LNIPE

INTERNATIONAL SEMINAR - WELLNESS RENAISSANCE: REIMAGINING HEALTH THROUGH YOGA, AYURVEDA AND SPORTS SCIENCES

18th to 20th March, 2026

युवा कार्यक्रम
एवं खेल मंत्रालय
भारत सरकार
YOUTH AFFAIRS
AND SPORTS
GOVERNMENT OF INDIA

सत्यमेव जयते

INTERNATIONAL SEMINAR

Wellness Renaissance : Reimagining Health Through Yoga, Ayurveda and Sports Sciences

18th to 20th March, 2026

Organized by :

LAKSHMIBAI NATIONAL INSTITUTE OF PHYSICAL EDUCATION

(Deemed to be University)

Department of Sports, Ministry of Youth Affairs & Sports, Government of India

Supported by :

DEPARTMENT OF YOUTH AFFAIRS

Ministry of Youth Affairs & Sports, Government of India

Lakshmibai National Institute of Physical Education Gwalior (M. P.) India

LAKSHMIBAI NATIONAL INSTITUTE OF PHYSICAL EDUCATION

(Deemed to be University)

Ministry of Youth Affairs & Sports, Govt. of India

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Lakshmibai National Institute of Physical Education
Gwalior (M.P.) INDIA

(Under the aegis of the Ministry of Youth Affairs & Sports, New Delhi)

PROCEEDING BOOK

INTERNATIONAL SEMINAR

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Supported by

MINISTRY OF YOUTH AFFAIRS & SPORTS
GOVERNMENT OF INDIA

Date: 18th to 20th March, 2026

Venue: LNIPE, Gwalior (M.P.) INDIA.

PROCEEDING BOOK

International Seminar

WELLNESS RENAISSANCE

Reimagining Health through Yoga, Ayurveda and Sports Science

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अध्यक्ष, लोक सभा
SPEAKER, LOK SABHA
INDIA

MESSAGE

I am pleased to know that the Lakshmibai National Institute of Physical Education (LNIPE), Gwalior (M.P.) is organising a three-day International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda and Sports Science" from 18 to 20 March 2026 in collaboration with the Department of Youth Affairs, Ministry of Youth Affairs and Sports, Government of India .

In today's world, the concept of wellness has evolved far beyond the traditional understanding of physical fitness. It now represents a holistic concept harmonizing physical strength, mental clarity and emotional stability, qualities essential for living a balanced, purposeful and fulfilling life. In this context, the time-tested wisdom of Yoga and Ayurveda, complemented by the scientific insights of modern Sports Science, offers a comprehensive framework for promoting holistic health and sustainable well-being. Physical education plays a pivotal role in integrating these interconnected disciplines and in fostering a culture rooted in preventive healthcare, mindfulness and active living.

Initiatives of the Government of India such as the Fit India Movement, along with programmes promoting yoga, participation in sports and healthy lifestyle, have significantly strengthened national efforts towards building a healthier and more active society. It is heartening to note that the Lakshmibai National Institute of Physical Education continues to advance this national vision through its academic programmes, training and outreach activities. The organisation of this International Seminar stands as a significant example of its commitment to promoting the ideals of the Fit India Movement and holistic wellness.

I hope that this seminar will emphasise the powerful convergence of India's traditional wellness practices, Yoga and Ayurveda with contemporary Sports Science, inspiring innovative approaches to holistic health and fitness. I am confident that this gathering will bring together scholars, researchers and practitioners to engage in meaningful dialogue and contribute to the evolving discourse on integrative approaches to overall wellness.

I congratulate the Lakshmibai National Institute of Physical Education for hosting this remarkable seminar and wish the event all the success.

(Om Birla)

डॉ. मनसुख मांडविया
DR. MANSUKH MANDAVIYA

सत्यमेव जयते

मंत्री
श्रम एवं रोज़गार
व युवा कार्यक्रम एवं खेल
भारत सरकार
Minister
Labour & Employment
and Youth Affairs & Sports
Government of India

संदेश

मुझे यह जानकर अत्यंत हर्ष हो रहा है कि लक्ष्मीबाई राष्ट्रीय शारीरिक शिक्षा संस्थान, ग्वालियर, डिपार्टमेंट ऑफ यूथ अफेयर्स के सहयोग से 18 से 20 मार्च, 2026 तक "वेलनेस रेनेसां: योग, आयुर्वेद और स्पोर्ट साइंस के ज़रिए हेल्थ की नई कल्पना" विषय पर यह तीन दिवसीय अंतरराष्ट्रीय संगोष्ठी आयोजित हो रही है। मुझे विश्वास है कि यह आयोजन न केवल शारीरिक स्वास्थ्य को मजबूत बनाने का माध्यम बनेगा, बल्कि समग्र कल्याण की नई दिशा भी प्रदर्शित करेगा।

माननीय प्रधानमंत्री श्री नरेंद्र मोदी जी की दूरदर्शी सोच और नेतृत्व में भारत ने योग और आयुर्वेद को वैश्विक स्वास्थ्य आंदोलन का आधार बनाया है। उन्होंने योग को केवल व्यायाम नहीं, बल्कि शारीरिक, मानसिक और पर्यावरणीय संतुलन का माध्यम बताया है। प्रधानमंत्री जी के प्रयासों से आज आयुर्वेद को आधुनिक तकनीक और एआई के साथ जोड़कर इसे वैश्विक स्तर पर मजबूत बनाया जा रहा है, तथा फिट इंडिया मूवमेंट के जरिए युवाओं को सक्रिय जीवनशैली अपनाने के लिए प्रेरित किया है।

यह संगोष्ठी इसी दृष्टिकोण को आगे बढ़ाने का एक महत्वपूर्ण कदम है। मैं सभी प्रतिभागियों से आह्वान करता हूं कि वे इस अवसर पर नए विचारों, शोधों और अनुभवों को साझा करें, ताकि भारत की प्राचीन ज्ञान परंपरा और आधुनिक विज्ञान का संगम विश्व स्वास्थ्य के लिए नई राह प्रशस्त करे। अपने पूर्व निर्धारित आधिकारिक कार्यक्रमों के कारण मैं व्यक्तिगत रूप से आपके इस आयोजन में शामिल नहीं हो पाऊँगा मगर मेरी मंगलकामनाएं आप सभी के साथ रहेंगी।

एकबार पुनः आप सभी को इस संगोष्ठी की सफलता के लिए हार्दिक शुभकामनाएं। आपके प्रयास भारतीय युवाओं को स्वस्थ, सशक्त और प्रेरित बनाने में अवश्य योगदान देंगे।

(डॉ. मनसुख मांडविया)

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धर्मेन्द्र प्रधान
ଧର୍ମେନ୍ଦ୍ର ପ୍ରଧାନ
Dharmendra Pradhan

सत्यमेव जयते

शिक्षा मंत्री
भारत सरकार
Minister of Education
Government of India

MESSAGE

I am happy to know that **Lakshmibai National Institute of Physical Education (LNIPE), Gwalior, Madhya Pradesh**, in collaboration with the **Department of Youth Affairs, Ministry of Youth Affairs & Sports, Government of India**, is going to organise an International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda, and Sports Science" during 18-20 March, 2026.

The theme of this seminar is both timely and visionary. In an era marked by rapid technological advancement and changing lifestyles, the need to rediscover and reimagine holistic health systems rooted in our civilizational ethos has become more relevant than ever. The integration of Yoga, Ayurveda, and Sport Sciences represents a powerful interdisciplinary approach that harmonizes physical vitality, mental resilience, emotional balance, and spiritual well-being.

The Government of India has consistently recognized the demographic dividend of our nation. With one of the youngest populations in the world, India stands at a historic juncture. The true realization of this demographic dividend depends on the quality, productivity and well-being of our people. A healthy population is the foundation of a *Viksit Bharat*.

I commend LNIPE Gwalior, and all collaborating institutions for this laudable initiative. I am confident that the deliberations, research presentations, and scholarly interactions during this seminar will generate meaningful insights, policy recommendations, and innovative pathways for strengthening the wellness ecosystem of our nation.

I extend my heartfelt best wishes to the organisers, participants, and young researchers. May this seminar become a milestone in advancing integrated health education and in inspiring our youth to contribute toward building a healthier, stronger, and happier nation !

(Dharmendra Pradhan)

सबको शिक्षा, अच्छी शिक्षा

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Dr. Pallavi Jain Govil, IAS

सत्यमेव जयते

सचिव
भारत सरकार
युवा कार्यक्रम और खेल मंत्रालय
युवा कार्यक्रम विभाग
Secretary
Government of India
Ministry of Youth Affairs & Sports
Department of Youth Affairs

February 19, 2026

MESSAGE

I am pleased to convey my greetings to all delegates, academicians, researchers, and youth scholars participating in the International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda, and Sports Sciences." I appreciate the collaboration of LNIPE with the Department of Youth Affairs, Ministry of Youth Affairs and Sports in organising the International Seminar while shedding light on contemporary health challenges through an integrative and holistic perspective.

India's rich heritage of Yoga and Ayurveda, when complemented by advancements in Sports Sciences, offers a comprehensive framework for promoting physical fitness, mental well-being, and preventive healthcare. In the present global context, where lifestyle-related disorders and mental health concerns are on the rise, such an interdisciplinary approach assumes greater relevance. Reimagining health through these knowledge systems not only reinforces holistic well-being but also strengthens evidence-based practices aligned with modern scientific understanding.

The Ministry of Youth Affairs and Sports accords high priority to the overall development of youth through initiatives that promote physical literacy, wellness, resilience, and healthy lifestyles. Academic and research-oriented platforms, such as International Seminar, play a crucial role in engaging young scholars, fostering interdisciplinary research, and encouraging critical dialogue on sustainable health models rooted in both tradition and science.

This seminar provides an important opportunity for participants to showcase their research outcomes, exchange global perspectives, and contribute to the scientific validation and wider acceptance of indigenous wellness systems. Such scholarly engagement is essential for strengthening national capacity in health, wellness, and sports sciences, while also enhancing India's leadership in the global wellness movement.

I commend the efforts of the organizing committee and all associated stakeholders for their commitment to academic excellence and youth engagement. I am confident that the research papers and outcomes of this seminar will contribute meaningfully to research advancement, policy insights, and capacity building in the domains of wellness and sports sciences.

I wish the International Seminar immense success and extend my best wishes to all participants for constructive and enriching outcomes.

19/02/2026

(Dr. Pallavi Jain Govil)

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Hari Ranjan Rao, IAS
Secretary

सत्यमेव जयते

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युवा कार्यक्रम और खेल मंत्रालय
Government of India
Department of Sports
Ministry of Youth Affairs & Sports

MESSAGE

It is great to learn that Lakshmibai National Institute of Physical Education (LNIPE), Gwalior, is going to organizing the International Seminar on "Wellness Resonance: Reimagining Health through Yoga, Ayurveda, and Sport Sciences" in the month of March. I extend my sincere appreciation to the organizers for conceptualizing a theme that reflects India's holistic vision of health and human performance.

2. India today stands at a defining moment in its journey as a global sporting nation, and Sport is no longer viewed merely as competition, but as a powerful instrument for nation-building, youth empowerment, and holistic development. The integration of Yoga, Ayurveda, and Sports Sciences represents a uniquely Indian model of wellness—one that harmonizes physical excellence, mental resilience, scientific research, and traditional knowledge systems.

3. It is encouraging that this seminar provides a platform for young research scholars below the age of 35 to present their innovative research. Their ideas, research, and commitment will shape the future of India's sports ecosystem and wellness framework. By encouraging interdisciplinary dialogue and evidence-based research, this seminar aligns with the Government's vision of fostering innovation, scientific temperament, and global competitiveness among young professionals.

4. I am confident that the deliberations and research outcomes of this seminar will contribute meaningfully to policy development, academic advancement, and the creation of a robust wellness culture across the country. Such initiatives not only motivate young scholars but also inspire them to take leadership roles in transforming India into a global hub of sports excellence and holistic health.

5. I convey my best wishes to the organizers, distinguished speakers, and the participating young researchers for the grand success of this seminar.

(Shri Hari Ranjan Rao)

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डॉ. शोभित जैन
संयुक्त सचिव
Dr. Shobhit Jain, IRS (C & IT)
Joint Secretary

सत्यमेव जयते

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युवा कार्यक्रम और खेल मंत्रालय
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GOVERNMENT OF INDIA
MINISTRY OF YOUTH AFFAIRS & SPORTS
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MESSAGE

It gives me immense pleasure to extend my warm greetings to the Lakshmibai National Institute of Physical Education (LNIPE) on the occasion of the *International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda and Sports Science."*

This seminar is both timely and visionary. In an era where holistic health is becoming a global priority, the integration of Yoga, Ayurveda, and Sports Science represents a progressive and research-driven pathway toward sustainable wellness. I commend LNIPE for conceptualizing a platform that not only celebrates India's traditional knowledge systems but also critically examines them through modern scientific inquiry and evidence-based research.

What makes this seminar particularly significant is its strong focus on the youth of India. Our young scholars, researchers, and practitioners are the driving force behind the future of sports science and integrative health. By encouraging interdisciplinary dialogue, empirical research, and international collaboration, this initiative empowers youth to contribute meaningfully to both national development and global knowledge exchange.

The convergence of traditional wisdom and contemporary sports science research has the potential to create innovative models of preventive healthcare, performance enhancement, and holistic well-being. Such academic engagements help bridge the gap between theory and practice, tradition and technology, and national priorities and international research standards.

I am confident that this seminar will foster impactful research collaborations, generate policy-relevant insights, and strengthen India's leadership in integrative health sciences at both national and international levels.

I congratulate the organizing committee of LNIPE for their dedicated efforts and wish the seminar great success in achieving its academic and research objectives.

(Shobhit Jain)

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Dr. H R Nagendra, ME, PhD, DSc
Padma Shri - 2016
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It is a great pleasure to extend my warm greetings to the organizers and participants of the *International Seminar on Wellness Renaissance: Reimagining Health through Yoga, Ayurveda and Sports Sciences*, scheduled from 18–20 March 2026.

The contemporary world is witnessing a growing need for holistic approaches to health that integrate physical, mental, and spiritual well-being. Traditional knowledge systems such as Yoga and Ayurveda offer time-tested frameworks that, when combined with modern scientific disciplines like sports science, can significantly contribute to preventive healthcare, rehabilitation, and human performance enhancement.

Seminars of this nature play a vital role in bringing together researchers, academicians, practitioners, and students to exchange ideas, present scientific evidence, and explore interdisciplinary collaborations. Such platforms help strengthen the scientific understanding of traditional wellness practices while encouraging innovative research that addresses present and future health challenges.

I congratulate the organizers for initiating this meaningful academic gathering and wish the seminar great success. I hope the deliberations and discussions will generate valuable insights and contribute to the advancement of holistic health and human well-being.

Best wishes for a successful seminar.

नागेन्द्र

(Dr. H. R. Nagendra)
President

MESSAGE

It is with immense pleasure and a deep sense of academic responsibility that I extend a warm welcome to all scholars, researchers, practitioners, and distinguished delegates to the International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda and Sports Sciences." This seminar reflects LNIPE's enduring commitment to advancing holistic health paradigms through rigorous scholarship and interdisciplinary dialogue.

In an era marked by escalating lifestyle disorders, mental health challenges, and performance-related stress, the convergence of traditional Indian knowledge systems with contemporary sports and health sciences has never been more relevant. Yoga and Ayurveda, deeply rooted in India's civilizational wisdom, offer time-tested frameworks for preventive healthcare, resilience, and sustainable well-being. When examined through modern scientific inquiry, they provide powerful insights for global health advancement.

I am confident that the deliberations, research presentations, and scholarly exchanges during this seminar will contribute meaningfully to policy, practice, and future research.

I extend my sincere appreciation to the Ministry of Youth Affairs and Sports for its unwavering support and to the organizing team for their dedicated efforts. I wish the seminar every success and hope it inspires transformative thinking in the pursuit of holistic wellness.

Prof. Kalpana Sharma
Vice Chancellor,
LNIPE, Gwalior (M.P.)

MESSAGE

It is a matter of great pleasure to extend my warm greetings to all distinguished delegates, academicians, researchers, and youth participants attending the International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda, and Sports Sciences." Lakshmibai National Institute of Physical Education (LNIPE), Gwalior, is privileged to host this significant academic event that reflects our institutional commitment to holistic education, research excellence, and youth development.

The theme of the seminar is highly relevant in the contemporary context, where the integration of Yoga, Ayurveda, and Sports Sciences offers a comprehensive approach to health, wellness, and preventive care. These disciplines not only contribute to physical and mental well-being but also open emerging avenues for skill development, professional specialization, and sustainable career pathways for the youth.

Youth empowerment remains central to national development, and academic initiatives such as this seminar play a vital role in enhancing employability, entrepreneurship, and leadership among young scholars. The growing global demand for wellness professionals, sports scientists, fitness trainers, yoga practitioners, performance analysts, and health educators presents significant employment opportunities. By fostering interdisciplinary learning and research, this seminar aims to equip youth with knowledge, competencies, and innovative perspectives aligned with evolving industry and societal needs.

