).

6. Discussion and Future Research Trajectories

Integrating Patanjali's epistemology into modern clinical frameworks offers several paradigm shifts for higher education and global healthcare:

1. **Expanding Third-Wave CBT:** While Mindfulness Based Cognitive Therapy (MBCT) has adopted Buddhist paradigms, integrating the systematic, step-by-step structural model of the Yoga Sutras offers a highly structured, analytical approach to self-regulation.
2. **De-stigmatizing Mental Health via IKS:** Framing mental health through the lens of ancient Indian philosophy makes psychological well-being culturally accessible and relatable within Eastern populations, fulfilling a core objective of contemporary global psychology.

7. Conclusion

Patanjali's Yoga Sutras and Cognitive Behavioral Theories represent a cross-temporal, cross-cultural consensus on the mechanics of human cognition. Both systems affirm that we are not disturbed by things, but by the views we take of things. By synthesizing the profound philosophical depth of Indian Knowledge Systems with the rigorous empirical testing of modern CBT, contemporary academia can build a comprehensive, holistic science of the mind-one that achieves not just clinical symptom reduction, but genuine mental sovereignty.

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AUTHENTICITY CRISIS IN THE GLOBAL EXPANSION OF TRADITIONAL YOGA PRACTICES

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Abstract

The global expansion of Yoga has reached an unprecedented scale; however, this phenomenon has simultaneously triggered a profound "Authenticity Crisis." As Yoga moved from the Indian paramparā into the secular global marketplace, the link between its physiological means and its spiritual ends was severed, as was the connection between its methods and purposes. This paper argues that restoring authenticity requires a return to the authentic techniques and original purposes of Yoga, specifically to its neurophysiological principles and the critical study of traditional manuscripts. A fundamental distinction must be made between voluntary motor exercise and traditional āsana. Whereas modern globalized Yoga practices often rely on the motor cortex to achieve external goals (fitness)—thereby activating the sympathetic nervous system and the egoic "doer"—Traditional Yoga seeks to bypass cortical voluntariness. By adhering to Patañjali's principles of sthira (stilness), sukha (comfort), and prayatna śaithilya (effortlessness), practice engages subcortical brain centers such as the cerebellum. This neurological shift induces a state of tonic regulation and homeostatic balance, stimulating the parasympathetic nervous system and vagal tone.Consequently, psychological transformation takes place from the worldly object-oriented mind (Viṣaya-cara) toward the mind moving in the void or the space of pure consciousness (Khecara). Through the lens of the critical editions provided by institutions such as The Lonavla Yoga Institute, this paper demonstrates that āsana is not a preliminary physical step, but rather a sophisticated tool for mental purification. The collaboration between Atmabodha School and the Universidad del Gran Rosario serves as a contemporary model for preserving this lineage in the West, ensuring that Yoga remains a legitimate path toward Self-realization (svarūpe'vasthānam).

1. Introduction: The Concept of Tradition (Paramparā) and the Dark House

The global expansion of Indian wisdom through Yoga is one of the most significant cultural phenomena of our era. However, this expansion has come at a high cost: a profound "Authenticity Crisis."

To address this crisis, we must first define what "Traditional" means within the context of Yoga. Etymologically and culturally, tradition implies Paramparā: the uninterrupted transmission of knowledge from generation to generation, from teacher to disciple. It constitutes a tripartite system for the preservation and transmission of knowledge: the written tradition (Śāstras), the oral tradition (Guru–Śiṣya), and the subtle tradition.

The written tradition refers to the teachings of self-realized masters preserved in ancient manuscripts. These original texts contain the transcriptions and commentaries produced by disciples based on the teachings they received. Some of these texts have been translated and published and have been

accessible to the public for the past few centuries (such as Patañjali's Yoga Sūtras and Svātmārāma's Haṭha Pradīpikā), while others remain on palm leaves, parchment, or cloth, inaccessible to the public and at risk of disintegration.

The oral tradition is the oldest form of transmission. It consists of teachings transmitted directly from mouth to ear, preserved in the memory of disciples who themselves later become teachers. Today, masters capable of testifying to an authentic lineage are increasingly rare.

The subtle tradition refers to experiential realization arising from one's own sādhana and from the intangible influence of masters, who may transmit knowledge through touch, gaze, or thought. This form of transmission challenges the limits of modern science; nevertheless, numerous yogis have testified to having received teachings from their masters in this way (e.g., Paramahansa Yogananda, Autobiography of a Yogi).

Today, most instructors and practitioners of modern Yoga lack access to the sources of the tradition. Due to the absence of contact with lineage masters, even the reading of foundational texts frequently leads to misinterpretations and inconsistencies between the theory being studied and the practice being performed.

Using the metaphor developed in my work Yoga Has Its Reasons, we currently live in a "dark house." Although the global marketplace offers many "lamps"—new styles, dynamic flows, and fitness-oriented Yoga—most lack connection with the original foundations and fail to ignite the match of genuine yogic experience.

Traditional Yoga practices generate the friction that ignites the latent inner light, yet this requires the application of fundamental principles that modern iterations have largely lost. The crisis emerges when Yoga is exported merely as a secular fitness regimen, thereby losing connection with the sources that ensure its integrity and ultimate purpose: the discovery of our True Nature (Ātman).

When the "how" (the technique) becomes separated from the "why" (the physiological rationale) and the "what for" (the connection with the Inner Self), Yoga ceases to be an ancient science of liberation and becomes merely another consumer product.

2. The Coherence Between Method and Purpose: Yoga Is Not Fitness

What is currently disseminated under the name of "Yoga" largely fails to correspond to the original methods of the tradition. Consequently, it is fundamentally incapable of producing the results promised by Yoga itself. In any scientific or spiritual discipline, method and purpose must exist in complete coherence. The current global tendency has lost both the "means" and the "end" of Yoga.

The purpose of Yoga is not fitness, nor the achievement of physical flexibility or aesthetic beauty. It concerns the knowledge of the Inner Self attained through states of profound relaxation, stillness, and introspection.

Contemporary methods focused on physical performance are based on effort, correction, and external adjustments, stimulating neurophysiological states incapable of leading to such self-knowledge. When the method is distorted into a fitness regimen, the practice continues reinforcing sympathetic activation patterns instead of promoting the parasympathetic regulation traditionally used in Yoga to dissolve chronic stress conditioning.

A biological contradiction emerges when methods that reinforce egoic doing are used to reach the

quality of Being.

Traditional Yoga is the art of non-doing: a science of stillness that cleanses the system of the tensions generated by worldly life and redirects the senses and attention toward inner consciousness.

3. The Biological Foundation: Stress, Survival, and the Vagus Nerve

To understand why traditional methods work while modern exercise fails within the context of Yoga, we must analyze our biological programming. The body is a biological intelligence constantly seeking homeostasis.

3.1. Sympathetic Hijacking

Most individuals in modernity live unconsciously "hijacked" by stress. The phenomenon of stress, described by Hans Selye as the "General Adaptation Syndrome," involves three phases: alarm, resistance, and exhaustion. In the globalized world, the distinction between what is important and what is urgent has become increasingly blurred. Constant financial, social, and emotional demands generate a chronic state of sympathicotonic hyperactivation that persists beneath conscious awareness.

When Yoga is practiced as dynamic exercise, it continues stimulating the Sympathetic Nervous System (SNS). The motor cortex remains active, adrenaline and cortisol are released, and heart rate stays elevated. This physiological response is useful for survival in the face of danger, metabolic activation, or competition, yet it represents the very antithesis of the yogic objective. Modern Yoga, by emphasizing strength, speed, and intensity, often maintains the practitioner in the "resistance phase" of stress, ultimately leading to exhaustion rather than recovery.

3.2. The Vagus Nerve: The Architect of Happiness

Traditional Yoga functions as an "architect of happiness" primarily through stimulation of the vagus nerve. This nerve serves as a bridge between body and soul and constitutes the principal component of the Parasympathetic Nervous System (PNS).