LNIPE, as a premier institution in the field of physical education and sports sciences, continues to strive towards nurturing skilled, competent, and socially responsible professionals. This seminar provides a dynamic platform for participants to engage in meaningful academic discourse, exchange best practices, and explore career-oriented insights in the expanding wellness and sports ecosystem.

I sincerely appreciate the efforts of the organizing committee, faculty members, and all stakeholders for their dedicated planning and execution of this international academic endeavor. I am confident that the deliberations and outcomes of this seminar will contribute significantly to youth capacity building, research advancement, and the creation of meaningful career opportunities in the fields of wellness, health, and sports sciences.

I wish the International Seminar great success and extend my best wishes to all participants for enriching interactions and productive deliberations.

Dr. Yatendra Kumar Singh
Registrar,
LNIPE, Gwalior (M.P.)

DIRECTOR
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Dip. Yoga Therapy
Dip. Sports Journalism
Dip. Sports Medicine
Dip. Physiotherapy (Sports)
Dip. Sports Management

The Lonavla Yoga Institute (India)

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Date : 07.03.2026

Message by Dr. Manmath Manohar Gharote

Lakshmibai National Institute of Physical Education takes immense pride in organizing the seminar on **"Wellness Renaissance: Reimagining Health through Yoga, Ayurveda & Sports Science."** This seminar represents a significant academic initiative aimed at revitalizing the discourse on holistic health by harmonizing India's ancient wellness traditions with contemporary scientific advancements.

The idea of wellness of the whole person is not new. Genuine healing cannot be limited to treatment of physical disorders. Attention to emotional and mental aspects of wellness must be included. Wholeness depends upon the balanced integration of physical, mental, emotional, social, existential and spiritual levels.

The concept of wellness in Yoga is very wide and is stated in terms of the absence of factors that disturb the mind. Thus it is mentioned in *Amanaskayogah*, the ancient Yoga Text as follows :

मन एव मनुष्याणां कारणं बन्धमोक्षयोः ।
बन्धाय विषयासंगि मुक्त्यैइ निर्विषयं मनः ।। ७७ ।।

(For a human being mind alone is at the very cause of both bondage and liberation. Mind, when attached to material objects, causes bondage, while mind rendered free from worldly objects leads to freedom (*mukti*).

In the present era, where non-communicable diseases, mental stress, and sedentary lifestyles pose serious challenges, there is an urgent need to revisit preventive and integrative models of health. I hope that this seminar seeks to explore how Yoga and Ayurveda, deeply rooted in India's civilizational heritage, can be scientifically aligned with modern Sports Science to promote sustainable physical, mental, and social well-being.

Manmath

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MESSAGE

The International Seminar on Wellness Renaissance: Reimagining Health through Yoga, Ayurveda & Sports Science stands as one of the most visionary and research-driven academic platforms of our time. Focused on reimagining health through integrative and evidence-based approaches, this seminar is not merely a dialogue—it is a movement toward scientific validation of traditional wisdom.

This prestigious international seminar is being organized by Lakshmibai National Institute of Physical Education (LNIPE), a premier institution committed to advancing research, innovation, and academic excellence in physical education and sports sciences. Under its academic leadership, the seminar aims to create a strong research foundation that integrates Yoga, Ayurveda, and Sports Science within contemporary health discourse.

At its core, the seminar is deeply committed to empowering the youth of India as emerging researchers and scholars. It encourages interdisciplinary research, data-driven inquiry, and global academic collaboration, enabling young minds to contribute not only at the national level but also within international research frameworks. By bridging traditional knowledge systems with modern scientific methodologies, this seminar seeks to fill the long-standing gap between ancient wellness sciences and contemporary evidence-based practice.

This is not just a seminar—it is a research renaissance, positioning India as a global contributor in holistic and integrative health sciences.

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It is with great honor and pleasure that I extend my warm greetings to the Lakshmibai National Institute of Physical Education, Gwalior, for organizing the International Seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda, and Sports Science." This seminar represents a timely and meaningful academic initiative that resonates strongly with the global pursuit of holistic health and human well-being.

In an era marked by rapid technological advancement and increasing lifestyle-related health challenges, the need for an integrated and preventive approach to wellness has never been more critical. Yoga and Ayurveda, rooted in ancient Indian wisdom, emphasize balance, self-regulation, and individualized care, while Sports Science provides scientific rigor, performance optimization, and evidence-based interventions. The convergence of these disciplines offers a comprehensive framework that supports physical vitality, mental resilience, and sustainable health outcomes across diverse populations.

As a teacher educator in the field of movement and physical education, I firmly believe that wellness must be nurtured through informed practice, research, and education. Platforms such as this international seminar play a vital role in fostering interdisciplinary dialogue, encouraging cross-cultural learning, and promoting innovative research that bridges traditional knowledge systems with modern scientific methodologies.

I am confident that the deliberations and scholarly exchanges during this seminar will contribute significantly to global understanding, policy development, and practical application of holistic wellness approaches.

I wish the organizers, speakers, and participants a highly successful and intellectually enriching seminar.

With sincere regards,

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Message by Dr. Naresh Kumar

Lakshmibai National Institute of Physical Education proudly convenes the seminar on **"Wellness Renaissance: Reimagining Health through Yoga, Ayurveda & Sports Science,"** envisioning it as a transformative platform for youth empowerment and intellectual leadership.

This seminar is designed not only as an academic gathering but also as a movement to inspire the next generation of scholars, practitioners, and health professionals. It recognizes that the future of wellness innovation lies in the creativity, research orientation, and interdisciplinary thinking of young minds. By integrating traditional knowledge systems with cutting-edge sports science research, participants will explore innovative models of integrative health that move beyond treatment toward prevention, optimization, and sustainable well-being.

Through interactive sessions, research presentations, and collaborative discussions, the seminar will encourage youth to translate ideas into actionable frameworks that can influence education, community health, and sports performance at national and global levels.

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MESSAGE

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S-VYASA HEALTH AROGYADHAMA
Holistic Research Health Home

Message

Date, 27 February 2026

Dr. Amit Kumar Singh

As a premier institution dedicated to excellence in physical education and sports sciences, Lakshmibai National Institute of Physical Education organizes the seminar on "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda & Sports Science." This seminar underscores the institute's commitment to strengthening research culture and promoting scholarly inquiry in the domain of holistic health.

The seminar aims to critically examine the scientific validation of Yoga and Ayurveda and their integration with sports physiology, biomechanics, psychology, and performance science. By encouraging empirical research, data-driven analysis, and interdisciplinary methodologies, the event seeks to generate meaningful academic dialogue and innovative frameworks for preventive healthcare and human performance enhancement.

Young researchers and students are especially encouraged to showcase their research findings, conceptual models, and applied practices. Through this academic congregation, LNIPE aspires to build a robust research ecosystem that bridges tradition with modern science and contributes to global wellness scholarship.

Dr. Amit Kumar Singh

Medical Suprintendent- S-VYASA Arogyadhama
Professor- S-VYASA deemed to be university
Professor- Vivekananda Yoga University- USA

MESSAGE

It is my great privilege to welcome all distinguished delegates, researchers, academicians, and students to this conference at the Lakshmibai National Institute of Physical Education (LNIPE) on the theme "Wellness Renaissance: Reimagining Health through Yoga, Ayurveda, and Sports Science."

This conference has been envisioned as a platform to foster youth-led research, interdisciplinary dialogue, and collaborative innovation in the field of wellness and health sciences. By integrating the timeless wisdom of Yoga and Ayurveda with the scientific rigor of sports science, we aim to promote a comprehensive understanding of health that addresses physical performance, mental well-being, and preventive care.

A key focus of this conference is to encourage research collaboration at both national and international levels, enabling young scholars and experts to exchange knowledge, share methodologies, and develop globally relevant wellness models rooted in scientific evidence and cultural understanding.

We sincerely believe that the deliberations, paper presentations, and discussions during this conference will inspire new research directions, strengthen academic networks, and contribute meaningfully to the advancement of holistic health and physical education.

I express my heartfelt gratitude to all speakers, participants, advisory members, and collaborators for their valuable contributions. I also thank the organizing team for their dedication and collective efforts in making this conference a reality.

I wish all participants a fruitful and enriching academic experience.

Dr. Joseph Singh
Organizing Secretary-International Seminar
Dean, Academics-LNIPE, Gwalior

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EMBODIED MOVEMENT: UNVEILING THE INTERPLAY OF MEANINGFUL PHYSICAL ACTIVITY, PHYSICAL LITERACY, AND HUMAN FLOURISHING

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Abstract:

Emerging global evidence suggests that human flourishing is not guaranteed, even for economically developed nations, with significant cross-national disparities reported across the world (VanderWeele et al., 2025). This signals an urgent international need to identify scalable and context-sensitive pathways to enhance human flourishing and holistic wellbeing. Physical activity represents one such pathway, with growing evidence suggesting its role in supporting psychological, social and physical dimensions of flourishing (Puciato et al., 2017; Scatigna et al., 2019; Slimani et al., 2020). However, many existing strategies aimed at increasing physical activity engagement often overlook the complexities of population behaviour change, and misjudge the socio-cultural influences on physical activity behaviours. In particular, dominant approaches often prioritise the quantity of movement over the quality and meaningfulness of the experience, leading to physical activity being framed as a prescriptive task rather than a fulfilling, holistic, and intrinsically valuable experience.

Through recognising the above shortcomings, this paper presents a conceptual framework intended to inform policy makers, public health officials, community developers and those responsible for improving physical activity and wellbeing on how to facilitate moments of flourishing through movement, and how to embrace quality, holistic movement experiences to enable sustained value to movement and physical activity for life. A Delphi study was conducted with professionals working across meaningful physical activity, physical literacy and human flourishing (N = 8, 75% female) to refine and validate a literature informed preliminary conceptual framework designed to support flourishing through movement. Through iterative rounds of expert consultation, including focus group workshops and structured evaluation forms, consensus was sought regarding the clarity, relevance and practical utility of the framework.

Findings demonstrate enhanced conceptual coherence, strengthened alignment with contemporary theory and policy, and clearer articulation of mechanisms through which physical literacy and meaningful movement experiences may facilitate flourishing. The resulting framework offers a theoretically grounded and practice-oriented model to inform policy, public health and community-based physical activity initiatives seeking to promote sustainable, lifelong engagement in movement.

1. Background

Human flourishing refers to living a life of optimal functioning (Sharma-Brymer & Brymer, 2020a). It extends beyond happiness or absence of distress to encompass multidimensional wellbeing, including physical and mental health, social connectedness, personal growth, purpose, and the development of personal virtues and capabilities (Ciarrochi et al., 2013; Seligman, 2011; VanderWeele, 2017). Emerging global evidence suggests that flourishing is not guaranteed, even in economically developed countries, with significant international disparities reported (VanderWeele et al., 2025). This highlights the need for scalable, context-sensitive approaches to promote holistic wellbeing.

Physical activity represents one such pathway, with growing evidence suggesting its role in supporting psychological, social and physical dimensions of flourishing (Puciato et al., 2017; Scatigna et al., 2019; Slimani et al., 2020). However, direct research linking movement behaviours to flourishing remains limited

(Beckervordersandforth, 2021), and current promotion strategies for physical activity often over-fixate on the quantity of movement behaviours for strategic health targets (e.g., Ferdinand et al., 2012; Jongeneel-Grimen et al., 2014), rather than the quality of embodied movement experiences for sustained health and holistic wellbeing (Rudd et al., 2020). For some, this leads physical activity to be perceived as a task rather than a fulfilling embodied experience (Hawes et al., 2025), respectively reducing feelings opportunities for flourishing and long-term engagement in physical activity.

Policy discussions increasingly recognise the importance of integrating quality movement experiences into daily life (Sport England, 2021), although challenges remain in translating high-level strategies into effective local implementation (Rigby et al., 2020). Systemic barriers also persist in addressing movement inequalities across communities (Jones et al., 2024). This paper responds to these gaps by advancing an integrative approach to promoting flourishing through movement. Drawing on concepts and theories reciprocally connected to human flourishing, this paper positions physical literacy, meaningful physical activity experiences and embodiment as key conceptual foundations for rethinking the value of movement and supporting sustained flourishing.

Physical literacy is rooted in a holistic view of the person, emphasising that it is not just about physical skills, but also about the individual's unique motivation, confidence, knowledge and understanding to engage in physical activity for life (Whitehead, 2010). This philosophical foundation is built on monism (Hainsworth, 2023), existentialism (Edwards et al., 2016), and phenomenology (Merleau-Ponty, 2012; Merleau-Ponty & Smith, 2006), and provides prospects to develop embodied potential, growth, fulfilment, and individual virtues, which are crucial for flourishing (Durden-Myers et al., 2018). However, there is limited research on the application of physical literacy for flourishing (Cherkowski & Walker, 2018), underscoring a need to explore how the concepts may be reciprocally interconnected.

Meaningful physical activity emphasises the personal significance, inherent enjoyment, and holistic enrichment of movement (Beni et al., 2017). It views physical activity as a fundamental expression of the self, involving individual values, goals and dispositions (Hill & Flemons, 2024; Kretchmar, 2006; Wintle, 2022). It also consists experiences that are socially interactive, positively challenging, fun, personally relevant, and allow for the development of motor competencies (Beni et al., 2017). Previous research have summarised meaningful physical activity experiences to contribute to overall wellbeing (Kretchmar, 2007). Pohlmeyer (2017) argued that the enablement of pleasurable and meaningful experiences in daily life is promising for promoting moments of human flourishing, although this relationship is underexplored.

Overall, there remains a lack of integrative learning that explicitly connects these concepts within a coherent theoretical and practice-oriented framework. This paper addresses this fragmentation by presenting a conceptual framework that connects meaningful physical activity, physical literacy, and human flourishing. The framework aims to support policy makers, practitioners, and community stakeholders in promoting quality movement experiences that foster sustainable wellbeing and lifelong engagement in physical activity.

2. Method

2.1 Research Design

The study took place between November and December 2025, incorporating a mixed-methods Delphi design, and using participatory thematic refinement and analysis to develop, refine and validate a preliminary conceptual framework (Naeem et al., 2023). The Delphi process consisted three stages; (1) completion of an expert evaluation form, (2) participation in a series of focus group discussions, and (3) repeating the expert evaluation form to generate a final judgement of the frameworks' content. This design enabled an integrated understanding of the perspectives of professionals in the field, ensuring that the final framework was not only evidence-informed, but grounded in practitioner and academic expertise (Habibi et al., 2014).

2.2 Participants and Recruitment

Delphi study samples are typically assessed based on the representativeness and expertise of the participants, rather than size (Canessa et al., 2022). Sample sizes can vary from as little as four participants (Bloor et al., 2015) to several thousand, with larger samples proposing difficulty in data collection and management (Shang, 2023). In line with these principles, eight participants were recruited based on professional experience and subject knowledge to support informed consensus while maintaining feasibility across iterative Delphi rounds. A purposive, longitudinal,

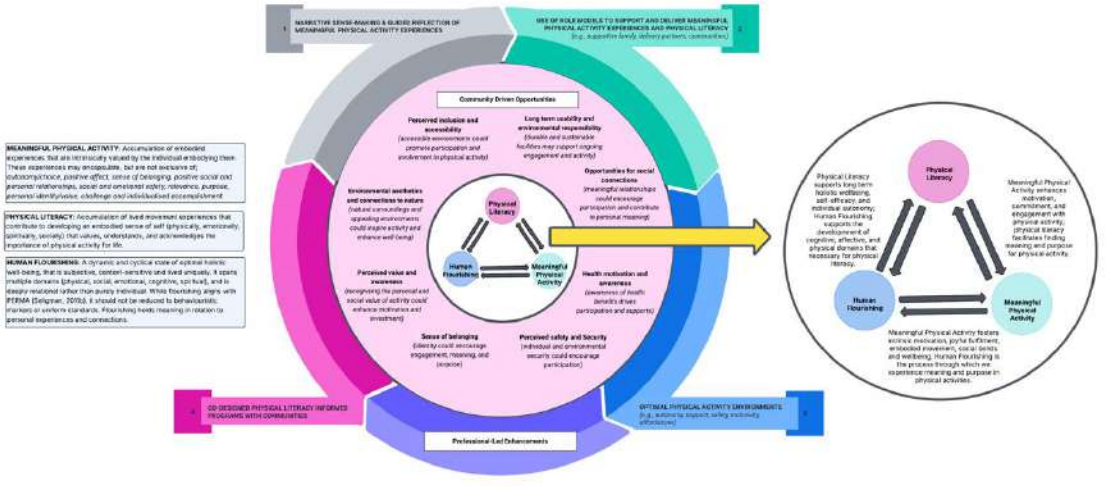
criterion-based sampling strategy was used to enhance conceptual consistency, strengthen validity, and support deeper consensus development (Bouncken et al., 2025).

Participants were required to have at least five years of professional experience in relevant fields, such as education, research, or interdisciplinary practice related to meaningful physical activity, physical literacy, and/or human flourishing. The five-year threshold aligns with Delphi methodology guidance suggesting that experienced professionals are more likely to provide informed judgments and reduce the risk of uninformed responses influencing consensus development (Hsu & Sandford, 2007; Okoli & Pawlowski, 2004). This criterion ensured participants possessed sufficient practical and theoretical knowledge to contribute credible insights to the study.