Whereas modern exercise redirects blood flow toward the extremities for action, traditional āsana — through stillness and tonic regulation — stimulates vagal tone. This activates what Herbert Benson termed the "Relaxation Response." This is not merely a state of "rest," but a specific hypometabolic condition in which heart rate and blood pressure decrease, blood flow is redirected toward the internal organs for cellular repair, and the brain enters a state of receptivity.

Traditional āsana is a psychophysical practice: by altering the condition of the body through vagal stimulation, the mental condition is inevitably transformed. Without this specific physiological activation, practice remains secular exercise, incapable of cleansing the impurities or mental noise accumulated by stress within the system.

4. The Neurological Division: Cortical Voluntariness vs. Subcortical Regulation

At the heart of the authenticity crisis lies a profound neurophysiological misunderstanding. A fundamental distinction must be made between employing the Motor Cortex in voluntary action and engaging lower brain centers, such as the cerebellum, in the involuntary regulation of the body.

4.1. The Motor Cortex and the Egoic "Doer"

Physical exercise and modern Yoga are cortical activities. They depend upon the Motor Cortex (Frontal Cortex) to execute voluntary, goal-oriented movements. In this mode, the practitioner becomes a "doer." The ego constantly evaluates the posture, comparing it with an external ideal and

forcing the body into a predetermined shape. This voluntary effort consumes metabolic energy and reinforces the same neural pathways activated during stressful daily life. It represents an imposition of will upon the body, frequently disregarding its authentic limits.

4.2. Subcortical Regulation and the State of Non-Doing

Traditional āsana seeks to quiet the voluntary motor cortex and engage the subcortical brain — particularly the cerebellum and basal ganglia. This is the physiology of non-doing.

When following Patañjali's instructions in Yoga Sūtras II.46–48, we are applying a precise neurological formula: Sthira-sukham-āsanam: By requiring stillness (sthira) and comfort (sukha), we eliminate the triggers that keep the motor cortex in a state of alarm.Whenever effort, pain, or movement persists, cortical activity continues to predominate. Only in stillness can subcortical centers assume regulation. Prayatna-śaithilya: This is perhaps the most misunderstood principle within global Yoga. Effortlessness is the mechanism through which control of the body shifts from the voluntary cortex to involuntary reflexive regulation. In traditional āsana, stretching is not actively "pulled" by the muscles; rather, it unfolds through passive action derived from the arrangement of body parts within the posture itself, the force of gravity, natural respiratory movement, and the progressive release of tension from the tissues.

Ananta-samāpattibhyām: When voluntary effort is relinquished, body and mind may merge into the infinite (Ananta), which physiologically translates into a state of profound self-regulation and spiritually into identification with the Inner Self, surrender to the Supreme Self, or the Absolute Principle. The result — tato dvandvā-anabhighātaḥ — is the overcoming of opposites: release from tension and conflict, psychophysiological homeostasis, and an integrated state of being. The practitioner is no longer a "doer" attempting to conquer a posture, but a "witness" (Draṣṭā) observing a psychophysiological process of equilibrium.

This transition from cortical to subcortical dominance is what enables movement from the worldly object-oriented mind toward a luminous, intuitive, and fully conscious state of awareness.

5. The Psychophysiological Bridge: Muscle Tone and Mental States

Muscle tone is not merely a physical attribute, but a direct biological reflection of emotional and mental states. In Traditional Yoga, the body itself becomes a sophisticated psychophysiological instrument through which the mind is transformed.

5.1. Muscle Tone as a Reflection of Viṣaya-cara

The worldly object-oriented mind, or Viṣaya-cara, is characterized by its constant movement toward external objects, demands, and sensory stimuli. From a neurophysiological perspective, this object-oriented state of consciousness is intrinsically linked to a specific type of muscular tone: hypertonicity. As explored in Yoga has its Reasons, the stress response generates a condition of chronic defensive tension. When the mind remains in Viṣaya-cara, it becomes "hijacked" by the survival brain. Muscles remain perpetually prepared for action even in the absence of real physical threat. This chronic hypertonicity produces a form of physical "noise" that continuously feeds back into the brain, maintaining the mind in an agitated and fragmented state. In this condition, the practitioner becomes trapped within a cycle of voluntary motor activity and persistent stimulation of thought processes, hindering access to deeper yogic states.

5.2. Tonic Regulation and the Path Toward Khecara

The purpose of traditional āsana is to facilitate the transition from Viṣaya-cara to Khecara — the mind moving within the inner space of consciousness. This process occurs through the principle of tonic regulation. Unlike modern exercise, which seeks to increase muscular tone or strength, traditional āsana seeks balanced muscular tone: a state of equilibrium that is neither tense (Rajas) nor flaccid (Tamas), but luminous and stable (Sattva).

By applying Patañjali's instructions, the "noise" of the worldly object-oriented mind gradually subsides through regulation of bodily tone: Dissolution of Tension: As cortical activity quiets and subcortical regulation emerges, chronic tensions associated with the worldly object-oriented mind begin to dissolve. Emergence of Khecara: When muscular tone reaches its state of equilibrium, stress-related feedback to the brain diminishes. The mind is no longer continuously distracted by biological signals associated with defense and survival. In this stillness, consciousness becomes progressively emptied of worldly contents and may enter the condition of Khecara. Khecara is not a state of emptiness in the nihilistic sense, but one of pure receptivity, in which consciousness may rest in the Inner Self (Svarūpe'vasthānam). In the present context, Khecara refers not merely to the technical practice of Khecarī Mudrā, but to an inwardly stabilized state of consciousness in which awareness ceases moving toward external objects and rests within inner awareness, as described in the Haṭha and Rāja Yoga traditions. This transformation becomes possible only through precise tonic regulation. Without it, the mind remains alert, stimulated, and bound to the objects of the external world (Viṣaya).

6. Institutional Guardians: The Lonavla Yoga Institute (LYI)

Restoration of authenticity requires an objective anchor: the Written Tradition. In this respect, the work of The Lonavla Yoga Institute (LYI), founded by Dr. M. L. Gharote, represents a pillar of global importance. The mission of the LYI consists in the rescue, preservation, and scientific study of ancient manuscripts that preserve the original relationship between yogic methods and their intended purposes.

6.1. Manuscript Preservation and Critical Editions

The crisis of authenticity is fueled largely by lack of access to original sources. For decades, much of the traditional knowledge remained hidden or subject to misinterpretation. The LYI undertook the monumental task of locating, cataloguing, and preserving thousands of manuscripts. Through the recovery of texts such as the 10-chapter Haṭha Pradīpikā, the Institute demonstrated that the ancient masters never conceived Haṭha Yoga as a merely physical discipline. These critical editions reveal that yogic techniques were always intended as preparation for the state of Khecara associated with Rāja Yoga, and that they must be practiced according to the foundational principles established by Patañjali.

6.2. Scientific Rigor and Critical Scholarship

A "Critical Edition" represents the highest standard of academic rigor. Through comparison of multiple manuscripts, transcription errors may be identified and original technical instructions restored. This process allows contemporary practitioners and researchers to move beyond modern reinterpretations and return to the original intention of the Paramparā.

These publications, translated into English with technical precision, provide the foundation for institutions such as the Universidad del Gran Rosario (UGR) and the Atmabodha School of Traditional

Yoga to teach Yoga as a science of Self-realization rather than a product of the global fitness industry.

7. A Bridge Toward the West: Atmabodha and the UGR

The collaboration between the Atmabodha School of Traditional Yoga and the Universidad del Gran Rosario represents a successful transplantation of this lineage into the Western academic world. As educators and practitioners, we bear the responsibility of ensuring that Yoga does not lose its "Reasons." By integrating the shāstric rigor of the LYI with relevant neurophysiological knowledge, we provide students with a map through which to navigate the contemporary crisis of authenticity. We teach that the body constitutes the "primary instrument" and that work upon muscular tone is essential for liberation of the mind. Within our classrooms in Argentina, we seek to light the same flame once lit in the ashrams of India: the flame of knowledge capable of dispelling the darkness of the worldly object-oriented mind. We cannot become complicit in practices that, through ignorance of their own physiology and original sources, lose the capacity to fulfill the authentic promise of Yoga.