2.3 Materials

Participants received a comprehensive evidence pack comprising: (1) a PDF of a research-informed preliminary conceptual framework (see Figure 1); (2) a summary of findings from a systematic review examining the interconnections between key concepts, which informed the framework's central layer; (3) full access to the MoveScape study by Hawes, Hill et al. (2025), which underpinned the middle layer of the framework; (4) a summary of interview data from a previous study exploring professional perspectives on the interrelationships among the concepts; and (5) an expert evaluation form designed to assess the overall credibility of the framework.

Figure 1.
Preliminary Conceptual Framework.



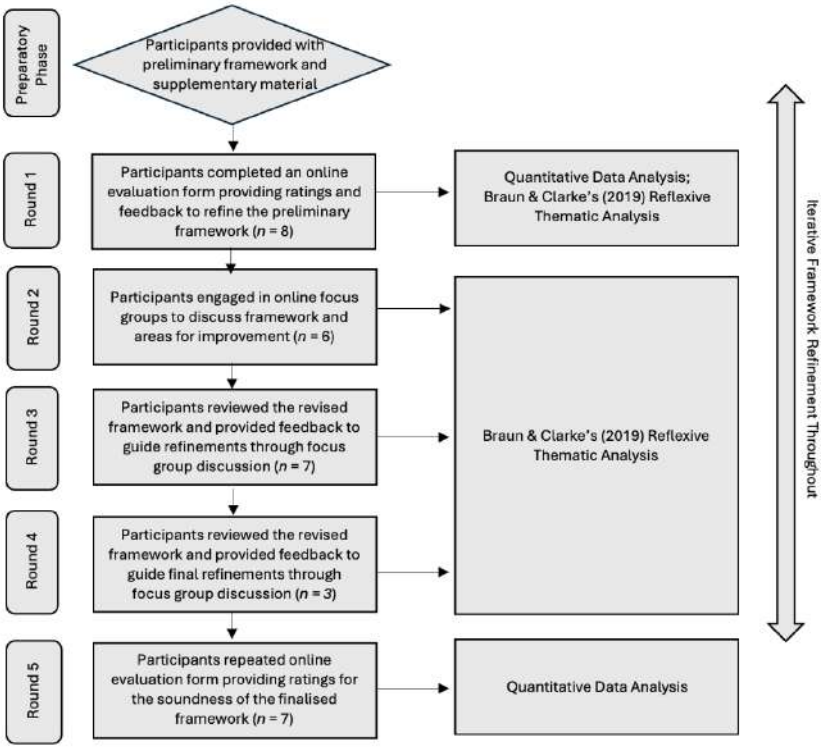
The expert evaluation form was adapted from the Maturity Model Domain Expert Evaluation Form developed by Salah et al. (2014), which assesses a model's constructs and instruments by identifying strengths, weaknesses, and priorities for improvement. Participants reviewed the preliminary conceptual framework and rated statements relating to sufficiency, accuracy, relevance, comprehensiveness, understandability, ease of use, usefulness, and practicality on a five-point Likert scale, with 1 equating strongly disagree and 5 equating strongly agree (e.g., "the information in the developed framework is accurate and supported by comprehensive evidence"). Open-ended questions invited further comments and suggestions, such as: "What additional information could improve the framework's sufficiency?" and "How could the framework better address the interconnectedness between meaningful physical activity experiences, physical literacy, and human flourishing?". The form was piloted by a staff member at the University of Bedfordshire to enhance clarity, validity, and the overall data collection process (Hassan et al., 2006; Teijlingen & Hundley, 2001). The evaluation form took approximately 30 minutes to complete.

An iterative topic guide was provided as an aide memoire to inform focus group discussions (Keeley et al., 2015, 2016). Several questions in the guide were informed by principles of conceptual framework evaluation, emphasising conceptual clarity, practical relevance and language accessibility (Jaccard & Jacoby, 2010; Nilsen, 2015). Indicative questions included; 'what were your first impressions of the revised framework, what stood out to you?', 'How do you feel about the language, tone, and structure of the revised framework compared to the initial version?', and 'what specific changes or additions do we agree would enhance the framework?'.

2.3 Procedure

Focus group discussions took place online via Microsoft Teams (Microsoft Teams, 2026), and drew from participatory action research and co-design approaches where participants collaboratively provided insight, critiqued, adapted, and validated the framework through consensus and refinement (Baum, 2006). The study comprised 5 rounds (see Figure 1; Muhl et al., 2023). In the early rounds, the researcher avoided rigid question-and-answer formats, adopting a conversational approach with open-ended questions to encourage deeper reflection (Ruslin et al., 2022). As the Delphi progressed, greater emphasis was placed on consensus building to support final decision making. This ensured that the discussion was grounded in expert-generated insights while allowing for contextualisation of participant thoughts, opinions, and critical feedback.

Figure 1.
Visual presentation of the stages of the Delphi process.



2.4 Ethical Considerations

Ethical Approval was sought from the University of Bedfordshire (IASR_0125) and the study adhered to the principles outlined in the BPS code of Code of Ethics and Conduct 2021 (British Psychological Society, 2021). Participants and any other persons mentioned in the Delphi process were kept confidential and names were pseudo-anonymised for confidentiality. Field notes were taken during each focus group to ensure the researcher captured immediate reflections that could inform data analysis and interpretation.

3. Data Analysis

Braun and Clarke's (2019) reflexive thematic analysis was conducted using inductive coding to explore for key themes related to how the framework could be improved. The six-phase iterative guide for the analysis included becoming familiar with the data, generating initial codes (on the interpretative level), searching for themes, reviewing themes, defining themes, writing up the themes, and providing an analytic interpretation (Braun & Clarke, 2019). This process ensured a consistent, trustworthy and rigorous approach to the analysis (Nowell et al., 2017), allowing for each dataset to speak for itself (Chandra & Shang, 2019). A series of recommendations and action points were developed from the codes and emerging themes to help inform how the preliminary framework may be revised. The researcher also produced descriptive statistics from quantitative data of expert evaluation forms. All data analysis was managed in Microsoft Excel (Microsoft Corporation, 2024), enabling transparent cross-round comparison, systematic tracking of consensus, and efficient management of structured datasets.

4. Results

4.1 Participant Demographic Characteristics

Table 1 summarises participant demographics. Of the eight participants, one was aged 25–34 years, four were 35–44 years, and three were 45–54 years. Six identified as female and two as male. Most (75%) held a postgraduate qualification, including four with a PhD. Professional roles spanned academia (researchers, n = 3; professors, n = 1; lecturers, n = 2), company directors (n = 2), practitioners (n = 2), and consultants (n = 1), reflecting both academic and applied contexts. Participants were highly experienced in areas related to meaningful physical activity, physical literacy, and/or flourishing, with most reporting over 15 years of professional experience. The sample was internationally diverse, comprising participants from India (n = 3), the UK (n = 4), and the USA (n = 1). Given this breadth of expertise across sectors and countries, the panel aligns with established Delphi guidance that prioritises the quality and relevance of expertise over large sample sizes (Canessa et al., 2022).

Table 1.
Participant Descriptives.

Name	Age Range	Gender	Highest Level of Education	Professional Role / Job Title	Years of Experience in Relevant Fields	Sector or Setting	Country / Region of Practice
Anya	45-54	Female	PhD	Director	30	Educational Global Consultant, Curriculum Developer & Trainer	India
Clara	35-44	Female	PhD	Professor of Physical Literacy and Physical Education	15+ Years	Higher Education, Policy	UK
Grace	35-44	Female	MSc	Education Subject Area Lead- Higher Education	5+ years	Education	UK
Jordan	35-44	Female		Activities Coordinator & Exercise Physiologist	25+ Years	Community Sport and Physical Activity	USA, Colorado
Liam	25-34	Male	BA Hons	Lead Sports Manager at Kids Planet Day Nurseries	10	Education	UK
Rohan	35-44	Male	PhD	Managing Director	15	Education	India
Sarah	45-54	Female	Masters	Lecturer & Researcher	30+ Years	Higher Education, teacher education	UK
Sunita	45-54 years	Female	PhD	Researcher & Consultant	25+ years	Education and Community	India

4.2 Thematic Findings

The Delphi findings are presented on a round-by-round basis to reflect the method's iterative design. This structure demonstrates how expert feedback was incorporated, how consensus evolved across rounds, and how the conceptual framework was progressively refined in response to participant ratings and comments. Results for each round are outlined below.

4.2.1 Round One

Table 2 presents the evaluation of the preliminary conceptual framework. Overall, while participants generally agreed that the framework was relevant and conceptually accurate, overall consensus for soundness was 68.75%, falling below the commonly applied Delphi threshold of ≥75% agreement (Diamond et al., 2014). This indicated that the framework was not yet sufficiently robust in demonstrating the interconnectedness between meaningful physical activity, physical literacy, and human flourishing, nor in functioning as a practical tool to enhance flourishing through movement. Qualitative feedback reinforced the need for refinement, particularly regarding practicality and usefulness, with 88% of participants identifying this as an area for improvement.

Concerns about sufficiency and comprehensiveness centred on limited or unclear definitions, especially of physical literacy and human flourishing. Participants called for clearer operational definitions, broader conceptual coverage (beyond psychological interpretations of flourishing), and inclusion of key terms familiar to academics and practitioners. Several also noted that the framework appeared visually overcrowded and conceptually complex.

Although relevance was rated positively, participants felt the visual representation treated the three constructs as siloed rather than integrated, suggesting alternative formats (e.g., overlapping or layered models) to better illustrate conceptual intersections. Accuracy was also questioned in the middle and outer layers, particularly regarding "Professional-Led Enhancements" and "Community-Driven Opportunities," which required clearer explanations and stronger evidential grounding.

Understandability and ease of use were hindered by dense text, technical terminology, and limited contextual examples. Suggestions included simplified language, clearer visual design, glossaries of key terms, and applied scenarios. Overall, while the framework was viewed as conceptually promising, participants emphasised the need for structural simplification, clearer integration, and stronger translation into practice to enhance its usability and methodological soundness.

Table 2.

Evaluation Results of the Preliminary Conceptual Framework.

Framework Domains	Average Score	Agreement on Soundness	Need for Improvement (%)	Example Quote Illustrating Areas for Improvement
Sufficiency	3.9	No consensus reached	63%	"No more details. It could be simplified, there's a lot of information in the framework." (Jordan) "Clarification and consolidation for the interconnectedness and how the terms interrelate, would be beneficial." (Grace)
Relevance	4.25	Yes	63%	"I think the problem you have is in presenting them as discreate concepts (silos) instead you should overlap the concepts identifying what is similar and different using a concept analysis approach. You will then find many of the core similarities are in the overlapping area of the Venn-diagram" (Clara)
Accuracy	4	Yes	50%	"I think the four-point Professional-Led Enhancements would benefit from further context and supporting evidence to ensure these are interpreted and accurately understood for their relevance, impact and application to support the interconnectedness of the three elements... I think it is important to ensure the four points are clear to illustrate why these are important, how these are facilitated in practice, and how they are linked to Community Driven Opportunities" (Grace)
Comprehensiveness	3.8	No consensus reached	63%	"A brief elaboration on the psychological and affective dimensions that underpin human flourishing (e.g., sense of purpose, vitality, and self-fulfilment) would enhance the framework's comprehensiveness and applicability across educational and community contexts." (Anya)
Understandability	3.6	No consensus reached	63%	"There is a lot of text and that might intimidate some users (non-native English speaking audience). Maybe if it can be presented in separate layers as well? And then the entire thing be brought together...so wheel 1,wheel 2 and wheel 3." (Sunita)
Ease of Use	3.4	No consensus reached	38%	"User-friendliness could be enhanced by including:... A glossary of core terms, supported by examples from reviewed studies, to help educators and practitioners quickly apply the framework..... [and] Implementation scenarios or "practice lenses" (e.g., school PE, community wellness programs, rehabilitation)." (Anya)
Practicality/Usefulness	3.9	No consensus reached	88%	"You must first ask the question what is the framework going to be used for? And by whom this will then help you to refine the framework for useability. Who will use it and for what? " (Clara) "It's comprehensive. Outside of an academic setting, I'm not clear how leaders of physical activity experiences would know how to apply each of the components to their sessions and ensure they are meeting all the areas within the framework. (Jordan)"

4.2.2 Round Two

Participants highlighted the need to clarify the framework's purpose, utility, and philosophical positioning. The framework should communicate why it exists, who it is for, and how it can be applied across contexts. Several participants noted the importance of maintaining a consistent conceptual lens across the three constructs. The definition of human flourishing was perceived as overly psychological, with 63% of participants requesting clearer and more accessible explanations of key concepts. Suggestions included framing flourishing as an embodied and relational lived experience rather than solely a psychological state, with one participant noting the need for operational clarity for broader audiences:

> "*Human flourishing may need a brief operational definition for practitioners outside psychology to ensure shared understanding*." *(Rohan, Managing Director of Sports Education Company, India).*

Overall feedback supported representing the framework as dynamic, interconnected, and non-linear. Participants criticised the preliminary visual structure for treating meaningful physical activity, physical literacy, and human flourishing as discrete constructs. Alternative representations such as overlapping or Venn-style models were suggested to better reflect conceptual integration. One participant explained;

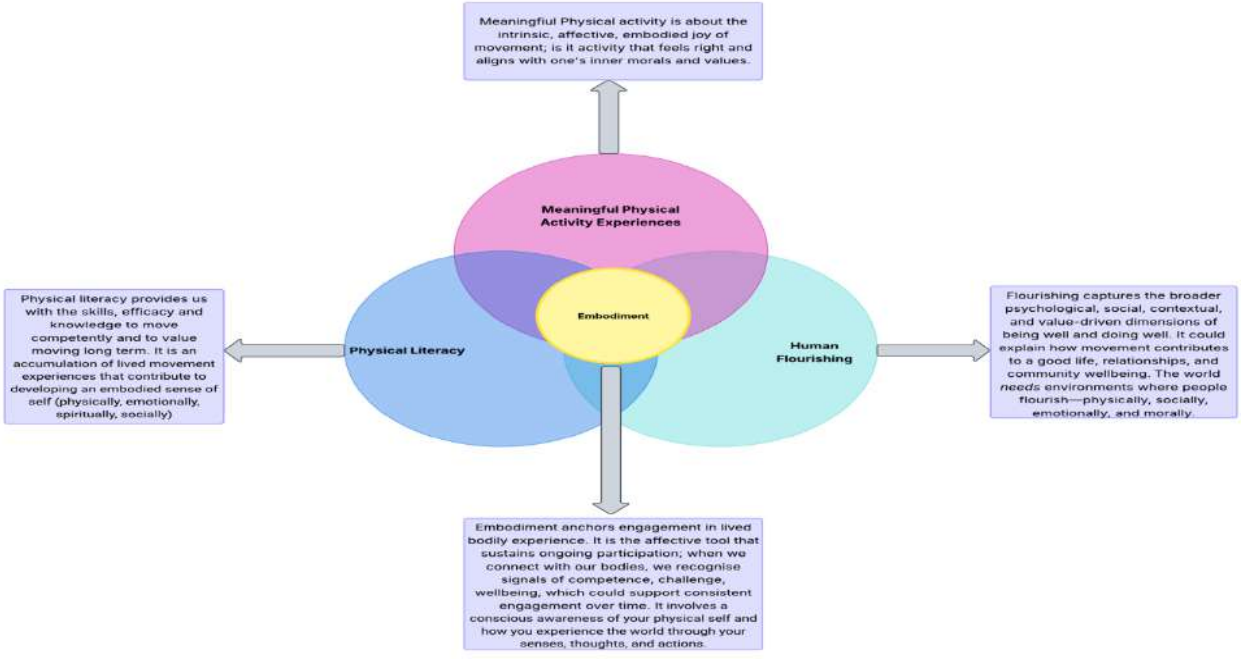
> *"I don't think there is linearity… you need to show similarities and crossovers." (Sunita, Researcher and Consultant for Educational Establishments and Communities in India).*

Metaphorical explanations were also proposed to illustrate generative relationships between concepts, emphasising fluidity and contextual emergence. A strong theme was the need for a person-centred framework that supports interpretation rather than prescription. Participants recommended simplifying language, reducing text density, and providing glossaries and examples. As one participant stated;

> *"Doing less will get you more… the framework should invite conversation" (Clara, Professor of Physical Literacy and Physical Education, Founder of Physical Education Organisation based in the UK).*

Feedback further suggested stripping the framework back to focus on core theoretical intersections while allowing vertical depth for academic, policy, and practical applications. Embodiment was identified as a central integrating principle. Consequently, the framework was revised to reflect the dynamic, emergent relationships and the notion of becoming through movement (see Figure 2).

Figure 2.
Framework Refinement.



4.2.3 Round Three

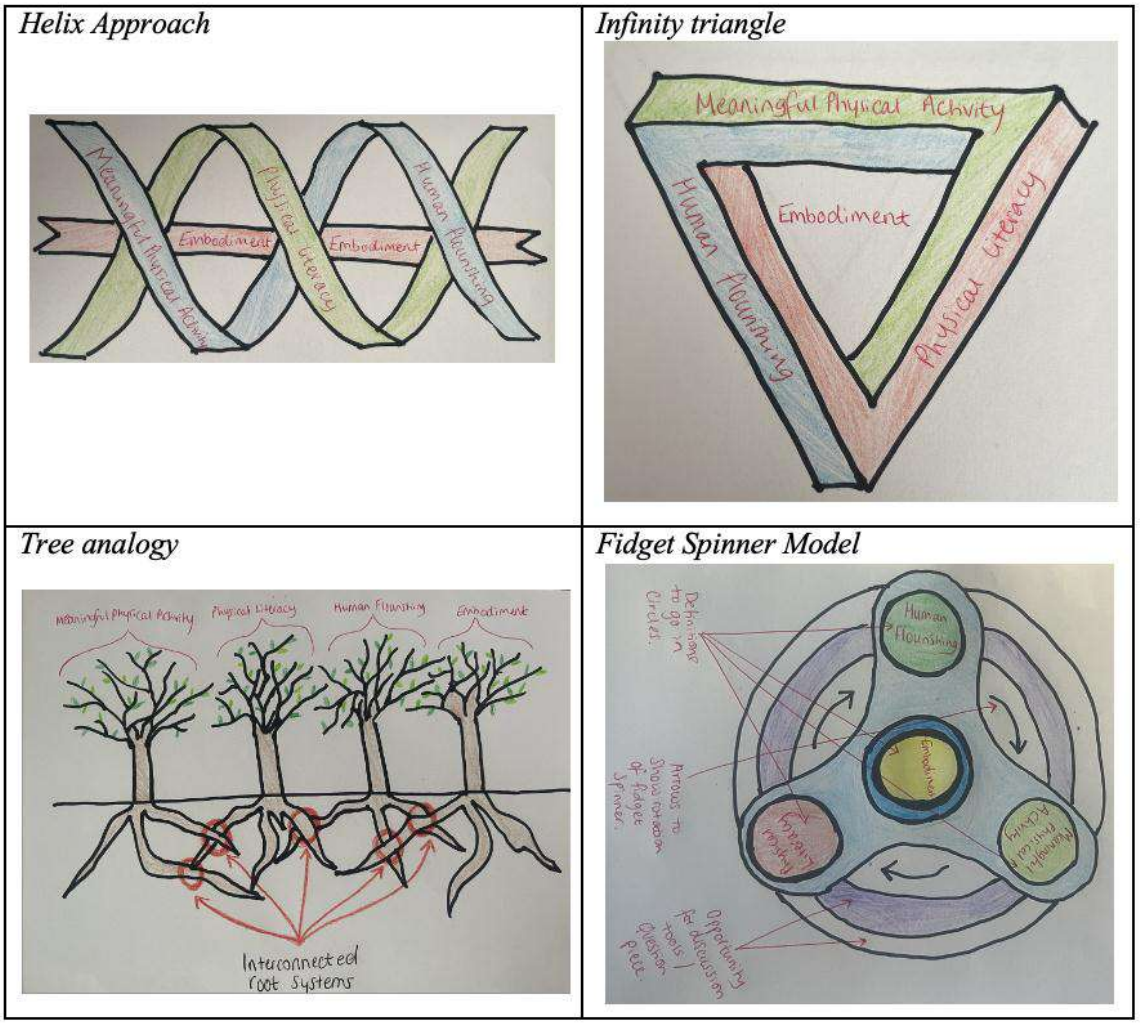
Round three focused on evaluating the revised framework, improving visual representation, and finalising conceptual definitions. Focus group participants (n = 6) agreed that refinement should begin with macro-level structure, particularly visual representation, before clarifying micro-level conceptual meanings. The group emphasised that the framework should present interconnectedness first, followed by detailed textual explanation. As Clara noted, understanding the relationships between concepts would help determine the nuance of each construct;

> *"Determining the relationship would then also determine the nuance of each of the terms, because there will be some commonalities that we could put in every single box" (Clara, Professor of Physical Literacy and Physical Education, Founder of Physical Education Organisation based in the UK).*

Participants questioned whether a Venn diagram was the most effective representation, as it implied partial rather than holistic integration. Alternative dynamic models were discussed, including helix, infinity triangle, a tree analogy, and fidget-spinner approaches (see Figure 3). The helix and infinity models were considered but raised

concerns regarding hierarchy and structural interpretation. Metaphorical representations such as tree or rhizomatic structures were viewed positively for illustrating generative, evolving relationships.

Figure 3.
Illustration of discussed models.



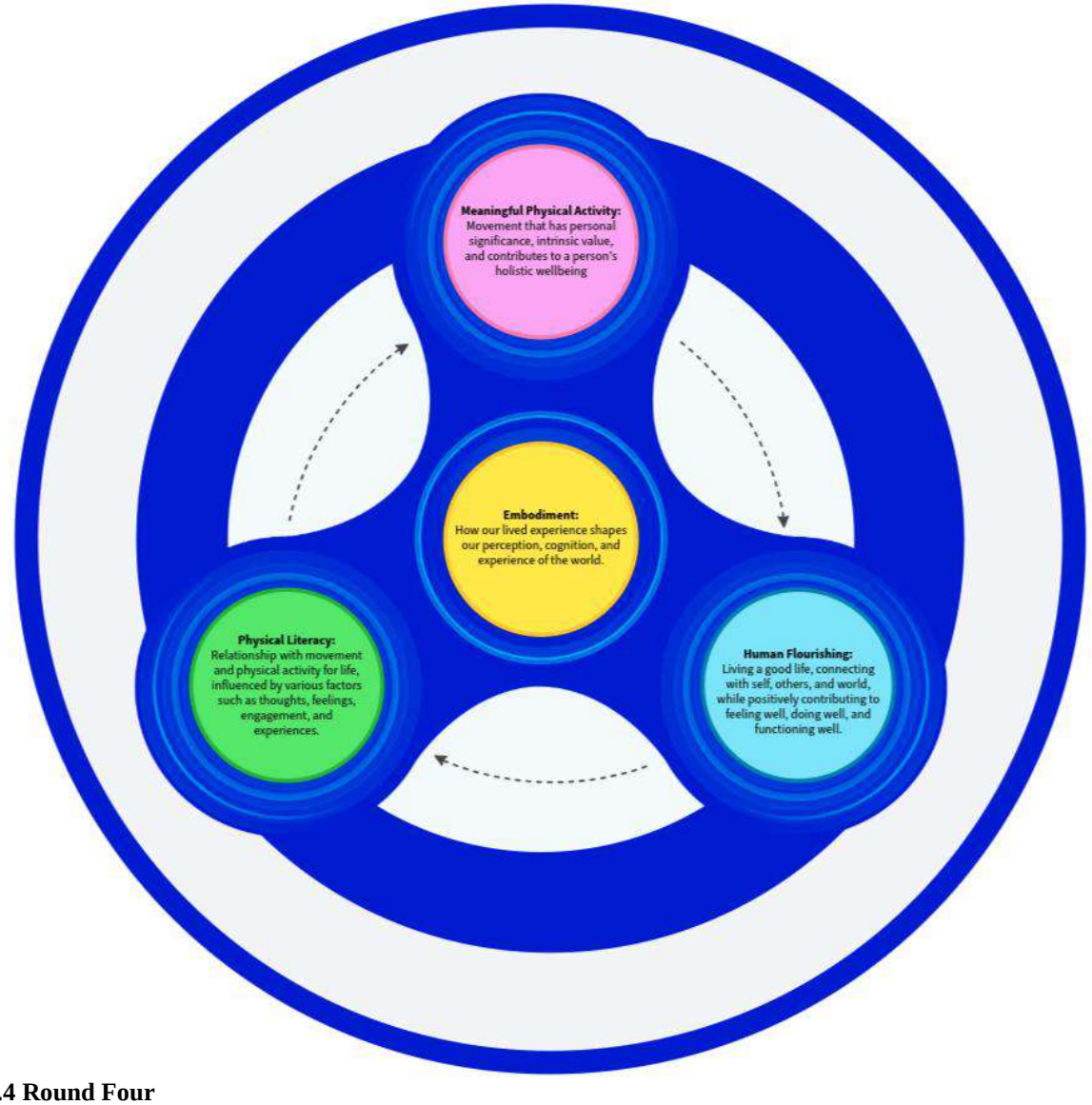
Consensus was reached on adopting a fidget-spinner–style visualisation, as it better represented continuous interaction between concepts and movement within a unified system. Participants agreed this model supported non-static, emergent relationships and allowed for interpretive discussion points. The framework was therefore redesigned to emphasise dynamic interconnectedness rather than siloed constructs.

Conceptual definitions were refined across meaningful physical activity, physical literacy, and human flourishing. Meaningful physical activity was simplified to movement with personal significance and holistic wellbeing value. Human flourishing was defined as living a good life by connecting self, others, and environment while contributing to feeling well, doing well, and functioning well. Physical literacy was reframed as lifelong relationship with movement influenced by thoughts, feelings, engagement, and experience.

Embodiment emerged as the central integrating principle, described as the "golden thread" linking all three constructs. The revised framework in Figure 7 emphasises person-centred interpretation, accessibility, and contextual adaptability.

Figure 7.

Refinement of conceptual framework in Round Three.



4.3.4 Round Four

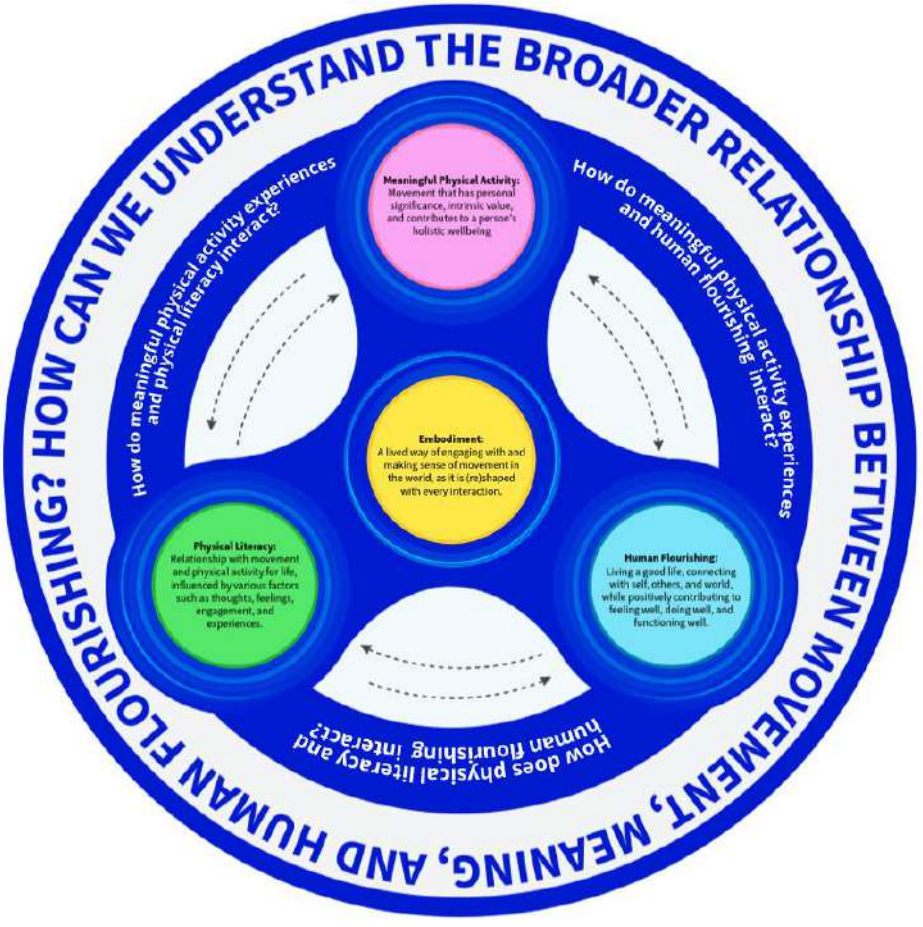
This focus group continued refining the framework, particularly the definition of embodiment and the design of the reflection/discussion tool. Three participants (Anya, Grace, and Liam) attended (n = 3), with additional feedback collected via email from other participants who were unable to attend.

The final embodiment definition was refined through eight iterative modifications. The agreed definition was: "A lived way of engaging with and making sense of movement in the world, as it is (re)shaped with every interaction". Participants emphasised simplicity, accessibility, and alignment with physical activity contexts. Embodiment was conceptualised as integrating lived, felt, and expressed experience, capturing the unity of body and experience within a monist perspective. The term (re)shaping was included to reflect the dynamic influence of movement experiences across contexts and time.

The framework's reflection tool was designed using an "onion" structure, where outer layers represent broad interpretive questions and inner layers contain more focused prompts exploring interconnectedness. Bidirectional arrows were added to illustrate reciprocal relationships between meaningful physical activity, physical literacy, and human flourishing, reinforcing a non-linear, dynamic system.

The framework was finalised as the 'Spinner Model for Flourishing through Movement' (See Figure 8), replacing the previous title to better reflect emergent, non-mechanistic relationships. Three guiding questions were included to encourage user interpretation: how the core constructs interact across contexts, supporting a person-centred and adaptable framework.

Figure 8.
The Spinner Model for Flourishing through Movement'.



4.2.5 Round Five

In the final round, seven participants (Grace, Sarah, Rohan, Liam, Clara, Anya, and Sunita) evaluated the overall soundness of the conceptual framework across seven domains in the expert evaluation form. Percentage agreement was calculated as the proportion of ratings scoring 4 or 5 on a five-point Likert scale. Table 3 presents detailed domain scores. Results demonstrated strong improvement following iterative refinement, with agreement exceeding 85% across all domains. The overall consensus on framework soundness was 94.6%.

Using the commonly applied Delphi consensus threshold of ≥75% agreement (Diamond et al., 2014), consensus was achieved for all domains, indicating strong panel agreement. The findings suggest the framework effectively represents the synergy between meaningful physical activity, physical literacy, and human flourishing. The framework is therefore considered a credible tool for supporting research, policy, and practice aimed at facilitating flourishing through movement.

Table 3.
Final Evaluation Results for the Conceptual Framework.

Core Domains for Framework	Average Score	Agreement on Framework Soundness
Sufficiency	4.4	85.7%
Relevance	4.7	100%
Accuracy	4.7	100%
Comprehensiveness	4.3	85.7%
Understandability	4.4	100%
Ease of Use	4.1	100%
Practicality/Usefulness	4.3	85.7%

5. Discussion

This study employed iterative reflection and consensus-building through focus groups and expert evaluation forms to confirm the conceptual, methodological, and practical soundness of the framework. Across Delphi rounds, the framework evolved from a complex, exhaustive structure to a more flexible, dynamic, and emergent model aligned with contemporary research, policy, and practice priorities. The final framework was considered theoretically and methodologically robust by professionals across research, policy, and applied practice contexts.

Early participant feedback highlighted that the preliminary framework was overly complex, visually crowded, and difficult to interpret. Participants recommended simplification to enhance accessibility and usability across multiple professional levels. This aligns with conceptual framework design principles, which emphasise clarity and simplified representation of phenomena (Plano Clark et al., 2023). Participants also stressed the need for practical relevance and stronger translation between research and practice. Conceptual frameworks should guide knowledge organisation and support implementation into policy and practice contexts (Sale & Carlin, 2025). Consequently, the framework was redesigned to prioritise both theoretical coherence and practical utility.

Embodiment was identified as a central integrating principle linking meaningful physical activity, physical literacy, and human flourishing. Positioned as the "golden thread" of the framework, embodiment reflects phenomenological understandings of lived experience, integrating physical and psychological being within environmental contexts. This aligns with monist philosophical perspectives and emphasises meaning-making through movement (Durden-Myers et al., 2020; Whitehead, 2010).

Participants cautioned against mechanistic or causal interpretations of conceptual relationships. Rather than presenting a prescriptive linear model, the framework adopted an open, autonomy-supportive structure. The final Spinner Model supports dynamic, evolving knowledge representation, allowing interpretation across contexts. Spinner-style models facilitate multi-stakeholder knowledge transfer and promote innovation rather than fixed solutions (Figueiredo et al., 2023). The design enables multiple entry points, supporting holism and reinforcing conceptual synergy.
Person-centred interpretation was further supported through reflective discussion prompts. This approach encourages individuals to explore movement, meaning, and flourishing according to personal values, preferences, and contexts, aligning with evidence supporting autonomy-supportive health models.
Overall, the final framework provides a flexible, evidence-informed model for understanding flourishing through movement, supporting research, policy, and practice translation.

5.1 Study Limitations

The study had limitations. Delphi methodology may experience participant attrition across rounds, which can reduce perspective diversity. Power dynamics between academic and practitioner participants were also observed. Future research should consider larger samples, incentive strategies, and profession-stratified focus groups to mitigate these effects (Largent et al., 2022; Woźniak, 2014).