8. Conclusion: Returning to the Inner Self

The global expansion of Yoga represents a triumph of Indian wisdom, yet it must be protected from dilution. The "Crisis of Authenticity" calls for a return to the original methods and purposes of the tradition. It is essential to recognize that contemporary methods rooted primarily in exercise are biologically incapable of leading toward the state of Khecara. A biological contradiction emerges when methods that reinforce egoic doing are used to reach the quality of Being. Traditional Yoga is the art of non-doing: a science of stillness that cleanses the system of the tensions generated by Viṣaya-cara. By returning to Critical Editions, respecting the role of subcortical regulation, and emphasizing tonic regulation, the legitimacy of practice may be restored. Yoga is not concerned with conquering a posture, but with discovering who we truly are when effort ceases. Only then — in bodily stillness and the luminosity of consciousness — may the authentic promise of the tradition be fulfilled: resting in our True Nature.

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INFLUENCE OF YOGA AND MEDITATION ON OCCUPATIONAL STRESS AMONG TEACHERS

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Abstract

Occupational stress is becoming an increasing problem for school teachers and it has a negative impact on their physical health, mental health, job satisfaction and teaching effectiveness. Educators are experiencing high levels of chronic stress due to increased workloads, administrative pressures, challenges of classroom management and emotional demands. Methods: This study examined the effectiveness of yoga and meditation in reducing occupational stress among teachers. The design was a true experimental pre-test-post-test control group design. Forty teachers (30-50 years) from selected schools of district Ernakulam, Kerala were randomly assigned into two groups (experimental group, n=20 and control group, n=20). The experimental group received a structured yoga and meditation intervention for 8 weeks (5 days/week, 45–60 minutes/session) that comprised of asanas, pranayama and mindfulness meditation. No intervention was performed in the control group. The Occupational Stress Index (OSI) of Srivastava and Singh (1984) was used to measure occupational stress before and after the intervention. Results: The result of this study showed a significant decrease in occupational stress in the experimental group from pre-test (M=72.40) to post-test (M=54.30) with a mean difference of 18.10 and 25% improvement (t=9.24, p<0.05). The independent t-test revealed a significant difference in the post-test scores between the experimental and control groups (t=8.76, p<0.05). No significant change was found in the control group. Conclusion: The results provide strong support for the efficacy of yoga and meditation as a non-pharmacological, holistic intervention for occupational stress management. The routine application of these techniques can greatly enhance teachers' mental health and professional effectiveness.

Keywords: *Yoga, Meditation, Occupational Stress, Teachers*

INTRODUCTION

In the eyes of modern society, teaching is one of the most difficult of occupations. Teachers play an important role in the intellectual, emotional and social development of students which in turn contributes to the national development. However, the teaching profession is often associated with high levels of occupational stress, originating from factors such as excessive workload, time pressure, classroom discipline issues, administrative tasks, and societal expectations. Teachers' stress has also been compounded in recent years by rapid educational reforms, technological advances and increased competition.

Occupational stress is when the job demands are more than a person can effectively cope with, and this causes harmful physical and emotional reactions in the person. Negative effects of ongoing occupational stress: physical health, emotional stability, job satisfaction, and professional

performance. Chronic stress in teachers can result in fatigue, anxiety, irritability, sleep problems, burnout and diminished teaching effectiveness. In severe cases, long term stress can cause serious psychological and physiological disorders.

With the increasing incidence of stress related disorders, there is a need for effective stress management strategies for teachers. Pharmacological treatments may provide a temporary relief, but they often ignore the very root causes of stress and are accompanied by undesirable side effects. Thus, non-pharmacological and holistic approaches have been gaining importance in stress management. Yoga and meditation are two ancient practices to bring about physical relaxation, mental calmness and emotional balance. Yoga is a combination of physical

postures, breathing techniques and relaxation methods that improves flexibility, blood flow and neuromuscular coordination. Meditation, however, helps to develop concentration, mindfulness and emotional regulation. Yoga and meditation have been shown to reduce cortisol levels, balance autonomic nervous system activity, improve mood, and increase general psychological well-being.