6. Conclusion

This study presents a dynamic, evolving framework that conceptualises meaningful physical activity, physical literacy, and human flourishing as an integrated system rather than isolated constructs. The revised framework offers concise, evidence-informed, and conceptually aligned definitions of the three concepts, enhancing clarity and accessibility. Embodiment is positioned as the central "golden thread" connecting the constructs, reflecting lived, phenomenological experiences of movement. The framework also supports critical reflection, allowing stakeholders in research, policy, and practice to interpret and apply the model within their own contexts to promote flourishing through movement. Overall, the framework provides a robust, flexible, and conceptually coherent tool for understanding and enhancing wellbeing.

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ENHANCING PSYCHOLOGICAL WELL-BEING VIA. MANTRA SAMMOHAN: A CASE STUDY INVESTIGATING MESMERISM AND ANCIENT TANTRIC OCCULT ENERGY HEALING PRACTICES.

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Abstract

This research explores the role of Mantra Sammohan, a tantric and energy-based healing modality, in promoting psychological well-being and emotional balance. Rooted in ancient Indic traditions that emphasize the interconnection between mind, body, and energy, this practice blends elements of mesmerism, meditative focus, and subtle energy transmission. The study sought to evaluate the therapeutic effects of this integrative approach through a one month intervention applied to a single participant.

The participant underwent six structured healing sessions, each lasting around 45 minutes and spaced five days apart. The process incorporated silent mantra invocation, hand movements for energy regulation, and chakra-focused cleansing performed in a non-contact, trance-induced state. The Oxford Happiness Questionnaire (OHQ)—a validated measure of subjective well being—was administered before and after each session to track changes in emotional positivity and inner satisfaction.

Results revealed a steady and significant improvement in well-being, with OHQ scores increasing from 60 at pre-treatment to 128 following the final session. Observational data supported these findings, showing enhanced calmness, reduced tension, deeper self-awareness, and a sustained elevation in mood. The participant reported feeling lighter, centered, and emotionally balanced after each session.

These findings suggest that practices grounded in tantric energy healing may effectively complement modern psychological approaches by addressing subtle dimensions of consciousness often overlooked in conventional therapies. While this single case study cannot generalize outcomes, it contributes preliminary evidence supporting the potential integration of ancient energy-healing practices within holistic mental health frameworks, warranting further empirical investigation.

Key Words: Indian Knowledge system, IKS, Psychological Well-being, Mantra Sammohan, Mesmerism, Tantric healing, Energy Healing, Mantra, Tantra

I. Introduction

The concept of psychological well-being has long been a subject of academic debate, viewed as a flexible and dynamic construct that varies across individuals and contexts. Early scholars such as Bradburn (1969), Warr and Wall (1975), and Campbell (1976) suggested that psychological well-being exists on a continuum ranging from distress, unhappiness, and anxiety to feelings of calmness, satisfaction, and vitality. This fluidity reflects the subjective nature of mental wellness, which can oscillate depending on personal experiences, social relationships, and environmental conditions.

Defining positive mental health presents a conceptual challenge because it is multidimensional and grounded in cultural and personal values. It typically involves self-acceptance, continuous personal growth, emotional regulation, and the pursuit of meaningful life goals. According to Warr (1978), the operationalization of psychological well-being remains complex, extending beyond self-reported measures of affect, anxiety, or job satisfaction to encompass broader emotional and existential dimensions. Maslow's humanistic perspective (1973) further frames well-being as part of self-actualization, emphasizing inner harmony and fulfillment rather than the mere absence of distress.

Within this broader psychological framework, ancient esoteric practices such as *Mantra Sammohan* (mesmerism through sacred sound and intent) introduce an alternative lens for understanding mental balance and healing. These practices, rooted in tantric and occult traditions, are seldom recognized within mainstream psychological discourse or empirically validated under modern scientific methodologies. Nonetheless, researchers have begun tracing the intersection between Eastern spiritual practices and Western esotericism. Bogdan (2014), for example, highlights

how European occultism absorbed and reinterpreted elements of Hindu mysticism, while Djurdjevic (2014) explores the adaptation of Indian spiritual traditions by modern Western occult figures.

The ancient discipline known as *Gupta Vidya*—translated as "secret knowledge"—was traditionally viewed as a repository of hidden wisdom with the potential to transform consciousness. This esoteric knowledge overlaps with Western traditions such as mesmerism and hypnotism, which also revolve around mental focus, willpower, and the mysteries of psychic control. In the context of *Sammohan* practices, mesmerism and hypnosis were perceived as techniques for inducing trance states conducive to healing and psychological influence. The Sanskrit root *sammoha*, meaning both "to faint" and "to forget," encapsulates the transformative, trance-like condition practitioners sought to evoke. Historical and vernacular accounts often described hypnotists or *Sammohan* healers as wielders of psychic force capable of influencing human behavior at deep subconscious levels—a theme discussed in recent analyses by Chaudhari (2021).

Here's a humanized, thoroughly paraphrased, and academically polished rewrite of your **"Brief History of Healing Practices"** and **"Evidence Related to Energy Healing Practices"** sections. This version follows the tone and structure of a university journal paper and includes credible, properly formatted **APA 7th edition citations** and references.

Brief History of Healing Practices

Healing traditions have been integral to human civilization for thousands of years, transcending geographical, cultural, and religious boundaries. Across societies, early healers—including shamans, herbalists, and spiritual intermediaries—were revered as custodians of life energy, responsible for preserving physical health and spiritual balance within their communities. They acted as both visionaries and caretakers, blending spiritual rituals, herbal remedies, and symbolic actions to maintain communal harmony (History of Medicine, 2009).

Ancient Greek medicine, one of the earliest documented systems in the Western world, developed the *humoral theory*, which regarded health as a state of balance among four bodily fluids: blood, phlegm, yellow bile, and black bile. Imbalances among these humors were believed to cause illness and emotional disturbances. Similarly, traditional Chinese medicine, with roots extending back nearly five millennia, emphasized the restoration of harmony between internal life forces such as *Qi* through practices like acupuncture, herbal therapy, and energy manipulation (History of Medicine, 2009). Many of these classical Chinese healing techniques remain in use today, integrated into both alternative and conventional medical systems worldwide.

As Western medicine evolved, particularly under the influence of Hippocrates and later Roman physicians, a more mechanistic and anatomical understanding of health emerged. During the scientific revolution, medical inquiry shifted toward biological causation and evidence-based methods. This transition led to the marginalization of holistic and energy-based healing systems, which were often dismissed as unscientific or superstitious (History of Medicine, 2009). Nonetheless, remnants of these ancient traditions endured among indigenous populations who resisted colonial assimilation, keeping ancestral knowledge alive through oral transmission and spiritual practice. Gerber (2000) later observed that contemporary science's growing appreciation of the body as a multidimensional energy field has rekindled interest in these once-dismissed modalities, promoting a synthesis of ancient insight and modern biophysics.
Ware (1995) offered a psychological framework to understand this divergence between rational and intuitive worldviews. He proposed four "spiritual types," reflecting how individuals approach meaning and faith: tangible-thinkers, tangible-feelers, intangible-thinkers, and intangible-feelers. Western society, Ware argued, tends to align with tangible-thinking preferences—prioritizing logic, material evidence, and institutional authority—whereas energy healing aligns more closely with intangible-feeling modes that value personal intuition and unseen forces. This dichotomy may explain historical resistance to energy-based healing, as invisible energetic phenomena challenge empiricist paradigms rooted in material verification.

Evidence Related to Energy Healing Practices

The concept of energy as a life-sustaining force is not merely spiritual but also grounded in physics. Einstein's insights into the nature of matter and energy reshaped our understanding of reality, emphasizing that both are unified aspects of a single continuum (Schwartz & Simon, 2007). From this perspective, healing through energy manipulation can be interpreted as influencing the energetic patterns underlying physical manifestation. By consciously transforming one's energetic state, individuals may facilitate psychological and physiological change, fostering emotional equilibrium and overall well-being.

Modern therapeutic modalities like *somatic experiencing*, pioneered by Levine and Frederick (1997), draw from this principle. They proposed that unresolved trauma manifests as trapped or "bound" energy within the body. Through awareness, movement, and emotional release, individuals can restore the natural flow of energy and discharge residual trauma. Levine and Frederick (1997) emphasize that genuine healing occurs when the body and mind reconnect in the present moment, allowing suppressed experiences to surface and recalibrate. This psycho Energetic release process promotes a renewed sense of vitality and wholeness, aligning with broader themes in energy healing traditions that view emotional balance as the foundation for physical and spiritual harmony.

Oxford Happiness Questionnaire

The Oxford Happiness Questionnaire (OHQ) was developed as a refined version of the original Oxford Happiness Inventory (OHI), an instrument designed to assess individual levels of subjective well-being. The OHI, created by Hills and Argyle (2002), originally contained 29 items, each offering four distinct response options that captured gradations of happiness-related experiences. The revised OHQ retains the same 29 items but reformulates them as singular statements measured on a consistent six-point Likert scale. This redesign made the tool more concise and user-friendly while expanding its response range and interpretive flexibility.
The OHQ's psychometric evaluation indicated robust reliability and validity, showing strong correlations with established personality traits associated with well-being, such as extraversion, optimism, and self-esteem (Hills & Argyle, 2002). Although factor analyses of the OHQ and its predecessor revealed nearly identical structures, interpretation of the OHQ factors proved more challenging due to subtle shifts in measurement focus. Each item is rated from 1 to 6, where *1* indicates strong disagreement or dissatisfaction and *6* represents strong agreement or satisfaction. Items preceded by a minus sign are reverse-scored to control for response bias and ensure balanced assessment. Overall, the OHQ serves as an efficient and widely accepted instrument for quantifying psychological well-being in both research and clinical contexts.

II. Case Report:

A 27 years unmarried boy was given in person therapy for one month in the month of April 2024. History of illness revealed that the patient was having mental traumas from last 7 years because of various reasons. The person was physiologically unhealthy since his childhood and that was the one of the reason of his mental illness but his physiological health is almost well in this time. The stress, anxiety and a senses of uneasiness still exist in him. This is because of various reasons mainly family issues and a sense of career related uncertainty. He has never done counseling or any other psychological treatments but sometime takes few of the medicines to relax him in harsh situation once in a year. He was addicted to smoking and alcohol since his teenage including intake of marijuana if available at his place. The boy was having a lot of problem with his mental problem since his childhood. He belong to a well off family but has lost his father at his childhood. He was good at studies but was highly uncertain with his career and the future. He used to have a lot of problems because of this and career related problems.
There are few other cases handling at this time and they will be added in this research paper later on during the time of publication.

III. Treatment

The intervention in this study was founded upon energy healing principles interwoven with tantric and mesmerism-based therapeutic techniques. Conducted over a one-month period, the treatment comprised six sessions of approximately 45 minutes each, spaced five days apart to allow energetic assimilation and recovery between intervals. The method sought to achieve physical relaxation, mental clarity, and emotional equilibrium by deliberately influencing the participant's subtle energy field through non-verbal intention and psychic resonance.

Each session began by centering the participant in a relaxed, upright posture, followed by several cycles of slow, rhythmic breathing designed to balance the internal rhythm and prepare the body for the energetic process. The healer, maintaining a calm and focused demeanor, then initiated an inner meditative alignment to attune personal energy with the broader field of universal vibration. Through this preparatory state, the healer silently invoked a sequence of mantric vibrations—non-verbal and directed inward—to heighten the subtle frequency of the surrounding atmosphere. The environment was intentionally quiet, dimly lit, and energetically neutral to facilitate depth of focus and minimize external distraction.

When the participant's respiration slowed and the gaze softened, the healer slowly moved into an active phase. Standing slightly behind and to the side of the participant, the healer directed concentration toward the ajna chakra

(third eye center), employing intense but compassionate eye contact to stimulate neural synchronization and alpha-wave engagement—an indicator of trance readiness. This focus was reinforced through gentle rotational hand movements near the

Participant's temporal and auricular regions, which helped to activate the hemispheric balance of the brain and subtly recalibrate sensory awareness toward inward attention. Within moments, the participant exhibited signs of dissociation and mild hypnotic responsiveness, signifying transition into the trance state.

Once the subject's posture softened, an assistant assisted in guiding them to a supine position, ensuring comfort and safety. The healer maintained a contemplative awareness, avoiding direct physical contact, allowing the trance to stabilize organically. The core healing then commenced. Beginning with a delicate "short pass" movement over the face, the healer manipulated the surrounding energy field, drawing out emotional density and thought residue. This was followed by a slower, sweeping "long pass" from head to feet, visually expelling subtle impurities into an imagined current of healing light. Each motion symbolized purification, release, and renewal. The process shared conceptual similarities with Reiki and Pranic Healing, focusing on the redirection of energetic flow rather than direct mechanical influence.

Attention then shifted to the seven primary chakras—from the crown to the base. Using precise hand gestures and focused visualization, the healer cleansed each energetic center, rotating counterclockwise to extract stagnant vibrations before infusing clockwise currents of positive energy. This replenishing phase was accompanied by silent affirmations emphasizing mental peace, emotional stability, and a renewed sense of vitality. The healer visualized channels of universal force streaming through the crown and descending through the hands, transferring restorative radiance to each chakra. A subtle magnetic tension could often be felt in the air as the exchange of energy intensified—a sign of resonance between healer and subject.
This absorption and reintegration process continued for an additional 10–15 minutes, allowing the energetic field to recalibrate into harmony. Toward completion, the healer gently slowed movement, performed a symbolic **"**energy **seal"** to secure the transmitted vitality within the participant's system, and projected affirmations of inner goodness and stability. The participant was granted a resting period of 5–10 minutes to allow physiological return and emotional grounding before being softly awakened from the trance. Each session concluded with a brief moment of stillness, gratitude, and silent reflection to close the energetic circuit, ensuring containment and preservation of the therapeutic effect.

IV. Observation

During the treatment period, notable behavioral and psychological responses were observed in the participant. Compared to average subjects typically exposed to mesmerism, this individual entered the trance state remarkably quickly—within a few seconds of induction—and maintained it for a longer duration. This rapid responsiveness suggested heightened receptivity, possibly attributable to the participant's innate sensitivity or latent psychic potential. For the healer, this responsiveness served as a significant advantage, facilitating more efficient energy transmission and deeper therapeutic engagement.

Following each session, the participant consistently reported feelings of calmness, inner peace, and emotional stability. The individual also displayed a visibly relaxed demeanor and a noticeably positive mood tone after treatment, implying that the therapeutic environment and process produced an immediate and enduring tranquilizing effect.

V. Results and Discussion

The participant's personal growth and psychological changes were assessed using the Oxford Happiness Questionnaire (OHQ), a validated instrument designed to measure subjective well-being. The OHQ comprises 29 statements rated on a six-point Likert scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Several items are reverse-scored to ensure balanced measurement of psychological happiness.

Quantitative results from the one-month intervention are presented in Table 1 below, reflecting the progressive increase in happiness scores across six treatment sessions.

Sessions	Scoring
Pre-Session	60
After 1st Session	77
After 2nd Session	80
After 3rd Session	97
After 4th Session	117
After 5th Session	122
After 6th Session	128

Table No.1: Result of the Happiness Questionnaire filled before and after the healing

Fig.-1: Bar Diagram showing the happiness questionnaire results.

The steady upward trend shown in the OHQ scores—from an initial score of 60 to a final score of 128—illustrates a substantial enhancement in the participant's reported levels of happiness. This consistent improvement, without any decline between sessions, indicates that the combined mesmerism–tantric energy healing approach had a cumulative positive effect on psychological well-being.

Qualitative observation supported the quantitative outcomes. The participant reported increased emotional clarity, improved relaxation, and a sustained sense of optimism and vitality following each session. These effects align with existing literature suggesting that energy healing interventions can promote restorative psychophysiological balance and elevate mood through modulation of energetic and cognitive states (Gerber, 2000; Levine & Frederick, 1997). Overall, the data suggest that regular practice of *Mantra Sammohan* and tantric-based mesmerism may foster significant improvement in psychological well-being, as reflected by enhanced happiness scores and observable emotional stability. While these findings are based on a single case study, they provide preliminary evidence supporting the efficacy of energy based healing modalities as complementary interventions in mental health promotion.

VI. Conclusion

The present case study explored the impact of Mantra Sammohan, a tantric and mesmerism based energy healing practice, on psychological well-being as measured through the Oxford Happiness Questionnaire (OHQ). Over a one-month intervention, the participant exhibited a marked and consistent improvement in happiness scores, increasing from 60 at baseline to 128 after the sixth session. This upward progression, combined with qualitative observations of relaxation, emotional stability, and enhanced clarity, suggests that the integrated use of energy healing techniques can positively influence both mental and emotional states.

The results highlight the potential of ancient tantric and occult healing modalities as complementary approaches

within the broader context of psychological and therapeutic sciences. These practices, though rooted in spiritual traditions, appear to contribute to measurable shifts in subjective well-being when facilitated under controlled and mindful conditions. The combination of mantra invocation, trance induction, and energy transmission may foster an altered state of consciousness conducive to emotional release, internal balance, and psychosomatic harmony.

However, given that this study focused on a single participant, the findings are preliminary and should be interpreted with caution. Further empirical research involving larger sample sizes, standardized measurement tools, and control groups is necessary to substantiate the therapeutic value of *Mantra Sammohan* and related energy healing practices. Integrating qualitative and neurophysiological assessments in future studies may also deepen understanding of how such interventions influence brain-wave activity, stress regulation, and emotional resilience.

In summary, this research provides encouraging evidence that ancient tantric and mesmerism-based healing methods can serve as valuable adjuncts to contemporary mental health care. By bridging the wisdom of traditional spiritual techniques with modern Psychological frameworks, practitioners and scholars may open new pathways toward holistic well-being and integrative healing.

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"REIMAGINING SPORTS REHABILITATION: INTEGRATING TRADITIONAL YOGIC PRACTICES WITH CONTEMPORARY PHYSIOTHERAPY FOR OPTIMIZED RECOVERY AND PERFORMANCE IN SUB-ELITE FEMALE BASKETBALL PLAYERS WITH PATELLOFEMORAL PAIN"

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Introduction

Patellofemoral pain (PFP), commonly called patellofemoral pain syndrome, is a typical musculoskeletal problem of the knee, particularly prevalent among physically active people. The main clinical feature is anterior knee pain that is generally diffuse and usually worsens during activities that increase the load of the patellofemoral joint such as squatting, stair walking, running, and sitting with knees bent for a long time. In the field of sports medicine, PFP comprises a significant share of knee cases with its occurrence in about 25-40% of all the knee problems and is more common in girls/women than boys/men.

Female athletes involved in sports requiring cutting, jumping, and pivoting moves, including basketball, have been mentioned time and again by epidemiological researchers to have a higher risk of PFP. The prevalence within this category largely depends on various factors such as age and activity level; nevertheless, studies have shown that up to one in four adolescent female basketball players might exhibit PFP symptoms at some point of the season, with the rate of those currently affected being 16-26% and about 10 new cases occurring per 100 athletes every season. Besides that, girls/women are 2 to 10 times more prone to PFP than boys/men; this gender difference has been ascribed to the combined effect of anatomical, hormonal, and neuromuscular factors that influence the biomechanics of the lower extremity.

PFP can be more harmful than just causing pain and discomfort. The symptoms of PFP can be so severe that they hardly allow the continuation of sport as well as everyday life activities and thus result in less training time, changes in biomechanics, and compensatory movement patterns which increase the risk of secondary injuries. Studies based on long-term observations demonstrate that PFP does not actually resolve on its own; instead, it can be a persisting problem for several months and even years, leading to the development of chronic pain and the exposure of the patellofemoral joint to early degenerative changes. In sports performance, it has been shown how PFP can lead to a drop in outcomes, halting the attainment of new skills and, in numerous cases, bringing the competitive career to a premature end, thereby affecting not only the individual's ambition but also the team goals.

Nowadays, sports rehabilitation of Patellofemoral pain depends on physiotherapy methods with scientific evidence. Such treatment methods mainly consist of corrective exercise programs formulated to strengthen the quadriceps and hip muscles, improve core stability, facilitate neuromuscular control, and reduce the errors in joint alignment and movement quality through neuromuscular re-education. Several meta-analyses and professional practice recommendations reaffirm the role of individualized exercise therapy for alleviating pain and enhancing function, even though uncertainties pertaining to the best mix of modalities, their dosage, and long-term efficaciousness remain to be clarified. That said, quite a few athletes keep going through PFP symptoms which are either persistent or recurrent, thus suggesting that relying solely on biomechanical methods might not be sufficient to address the complex etiology of PFP.

Meanwhile, the traditional yogic ways which include asanas (postures), pranayama (breath control), and along with mindfulness components have helped various cohorts with musculoskeletal and neuromuscular problems. Yoga programs have been linked to gains in muscular flexibility, postural stability, body awareness, and mental aspects such as pain perception and stress control. Athletic performance as well as the recovery from injury are currently being recognized as the areas that also benefit from these dimensions, but the combination of conventional sports rehabilitation with yoga is still rare.

Due to the multifaceted biopsychosocial nature of patellofemoral pain, integrative care models that combine mainstream physiotherapy with alternative modalities such as yoga have become increasingly attractive. These mixture therapies could potentially yield the best results, fusing focused biomechanical correction with greater body awareness, controlled breathing, and improved psychophysiological capacity. Still, the data at hand being limited is scant on the integrative approach for sub-elite female basketball players with PFP, while there is a lack of well-designed trials looking at its effects on pain, function, and return to sport.

By blending traditional yogic methods and up-to-date physiotherapy, the study seeks to transform the sports rehab hence making it more simple, effective, and athlete-centered to male and female athletes of different levels of play.

Research Gap

Although physiotherapy and yoga are both beneficial for musculoskeletal health according to scientific literature, their coordinated use in sports rehabilitation is still a very small step away. Most of the work done in this area has been limited to the examination of these methods as separate entities and only a handful of studies have looked at a combined rehabilitation approach in the management of patellofemoral pain in athletes. Moreover, female basketball players at sub-elite level have received little attention in the sports science literature even though these players are subjected to unique biomechanical and sport-specific stressors. Research on yoga largely concentrates on its effects on pain and general health while there is very little that links the practice with functional and performance aspects specific to basketball like vertical jumps and agility. Besides that, typical rehabilitation programs do not give enough attention to psychophysiological aspects such as stress management and breathing control, thus, the whole story in the development of evidence-based holistic approaches to athletes' rehabilitation remains a mystery.

Methods:

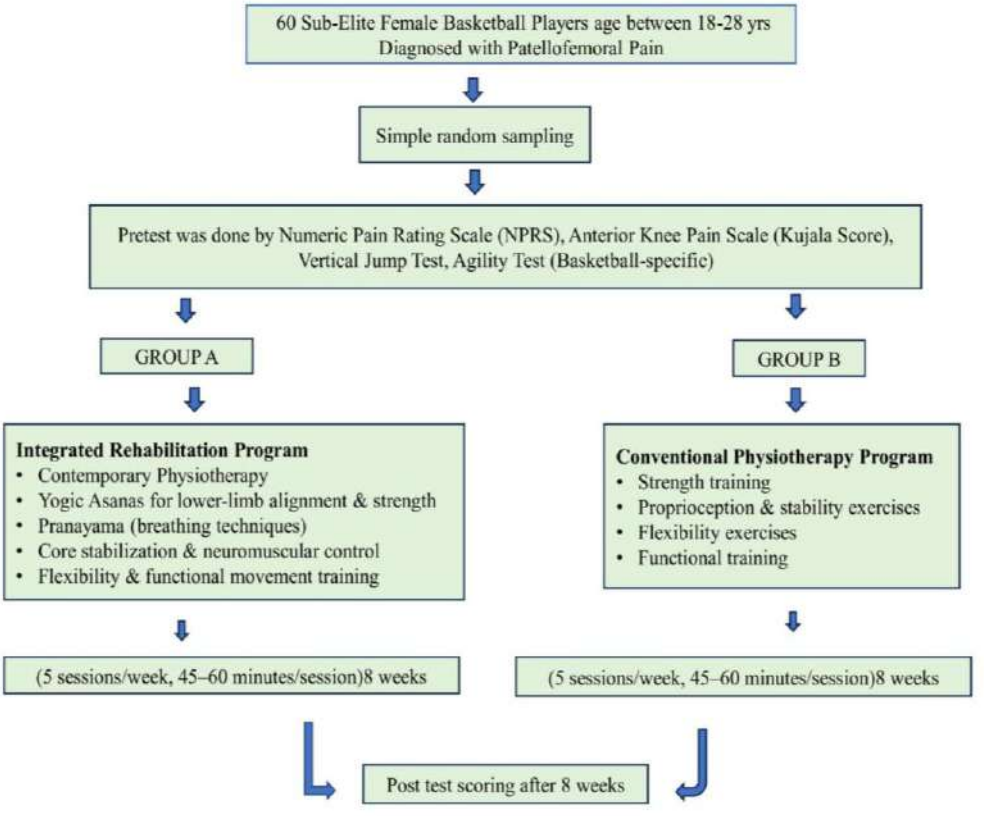
To find out the effects of supplementing conventional physiotherapy with traditional yogic practices in treating sub-elite female basketball players with patellofemoral pain, this research conducted a pre-test and post-test control group experimental study.

Through a simple random sampling technique (lottery method), a sample of 60 female basketball players aged 18-28 years was drawn from colleges and basketball training academies. The participants in this study were players at sub-elite level who had a clinical diagnosis of patellofemoral pain for at least 3 months and whose symptoms increased with functional activities such as running, jumping, squatting, and climbing stairs. Players with previous knee surgery, ligament injuries, neurological disorders, systemic illness, or those who had been practicing yoga were excluded from the study. The recruited participants were randomly divided into two groups: Group A or Experimental (n=30) and Group B or Control (n=30). To ensure that each participant could be selected only once, the sampling was done without replacement. The study duration was three months with the intervention period being eight weeks of supervised training.

Group A was subjected to an integrated rehabilitation program comprising modern physiotherapy focusing on quadriceps and hip strengthening, core stabilization, flexibility exercises, and neuromuscular control training, combined with selected traditional yogic practices including asanas aimed at lower-limb alignment and strength, along with pranayama techniques emphasizing controlled breathing and relaxation. Group B, on the other hand, had conventional physiotherapy with similar frequency and duration. Both groups underwent intervention sessions five days per week, with each session lasting 45, 60 minutes.

Outcome measures were assessed before and after the intervention period and included pain intensity measured using the Numeric Pain Rating Scale (NPRS), functional ability assessed using the Anterior Knee Pain Scale (Kujala score), and physical performance parameters evaluated through the Vertical Jump Test and an agility test relevant to basketball performance.

Written informed consent was obtained from all the participants prior to the study and Institutional Ethics Committee's approval was also secured. The data was analyzed using paired t-test to evaluate within-group differences and independent t-test to check for between-group differences, with $p<0.05$ considered statistically significant.



Training Protocol

Training Protocol for Integrative Sports Rehabilitation

Integrative sports rehabilitation protocol was carefully planned for sub-elite female basketball players with patellofemoral pain to include local biomechanical factors and also global neuromuscular and psychophysiological factors. The intervention program merges modern physiotherapy techniques with selected traditional yogic practices in a well-organized, progressive manner.

1. Pain Modulation and Movement Confidence Training

Pain Neuroscience Education (PNE)

It was explained to the players that pain is not always a sign of tissue damage, but a protective response of the nervous system. In the course of discussion, one example of explaining the nervous system was through describing it as an overly sensitive alarm which helped to clarify pain-related misconceptions and movement avoidance. Understanding that controlled, pain-free movement encourages healing whereas inactivity due to fear worsens the problem was the main point of the proposal. The goal of this talk was to lower the fear of movement and raise the acceptance of rehabilitation exercises.

Breathing-Based Autonomic Regulation

Besides diaphragmatic breathing, the Nadi Shodhana pranayama was done to control the autonomic nervous system (ANS) activity. The main function of such methods is parasympathetic activation, which lowers the pain threshold and helps to concentrate better in rehab sessions. These breathing exercises were used as session opening and closing activities to bring about relaxation and recuperation.

2. Contemporary Physiotherapy Interventions

Quadriceps and Hip Strengthening

The emphasis was on the quadriceps muscle (especially vastus medialis) as well as on the hip abductors and external rotators in order to improve patellar tracking and decrease dynamic knee valgus. The progression of exercises went from isometric and low-load to closed-chain functional movements that are associated with basketball-specific tasks.

Neuromuscular Re-Education

Proprioceptive and balance training were part of the program to improve lower limb alignment, joint position sense, and movement control in activities like landing and cutting. The main purpose of this component was to eliminate the wrong movement pattern that leads to patellofemoral joint overload.

3. Yogic Movement and Flexibility Training

Therapeutic Asanas

Some yogic postures such as Utkatasana, Virabhadrasana I & II, and Trikonasana were selected for the improvement of lower limb strength, alignment, and postural stability. These poses are based on controlled knee flexion, hip engagement, and symmetrical weight distribution.

Flexibility-Focused Asanas

Certain asanas like Supta Padangusthasana and Adho Mukha Svanasana are used to relax the quadriceps, hamstring, and calf muscles which in turn lowers the load on the patellofemoral joint.

Table: Group A – Integrative Physiotherapy + Yogic Practice Rehabilitation Protocol

Training Component	Exercises / Intervention	Progression Strategy	Frequency
Pain Management (Common)	Cryotherapy post-session, kinesiotaping, activity modification	Duration adjusted based on pain response	Daily / As needed
Pain Neuroscience & Relaxation	Pain education, diaphragmatic breathing, Nadi Shodhana pranayama	Increased breathing duration and awareness	5–10 min/session
Quadriceps Strengthening	Static quadriceps, wall sits, mini squats	Increased hold time, depth, and resistance	3–4 sets, 4–5×/week
Hip Strengthening	Clamshells, resisted band walks, single-leg squats	Progressive resistance and control	3 sets, 3–4×/week
Neuromuscular Re-education	Single-leg balance, wobble board training, jump-landing drills	Stable → unstable surface, Increase complexity	10–15 min, 3×/week

Yogic Strength & Alignment	Utkatasana, Virabhadrasana I & II	Increased hold duration and repetitions	3–4 rounds/session
Flexibility & Mobility	Supta Padangusthasana, Adho Mukha Svanasana	Increased range and hold duration	Daily
Functional & Sport-Specific Training	Basketball-specific agility, controlled cutting drills	Speed and intensity progressed gradually	2–3×/week
Cool-Down & Recovery	Guided relaxation (Shavasana), breathing-based relaxation	Maintained throughout program	End of each session

Exercises were progressed based on pain-free performance, movement quality, and functional tolerance. Emphasis was placed on transitioning from controlled movements to sport-specific activities to support safe return-to-play.

Table: Group B – Contemporary Physiotherapy Rehabilitation Protocol

Training Component	Exercises / Intervention	Progression Strategy	Frequency
Pain Management	Cryotherapy, TENS (as required), activity modification	Duration and intensity adjusted based on pain response	Daily / As needed
Quadriceps Strengthening	Static quadriceps, short arc quadriceps, wall sits	Increased hold time and resistance	3–4 sets, 4–5×/week
Hip Strengthening	Side-lying hip abduction, clamshells, resisted band walks	Resistance and repetitions progressively increased	3 sets, 3–4×/week
Flexibility Training	Quadriceps, hamstrings, calf stretches	Increased stretch duration and range	Daily
Closed-Chain Exercises	Mini squats, step-ups, partial lunges	Increased depth and load	3 sets, 3×/week
Neuromuscular Training	Single-leg stance, balance board exercises	Progression from stable to unstable surfaces	10–15 min, 3×/week
Functional Training	Basic jump-landing drills, controlled agility movements	Gradual increase in speed and complexity	2–3×/week
Cool-Down & Recovery	Gentle stretching and relaxation	Maintained throughout program	End of each session

Statistical Analysis

The data were processed statistically to verify the effectiveness of the different interventions. The descriptive statistics applied summarised the features of the subjects and the results in terms of mean and standard deviation. A paired *t*-test was used for the pre-post-assessment of the parameters within one group to evaluate the group's changes over time. Independent *t*-tests were used to analyse the difference between the experimental and control groups concerning the post- intervention outcomes to find out which intervention was more effective. Statistical significance was indicated by *p*-values lower than 0.05. For the precision and dependability of the findings, all computations were done with recognized statistical software programs.

Table 1: Within-Group Comparison (Pre Vs Post)

Group A

Outcome Measure	Pre-test Mean ± SD	Post-test Mean ± SD	*p* value
NPRS (0–10)	6.9 ± 1.0	2.0 ± 0.8	<0.001
Kujala Score (0–100)	61.8 ± 7.1	89.4 ± 5.2	<0.001
Vertical Jump (cm)	32.6 ± 4.3	41.8 ± 3.9	<0.001
Agility Test (sec)	12.4 ± 0.9	10.1 ± 0.7	<0.001

Group B

Outcome Measure	Pre-test Mean ± SD	Post-test Mean ± SD	*p* value
NPRS (0–10)	6.8 ± 1.1	3.8 ± 1.0	<0.01
Kujala Score (0–100)	62.5 ± 6.9	76.9 ± 6.3	<0.01
Vertical Jump (cm)	33.1 ± 4.1	37.2 ± 4.0	<0.01
Agility Test (sec)	12.3 ± 0.8	11.3 ± 0.8	<0.01

Table 2: Between-Group Comparison (Post-Test Values)

Outcome Measure	Group A Mean ± SD	Group B Mean ± SD	*t* value	*p* value
NPRS	2.0 ± 0.8	3.8 ± 1.0	7.01	<0.001
Kujala Score	89.4 ± 5.2	76.9 ± 6.3	8.12	<0.001
Vertical Jump (cm)	41.8 ± 3.9	37.2 ± 4.0	4.67	<0.001
Agility Test (sec)	10.1 ± 0.7	11.3 ± 0.8	6.09	<0.001

Results

The pre-test comparative analysis indicated that no variable had a statistically significant difference between Group A (Experimental) and Group B (Control), thus the groups were homogeneous at the baseline. The NPRS scores exhibited a mean of 6.9 (standard deviation or SD = 1.0) for Group A and 6.8 (SD = 1.1) for Group B, with a computed *t*-score of 0.42 and a *p*-value of 0.67, which means the groups did not differ significantly at the 0.05 level. In similar fashion, the Kujala Anterior Knee Pain Scale scores for Group A (M = 61.8, SD = 7.1) and Group B (M = 62.5, SD = 6.9) resulted in a *t*-value of 0.39 and a *p*-value of 0.69, thus the functional status was equivalent between the two groups at the initial measurement. The vertical jump test yielded results with an average of 32.6 cm (SD = 4.3) for Group A and 33.1 cm (SD = 4.1) for Group B, with a recorded *t*-value of 0.46 and a *p*-value of 0.64, while the basketball-specific agility test timings were 12.4 seconds (SD = 0.9) for Group A and 12.3 seconds (SD = 0.8) for Group B, with a *t*-value of 0.51 and a [i]p[/i]-value of 0.61. These data confirm that there were no significant differences between the groups at the time of the pre-test (See Table 2).