More and more people in different kinds of jobs are discovering the benefits of combining yoga with meditation to reduce stress. These methods help people cope better with the demands of their jobs by facilitating relaxation and improving coping skills. However, few studies specifically address instructors, especially in the context of Indian education. Present study was conducted to know the effect of yoga and meditation on occupational stress of teachers.

Objectives of the Study

The present study was conducted to study the effect of yoga and meditation on occupational stress among teachers. The purpose of the study was to find out if regular practice of yoga and meditation could significantly reduce the levels of occupational stress among teachers. Another objective was to compare the stress levels between the experimental and control groups after the intervention programme. The study also aimed to assess the effectiveness of yoga and meditation as non-pharmacological approaches to enhance psychological well-being and professional functioning of teachers.

METHODOLOGY

The study included a pre-test and post-test control group as part of a proper experimental research design. The study was carried out in a few schools in Kerala's Ernakulam District. Forty instructors, aged 30 to 50, from a variety of government and private schools were chosen using purposive sampling. A full-time instructor with at least two years of teaching experience, a person between the ages of thirty and fifty, and a willingness to take part in the eight-week program were the requirements for inclusion. We excluded teachers who practiced yoga or meditation on a regular basis (more than once a week in the last six months), who had serious medical conditions (e.g. uncontrolled hypertension, recent surgery, or psychiatric disorders), and who were not willing to give informed consent. The sample included 25 female and 15 male teachers. With respect to school type, 22 were from government aided schools and 18 from private unaided schools. The subjects were randomly distributed into two equal groups used by simple randomisation, treatment group (n 20) and control group (n 20).

Training intervention

Tadasana (Mountain Pose), Bhujangasana (Cobra Pose), Vajrasana (Thunderbolt Pose), and Shavasana (Corpse Pose) were the asanas practiced, and Anulom Vilom (alternate nostril breathing) and Bhramari (humming bee breath) were the pranayama techniques used in the eight-week structured yoga and meditation training program, which was led by a certified yoga instructor five days a week for 45 to 60 minutes. Meditation sessions focused on mindfulness and guided relaxation techniques. No adverse events were reported during the intervention. The control group did not receive any structured intervention and continued with their routine activities. Both groups were advised not to start any new physical or relaxation practices during the study period.

Tool and Technique

The Occupational Stress Index (OSI), which was created in 1984 by Drs. A.K. Srivastava and Ashok Pratap Singh, is a set of questions with 46 items that are divided into 12 parts. These parts look at different types of stress people experience at work, such as having too much work, not knowing what to do, and dealing with problems at work. People answer these questions by selecting one of five options, ranging from Agree to Strongly Disagree. The higher the score, the more stress people feel at work. In India, the Occupational Stress Index (OSI) is often utilised. is regarded as a useful tool as it provides reliable results and is a reliable indicator of stress. Because the Occupational Stress Index (OSI) is a tool for measuring teacher stress, it was used for this study. Both the group and the control group received the questionnaires before to the commencement of the research and following the completion of the eight-week program.

RESULTS

This part of the work shows what we found out from the groups we were studying. We took the information we got. Organized it in a way that makes sense. We wanted to see if what we thought would happen really did happen. We used complicated math to understand what the numbers were telling us.

Table 1 Paired 't' Test Analysis of Occupational Stress Scores

Group	Test	Mean	Mean Difference	SD	t-value	Improvement (%)
Experimental	Pre-test	72.40	18.10	5.12	9.24*	25.00%
	Post-test	54.30		4.86		
Control	Pre-test	71.85	1.45	5.05	1.08	2.01%
	Post-test	70.40		5.11		

Table value 2.09 df 1&19, Significant at 0.05 level

The above table shows the mean occupational stress score of the experimental group decreased substantially from 72.40 (pre-test) to 54.30 (post-test), recording a mean difference of 8.10 with 25 % improvement. In contrast, the control group showed only a marginal decrease from 71.85 to 70.40 (mean difference = 1.45).