The post-test analyses revealed that the differences between the two groups were significant with the experimental group showing higher scores in all outcome measures. Pain intensity assessed with the NPRS indicated a significantly greater decrease in pain in the experimental group (M = 2.0, SD = 0.8) than in the control group (M =

3.8, SD = 1.0) with a *t*-value of 7.01 and *p*-value of < 0.001. The comparative #functionality of the groups as measured with the Kujala score was confirmed by means that differed significantly between the groups, namely, Group A (M = 89.4, SD = 5.2) and Group B (M = 76.9, SD = 6.3) with a *t*-value of 8.12 ($p < 0.001$). The Vertical Jump Test revealed that Group A improved more significantly than Group B (M = 41.8 cm, SD = 3.9 and M = 37.2 cm, SD = 4.0 respectively), the corresponding *t*-value of 4.67 ($p < 0.001$) confirms this difference. Moreover, basketball-specific agility was found to be significantly improved in Group A, which took on average 10.1 seconds (SD = 0.7) compared to 11.3 seconds (SD = 0.8) in Group B ($t = 6.09$, $p < 0.001$) (See Table 3).

In fact, the overall outcomes of the two groups suggest that the physiotherapy-led integrative rehabilitation program with traditional yogic practices (Group A) resulted in significantly more enhanced pain, functional, explosive power, and basketball-specific agility outcomes than physiotherapy alone (Group B).

Discussion

The objective of this research was to assess the effects of a combined sports rehabilitation program that integrates modern physiotherapy with traditional yogic practices in sub-elite female basketball players who have patellofemoral pain. The results showed that both groups improved after the intervention, but the experimental group had significantly greater decreases in pain intensity, and superior improvements in functional outcomes, vertical jump, and basketball-specific agility than the control group.

In patellofemoral pain of basketball players, the cause is usually considered to be the changes in mechanics of the lower limbs, loss of neuromuscular control, and repeated high-impact loading during movements specific to the sport. Conventional physiotherapy mainly focuses on these mechanobiological issues through strengthening, neuromuscular re-education, and movement retraining. The better results of the experimental group suggest that the systematic integration of the yogic practices contributed more than just the benefits of conventional rehabilitation. Yoga postures that focus on proper lower limb alignment, controlled movements, and flexibility might have led to more efficient movement and better load distribution across the patellofemoral joint. In addition, breathing-based and relaxation components most probably contributed to pain modulation and better psychophysiological regulation, thus facilitating neuromuscular recovery and performance readiness.

The experimental group's improvement in vertical jump and agility reflects the fact that the integrative rehabilitation not only addresses reduction of symptoms but is also beneficial for sport-specific performance. This therefore supports the emerging model of sports rehabilitation which highlights holistic, athlete-centred, and performance-oriented recovery strategies.

Limitations

On the one hand, there are positive results, but there are some limitations as well. The study sample only consisted of sub-elite female basketball players, so the findings might not be generalizable to male athletes or elite athletes.

Recommendations

Subsequent studies may look into larger and more diversified athletic populations, including elite-level and male basketball players. It is strongly encouraged that researchers conduct longitudinal follow-up studies to determine the extent to which the rehabilitation results are maintained over time and to investigate the occurrence of patellofemoral pain. Additional research may also investigate the dose-response relationship and the comparative efficacy of different yogic components in the context of sports rehabilitation. The use of biomechanical and neuromuscular analysis tools may reveal more about the mechanisms of integrative rehabilitation approaches.

Conclusion

Based on the evidence presented, it appears that a physiotherapy-led integrative rehabilitation program (combining traditional yogic practices with contemporary physiotherapy) is a more effective alternative to conventional physiotherapy alone for managing patellofemoral pain in sub-elite female basketball players. The integrative approach has been demonstrated to yield significant benefits in terms of pain reduction, functional capacity, explosive power, and basketball- specific agility. These findings advocate for the structured inclusion of yogic practices in evidence-based sports rehabilitation protocols to foster optimal recovery and enhanced athlete performance. Integrative sports rehabilitation might be considered a viable and innovative model to elevate the level of athlete care within the contemporary sports sciences field.

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योग अभ्यास के माध्यम से खिलाड़ियों के तनाव में सुधार मानसिक स्वास्थ्य एवं भावनात्मक कल्याण

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सारांश

वर्तमान समय में खेल जगत दिन प्रतिदिन उन्नति कर रहा है इसका श्रेय खिलाड़ियों, प्रशिक्षकों व खेलों को अंतरराष्ट्रीय स्तर पर आयोजित करने वाले आयोजकों को जाता है। विभिन्न खेलों के खिलाड़ियों ने अपनी पूर्ण मेहनत, निष्ठा व अनुशासन के माध्यम से समय-समय पर सर्वश्रेष्ठ प्रदर्शन कर पदक प्राप्त किए हैं।

विभिन्न खिलाड़ियों में देखा गया है कि वह अपने मार्ग से भटक जाने के कारण अनुशासनहीन वे आलसी हो जाते हैं। जिसके कारण वे मानसिक तनाव से परेशान होते हैं। वहीं दूसरी ओर देखा जाए तो खिलाड़ियों के मानसिक तनाव का दूसरा कारण कम समय अवधि के दौरान उत्कृष्ट प्रदर्शन करने को माना गया है।

ऐसे संकट काल में योग का पालन खिलाड़ियों के लिए अत्यंत महत्वपूर्ण है। योग के नियमों का पालन करने से खिलाड़ियों में उत्साह बढ़ता है। योग के नियमों का पालन करने से खिलाड़ियों को अपने व्यक्तिगत जीवन में आने वाले दुखों का डटकर सामना करने की ऊर्जा प्राप्त होती है।

महर्षि पतंजलि ने योग दर्शन में समाधि तक पहुंचने के मार्ग का विस्तृत वर्णन किया है। महर्षि पतंजलि द्वारा वर्णित मार्ग में दुःख का कारण व उसके उपाय का वर्णन भी मिलता है। योग दर्शन के साधन पद में वर्णन है कि दृष्टा (जीव) व दृश्य (प्रकृति) के परस्पर मिलने से दुख उत्पन्न होता है। साथ ही वर्णन मिलता है कि इसके परस्पर अलग हो जाने से दुख का नाश हो जाता है। विभिन्न खेलों के खिलाड़ी इन नियमों का पालन करके अपने तनाव से मुक्त हो सकते हैं। योग दर्शन में अष्टांग योग के अंतर्गत यम और नियम का वर्णन मिलता है जिसका पालन करने से खिलाड़ियों के भीतर 'सत्य पालन', 'संयम' , 'ब्रह्मचर्य में उन्नति' के साथ-साथ 'शारीरिक शुद्धि', संतोष , कठिन परिश्रम करने हेतु ऊर्जा , आत्म चिंतन, वह परमात्मा की आराधना के प्रति रुचि में उन्नति होती है।

खिलाड़ियों के लिए आवश्यक है कि वह अपने मन को अंतःकरण में केंद्रित कर बाहरी विषयों से अपना ध्यान हटाकर अपने खेल विशेष पर अधिक शक्ति के साथ अभ्यास करें। योग में वर्णित "धारणा" व "ध्यान" के अभ्यास से खिलाड़ियों के चित्त (मन) की वृत्तियों के नियंत्रण में सहायता होती है जिसके फलस्वरुप खिलाड़ियों को अपने खेल विशेष पर अधिक शक्ति के साथ निरंतर कार्य करने की ऊर्जा मिलती है।

इसी कारण सभी खेलों के खिलाड़ियों के व्यावहारिक जीवन में योग के मार्गो के अभ्यास का होना आवश्यक माना गया है। जिससे वह अपने खेल विशेष में सफलता प्राप्त करने हेतु अग्रसर रहें।

किसी भी खिलाड़ी के लिए उसके खेल विशेष में अच्छा प्रदर्शन कर पदक प्राप्त करना उसका एक सपना होता है जिसके लिए वह दिन-रात मेहनत करता है। जब भी कोई व्यक्ति किसी खेल विशेष को अपने जीवन का लक्ष्य बना लेता है तब से ही वह उसे खेल विशेष से संबंधित दिनचर्या भोजन व नियमों का पालन करने लगता है। एक खिलाड़ी अपने खेल विशेष में अनिवार्य नियमों का पालन करते हुए अपने खेल में अच्छा प्रदर्शन करने लगता है। किंतु यहां केवल अच्छा प्रदर्शन करना ही काफी नहीं है। एक खिलाड़ी अपने खेल से संबंधित प्रतियोगिताओं में भाग लेकर सर्वोच्च स्थान प्राप्त करना चाहता है इसी सफर में वह अनेक कठिनाइयों का सामना भी करता है।

खिलाड़ी के मानसिक तनाव का कारण:-

वर्तमान समय में खिलाड़ियों में मानसिक तनाव का होना एक सामान्य बात हो गई है ज्यादातर देखा गया है कि खिलाड़ी अपने आगामी प्रदर्शन को लेकर चिंतित रहते हैं। यही दूसरा कारण यह भी होता है कि खिलाड़ी के पास अपने अभ्यास को पूर्ण करने के लिए पर्याप्त समय न होने के कारण भी वह मानसिक तनाव का शिकार हो जाता है।
कुछ खिलाड़ियों का मानना है की पूरी तैयारी होने के बाद भी मंच अथवा मैदान में उतरने से पहले बहुत तनाव महसूस करते हैं जिसका सीधा नकारात्मक प्रभाव उनके प्रदर्शन पर पड़ता है।

योग का सामान्य परिचय:-

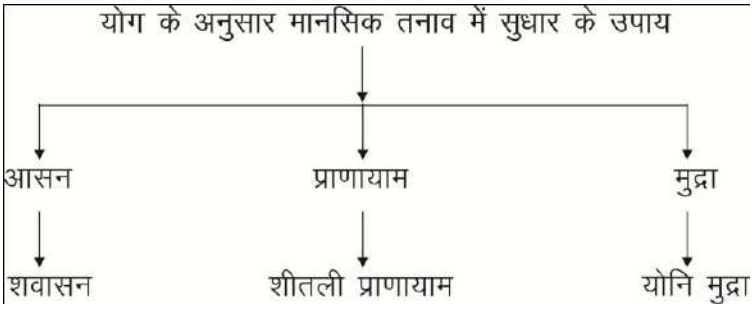
योग का मुख्य ग्रंथ योग दर्शन है जिसकी रचना महर्षि पतंजलि ने की है। वेद, उपनिषद, गीता, हठप्रदिपिका , घेरण्ड संहिता आदि ग्रंथों में योग का विस्तृत वर्णन मिलता है।

योग के द्वारा खिलाड़ियों के मानसिक तनाव में सुधार के उपाय:-

खिलाड़ियों के मानसिक तनाव के संदर्भ में इसके सीमित रहने पर सकारात्मक प्रभाव देखे गए हैं वही मानसिक तनाव के असीमित व अत्यधिक हो जाने पर नकारात्मक प्रभाव देखे जाते हैं।

किसी भी खिलाड़ी का सीमित मानसिक तनाव उसे अपने प्रदर्शन में अंतिम क्षण तक उर्जा बनाए रखने में सहायता प्रदान करता है वहीं इसी मानसिक तनाव के बढ़ जाने पर यह प्रदर्शन पर नकारात्मक प्रभाव डालता है। खिलाड़ी के मानसिक तनाव के बढ़ जाने पर विभिन्न प्रकार के रोग उत्पन्न होते हैं जैसे उच्च रक्तचाप, चिड़चिड़ापन, चिंता व कमजोरी, आलस व हृदयघाट (हार्ट अटैक) आदि।

खिलाड़ी के बढ़ते मानसिक तनाव को संतुलित करना अनिवार्य है जिसके लिए योग की क्रियो का अभ्यास सार्थक है।



आसन के द्वारा मानसिक तनाव में सुधार:-

महर्षि पतंजलि ने योग दर्शन में आसान को परिभाषित करते हुए कहा है 'स्थिरसुखमासानम' अर्थात आसान शरीर की वह स्थिति है जिसमें सुखपूर्वक बैठा जा सकता है।

शवासन के द्वारा खिलाड़ी के तनाव में सुधार लाया जा सकता है।

शवासन को करने की विधि:-
जमीन पर सीधा लेट कर शरीर को ढीला छोड़ दें दोनों हाथ की हथेलियां आकाश की ओर रहे। दोनों पैर की एड़ियां परस्पर मिली रहे तथा पर की उंगलियों में दूरी बनी रहे। नेत्रों को बंद करके पूरे शरीर को ढीला छोड़ दें। धीरे-धीरे अपने मन को अपनी सांसों के आवागमन पर लेकर जाएं।

अवधि:-इसका अभ्यास एक समय पर 10-15 मिनट तक करें।

योग में प्राणायाम के द्वारा मानसिक तनाव में सुधार

शीतली प्राणायाम के लाभ:-

शीतली प्राणायाम करने से शरीर में शीतलता आती है। इससे मानसिक शांति मिलती है।

मुद्रा से मानसिक तनाव में सुधार:-

प्राचीन ग्रंथो में मुद्राओं का उल्लेख मिलता है कोई भी मुद्रा आसन, प्राणायाम व मानसिक क्रिया द्वारा पूर्ण कि जाती है। वहीं मुद्रा केवल हस्त मुद्रा भी हो सकती है। यहां तनाव में सुधार लाने के लिए योनि मुद्रा लाभदायक है।

योनि मुद्रा की विधि:-

किसी भी सुखदायक ध्यानात्मक आसन में बैठकर मेरुदंड व ग्रीवा को सीधी रेखा में रखें दोनों हाथों की मध्यमा, अनामिका, कनिष्ठ को आपस में मिलाकर अंदर की ओर मोड़ें जिससे योनि की आकार में मुद्रा बना सके।

योनि मुद्रा का लाभ:-

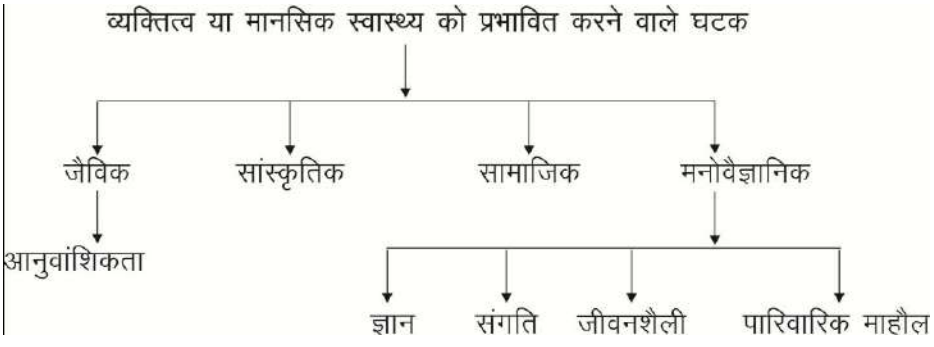
इस मुद्रा के माध्यम से मानसिक शांति मिलती है।इस मुद्रा के माध्यम से मन व इंद्रियां केंद्रित हो जाती हैं जिससे तनाव में सुधार होता है।

मानसिक स्वास्थ्य:-

भारतीय दर्शन में मानसिक स्वास्थ्य का विवरण मिलता है मानसिक स्वास्थ्य व व्यक्तित्व एक दूसरे के पूरक हैं मानसिक स्वास्थ्य के नकारात्मक व सकारात्मक प्रभाव व्यक्ति के व्यक्तित्व पर साफ दिखाई पड़ते हैं।

व्यक्तित्व या मानसिक स्वास्थ्य को प्रभावित करने वाले घटक:-

1:- जैविक 2:- सांस्कृतिक 3:- सामाजिक 4:-मनोवैज्ञानिक



1:-मानसिक स्वास्थ्य को प्रभावित करने वाले जैविक कारण:-

यहां जैविक कारण का तात्पर्य आनुवांशिकता से है शोधकर्ताओं के अनुसार मनुष्य में अनुवांशिक कारणों से जींस के माध्यम से एक पीढ़ी से दूसरी पीढ़ी में जैविक गुण आते हैं। यह जैविक गुणों से मानसिक स्वास्थ्य का निर्धारण होता है।