The paired samples t-test was conducted to examine the difference between pre-test and post-test scores within each group. For the experimental group, the calculated t-value (9.24) was found to be statistically significant at the 0.05 level. This indicates a significant reduction in occupational stress after the eight-week yoga and meditation intervention. However, in the control group, the t-value (1.08) was not statistically significant, suggesting that there was no considerable change in

occupational stress levels without any intervention.

To determine whether the post-test scores of the experimental group differed significantly from the control group, an independent samples t-test was performed.

Table 2 Independent 't' Test Analysis of Post-test Occupational Stress Scores between Experimental and Control Groups

Group	Mean	SD	Mean Difference	t-value
Experimental	54.30	4.86	16.10	8.76*
Control	70.40	5.11		

Table value 2.09 df 1&19, Significant at 0.05 level

The independent t-test revealed a statistically significant difference between the two groups in the post-test scores ($t = 8.76$, $p < 0.05$). The experimental group reported markedly lower occupational stress levels compared to the control group after the intervention.

Discussion

The current study's results unequivocally show that instructors' occupational stress was significantly reduced by the eight-week structured yoga and meditation program. The significant reduction in stress scores in the experimental group (25% improvement) and the significant difference observed between the experimental and control groups in the post-test strongly support the effectiveness of the intervention. These results align with several previous studies. Sharma and Gupta (2023) reported similar significant reductions in stress and burnout among school teachers practicing yoga regularly. Kauts and Sharma (2019) also found that mindfulness-based practices significantly improved emotional stability and reduced occupational stress among educators. Varambally and Gangadhar (2016) demonstrated the positive impact of yoga-based interventions on mental well-being among professionals. When we look at how our bodies work, we can see that yoga and meditation really help reduce stress. This is because they have an effect on our nervous system. If we do yoga and meditation regularly it helps our body relax more. It also helps to reduce the number of hormones in our body. (Streeter et al., 2012). Meditation, the kind that helps us focus on the present moment helps us deal with our emotions better. It also helps our brain work better when we are stressed. (Khalsa, 2015). This means that teachers can handle their workload and the pressure of time better. They can also handle their emotions better. The people in the control group did not show change. This shows that just doing our routine is not enough to reduce the stress we feel at work. This is why we need to have programs in schools that help us relax and reduce stress. We need to have yoga and meditation, in schools to help teachers and students manage stress

CONCLUSION

The current study offers strong evidence that school teachers' occupational stress can be considerably reduced by an organized eight-week yoga and meditation intervention. From the pre-test to the post-test, the experimental group's occupational stress levels significantly and statistically significantly decreased ($t = 9.24$, $p < 0.05$), with a mean reduction of 25%. The control group, on the other hand, showed very little alteration. The independent t-test further indicated that the post-test stress levels of

the experimental group were considerably lower than those of the control group ($t = 8.76$, $p < 0.05$). These data clearly illustrate the usefulness of yoga and meditation as a potent, non-pharmacological approach for controlling occupational stress in the teaching profession.

Yoga and meditation practices help teachers manage workload pressure, emotional demands, and role-related stressors by promoting physical relaxation, mental calmness, and improved emotional regulation. The results of this study support the integration of regular yoga and meditation sessions into the professional development programs of teachers. Educational institutions, especially in the Indian context, should consider implementing such holistic wellness programs to enhance teachers' mental health, job satisfaction, and overall teaching effectiveness. Even though the study produced positive results, it has some limitations, such as a relatively small sample size and short intervention period. Future research could look at the long-term effects of yoga and meditation with larger samples, diverse populations, and follow-up assessments. Additionally, studies that focus on psychological well-being using

standardized scales would further strengthen the understanding of the wider benefits of these practices. In conclusion, the regular practice of yoga and meditation emerges as an effective, safe, and sustainable strategy for reducing occupational stress and improving the psychological well-being of teachers. Adopting these ancient practices in modern educational settings can play a vital role in creating a healthier and more productive teaching community.

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