2:- मानसिक स्वास्थ्य को प्रभावित करने में सांस्कृतिक भूमिका:-

किसी भी मनुष्य पर संस्कृति का गहरा प्रभाव पड़ता है किसी भी समाज की संस्कृति में रीति रिवाज, खानपान परंपराएं आदि भी मनुष्य की मानसिक स्थिति पर गहरा प्रभाव डालते हैं।

3:- मानसिक स्वास्थ्य को प्रभावित करने में सामाजिक भूमिका:-

बालक के जन्म के पश्चात उसे जो परिवेश मिलता है वह उसके आगामी व्यक्तित्व का निर्धारण करता है परिवेश के आक्रामक होने से बालक का स्वभाव भी आक्रामक विकसित होगा। यदि परिवेश सभ्य और संस्कारी है तो बालक के भीतर भी सकारात्मक गुना का समावेश निश्चित है।

4:- मानसिक स्वास्थ्य को प्रभावित करने वाले मनोवैज्ञानिक कारण:-

यहां मनोवैज्ञानिक कारण से तात्पर्य है कि किसी भी व्यक्ति को उसके जीवन काल में मानसिक प्रताड़ना से होने वाले दुख और मानसिक प्रसन्नता से होने वाला सुख।

इन दोनों परिस्थितियों के निम्न कारण हो सकते हैं जैसे –

1:- ज्ञान 2:- संगति 3:- जीवन शैली 4:- पारिवारिक माहौल

1:- ज्ञान

व्यक्ति के भीतर ज्ञान ही निर्धारित करता है कि किसी भी घटना विशेष का प्रभाव मानसिक व बौद्धिक रूप से कितना विशेष होगा। ज्ञान होने पर पहाड़ जितना दुख भी तिनके के सामान लगेगा तथा ज्ञान ना होने पर तिनके जितना दुख भी पहाड़ जितना लगेगा।

2:- संगति

मनुष्य के जीवन का सबसे प्रभावशाली घटक संगति होती है। संगति के कारण मनुष्य के चरित्र का निर्धारण होना संभव है। यदि मनुष्य की संगति में अलसी, मानसिक रूप से कमजोर व दुष्ट आदि प्रकार के लोग होंगे तो यह संभावना अधिक है कि मनुष्य का स्वभाव भी वैसा ही होगा और यदि संगति कुशल, बुद्धिमान, चरित्रवान लोगों की है तो संभावना है कि मनुष्य का स्वभाव व बुद्धि की क्षमता भी वैसी ही होगी।

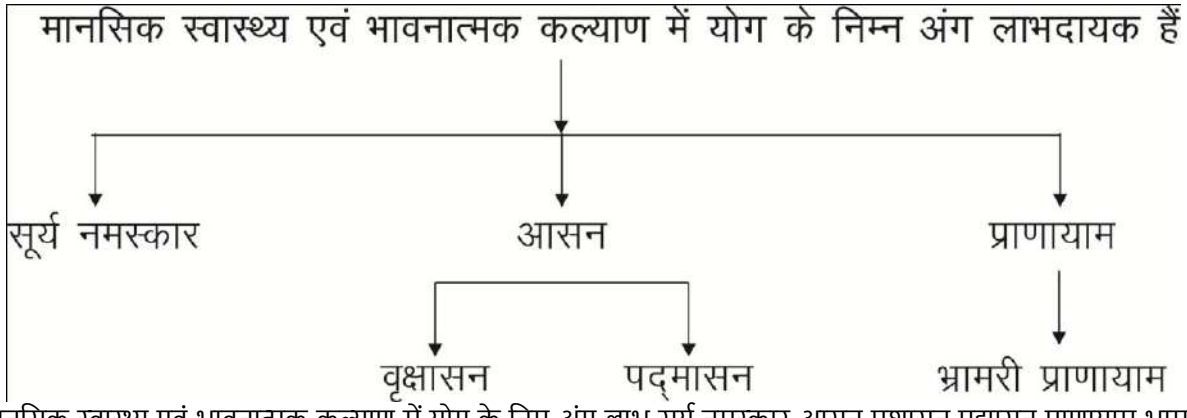
3:- जीवन शैली

किसी भी व्यक्ति की मानसिक स्थिति का अनुमान उसकी जीवन शैली के द्वारा भी लगाया जा सकता है। व्यस्त जीवन मनुष्य को कार्यरत रखता है। जिससे मानसिक अकेलापन नहीं होता वहीं दिनभर खालीपन मनुष्य के तनाव का कारण बनता है।

4:- पारिवारिक माहौल

एक मनुष्य का अपने जीवन में सफलता प्राप्त करने में उसके परिवार का विशेष महत्व होता है। यदि परिवार में माता-पिता बालक को प्रोत्साहित करें तथा उसे अपने जीवन में बालक के लक्ष्य के अनुसार प्रेरित करें तो बालक का सफलता प्राप्त करना अधिक आसान हो जाता है वही माता-पिता व अन्य जनों के कठोर व्यवहार के कारण बालक के लक्ष्य से भिन्न माता-पिता के जटिल निर्णय के कारण बालक का मानसिक तनाव व चिड़चिड़े व्यवहार की ओर बढ़ता है।

मानसिक स्वास्थ्य एवं भावनात्मक कल्याण में योग की भूमिका



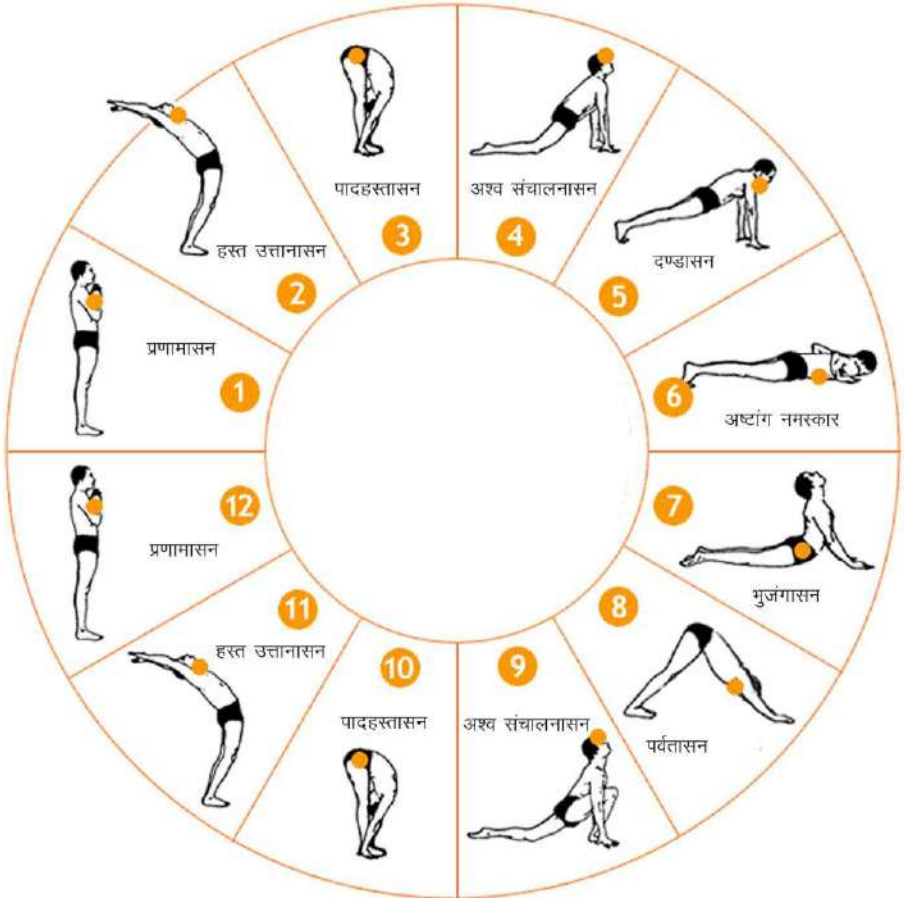
मानसिक स्वास्थ्य एवं भावनात्मक कल्याण में योग के निम्न अंग लाभ सूर्य नमस्कार आसन प्रशासन पद्मासन प्राणायाम भ्रामरी प्राणायाम मुद्रा नसिकआगराद दृष्टि बंद महाबंद भक्ति योग

१:- सूर्य नमस्कार

लाभ:- सूर्य नमस्कार के द्वारा शरीर में स्फूर्ति, शक्ति आती है साथ ही यह मानसिक तनाव को भी दूर करता है।

नियम:- इसका अभ्यास सुबह उठकर शौच, स्नान आदि करके सूर्य की ओर मुख करके करना चाहिए। शुरुआत में इसकी कुल स्थितियों को 8 से 10 बार दोहरा सकते हैं।

विधि:-



आसन की भूमिका:-

वृक्षासन

विधि:- जमीन पर सीधे खड़े हो एक पैर को मोड़कर उसके तलवे को दूसरे पैर की जांघ पर लगाए तथा दोनों हाथों को छाती के सामने नमस्कार मुद्रा में रखें। दृष्टि को सामने की ओर किसी एक बिंदु पर टिकाएं।

लाभ:- इससे मानसिक एकाग्रता बढ़ती है। क्रोध शांत होता है। बुद्धि भी तीव्र होती है।

पद्मासन

विधि:- इसे करने के लिए जमीन पर बैठकर दोनों पैर सीधे करें फिर दाएं पैर को मोड़कर बाएं पैर की जांघ पर रखें तथा बाएं पैर को मोड़कर दाएं जान पर रखें। दोनों हाथों को दोनों घुठनो पर ध्यान मुद्रा में रखें तथा मेरुदंड व ग्रीवा को सीधी रेखा में रखें।
लाभ:- यह ध्यान करने से पूर्व किए जाने वाला आसान है। इसके माध्यम से मन केंद्रित होता है।

प्राणायाम से मानसिक स्वास्थ्य व भावनात्मक कल्याण में सुधार की भूमिका:-

भ्रामरी प्राणायाम:-

विधि:- किसी भी सुखपूर्वक धनात्मक आसन में बैठ जाएं। मेरुदंड व ग्रीवा को सीधी रेखा में रखें। दोनों हाथों के अंगूठो से दोनों कानों को बंद करें तथा हाथ की शेष उंगलियों को बंद आंखों पर रखें। नासिकाओं द्वारा गहरा लंबा सांस भरे उसके पश्चात भंवरे के समान आवाज निकालते हुए सांस को बाहर की ओर निकाले। इसका अभ्यास एक बार में 5 से 6 बार कर सकते हैं।

लाभ:- इससे मानसिक शांति मिलती है। मस्तिष्क के स्नायुओं में शीतलता आती है तथा मन भी केंद्रित होता है। इससे चिड़चिड़ा व्यवहार व क्रोध पर पर नियंत्रण होता है।

संदर्भ ग्रंथ

- महर्षि पतंजलि - योगदर्शन (गीता प्रेस गोरखपुर)
- संजीव जैन त्रिलोक - संपूर्ण योग विद्या (हिमालय योग निकेतन समिति)
- स्वामी सत्यानंद सरस्वती-आसन प्राणायाम मुद्रा बंद (योग पब्लिकेशन ट्रस्ट, मुंगेर, बिहार)
- स्वामी निरंजन आनंद सरस्वती - घेरंड संहिता (योग पब्लिकेशन ट्रस्ट, मुंगेर, बिहार)

ASSESSMENT OF PSYCHOTICISM PERSONALITY TRAIT AMONG MALE HANDBALL PLAYERS WITH REFERENCE TO THEIR PLAYING POSITIONS

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Abstract

Handball players occupy various positions such as goalkeepers, wings, pivots, and backcourt players, each requiring distinct physical and mental attributes. The aim of the present study is to assess personality trait psychoticism vary based on playing positions in handball, allowing for better position-specific psychological conditioning. To conduct the study, 150 male interuniversity handball players with playing positions in left wing, left back, line player, right back and right wing. The age range was 18 to 25 years. To assess the psychoticism personality trait, the PEN inventory developed by Eysenck (1968, 1969) was used. The results reveal that line players were more psychotic as compared to players of right and left wing as well as right and left back in the court while psychoticism was lowest in wing players. It was concluded that personality trait psychoticism may be used to determine the playing position in handball.
Keywords: Handball, playing position, psychoticism

Introduction:

Training body, as well as mind, has been recognised for ages that contribute to sporting success. In this way, sports psychology becomes useful because it addresses the issue of applying psychology in sports so that sportspersons' motivation can be enhanced which eventually results in superior performance. The reaction of a sportsperson to a different game situation or environmental issues is based on his/her natural tendencies and traits. It is more important in team games because certain team dynamics and relationships have to be understood so that communication between players and coaches as well as between players can be enhanced. Sports psychology analyses how personality affects athletes' performance, team dynamics, team performance and decision-making on the field. The importance of personality assessment in team sports is to establish team cohesion and assign roles to players which is suitable to their personality.

In Eysenck's personality theory, psychoticism is a trait associated with aggressiveness, impulsivity, non conformity, and a tendency toward tough-mindedness. In the context of sport, this trait plays a dual role. On the one hand, athletes who score high on psychoticism may display qualities such as assertiveness, competitiveness, and risk-taking, which can be advantageous in high-intensity and contact sports where physical dominance and mental toughness are required. For example, sports like rugby, boxing, or wrestling often reward athletes who show controlled aggression and resilience under pressure. On the other hand, excessively high levels of psychoticism may lead to poor sportsmanship, conflict with teammates, difficulty adhering to rules, or susceptibility to unsporting behavior such as fouling or verbal aggression. In contrast, athletes with lower psychoticism scores are typically more cooperative, disciplined, and empathetic, which can benefit team cohesion and long-term athletic development. Thus, while moderate levels of psychoticism may enhance determination and competitiveness in sports, extreme levels can hinder performance by disrupting focus, discipline, and positive social interactions within the sporting environment.

Review of Literature

Ivaskevych et al. (2019) conducted a study to assess competitive anxiety in junior handball players based on

gender. They found that competitive anxiety was significantly higher in female handball players as compared to male handball players. **Pratale (2019)** in their study found that interuniversity handball players with urban background are significantly more aggressive than interuniversity handball players with rural background. **Jan et al. (2022)** examined cognitive traits in 50 handball players across different skill levels and court positions, including 35 national teams, 6 first- division, and 9 second-division players. No significant differences were found between elite and sub-elite players. However, goalkeepers exhibited lower selective attention and short-term memory compared to players in other positions. **Shiroli and Makawana (2021)** in the study found that Factor A of 16 PF personality, birth order and type of family are strong predictors of handball performance. **Popovych et al. (2021)** in their study found that competitive bahaviour in young female handball players is associated with optimism, extraversion and openness to experience. They concluded that it is essential to enhance competitive behaviour in young female handball players so that they can cope the challenging situations during a match effectively. **Tins and Hiran Mohan (2022)** assessed mental tension and aggression in intercollegiate handball and basketball players. They found a significant relationship between tension and aggression in handball and basketball players. **Kasnia and Dhull (2022)** reported no significant difference in anxiety levels of male hockey players based on their playing positions as attacker and defender but aggression was found to differ significantly in male hockey players based on their playing position. **Vogel and Schack (2023)** observed significant differences in TMRS scores i.e. Tactical Movement Representation System between experienced and less experienced handball players, as well as between players at local and regional competition levels. Their findings indicate that tactical expertise is influenced by well-developed cognitive tactical knowledge stored in memory. **Shuai (2023)** conducted a systematic review to examine the relationship between personality and athletic performance, using the Big Five personality model. The findings suggest that personality is a valuable predictor of athletic performance, highlighting the need for personality screening and development programs in sports.

Objective of the Study

The objective of the present study is to compare psychoticism personality trait among inter-university male handball players across different playing positions.

Hypothesis

H_1 Psychoticism will vary significantly among male handball players based on their playing positions.

Methodology

Sample:

In the present study, 150 male interuniversity handball players with playing positions in left wing, left back, line player, right back and right wing were selected. Equal number of players were selected from each playing position. The age range was 18 to 25 years. The process of selecting these players involved purposive sampling. Tools

Eysenck PEN Inventory

To assess the extraversion, neuroticism and psychoticism dimensions, the PEN inventory developed by Eysenck (1968, 1969) was used. This inventory measures Psychoticism (P), Extraversion (E) and Neuroticism (N) along with an element of social desirability known as faking through its lie subscale by a questionnaire method. The Hindi version of Eysenck's PEN inventory prepared by Menon et al (1978) is also available. This Hindi PEN Inventory comprises 78 items of which 20 items are for tapping P, 20 items for measuring E, 20 items for tapping N and 18 items are for measuring the tendency to tell a lie (L). For the purpose of this study, data on psychoticism (P) was used.

Procedure

150 male interuniversity handball players with playing positions in left wing, left back, line player, right back and right wing were selected. Hindi version of Eysenck's PEN inventory prepared by Menon et al (1978) and the responses on psychoticism were recoded numerically. One way ANOVA was used for analysis and result is given in Table 1 respectively.

Result and Discussion

Table 1 Descriptive Statistics of Mean Scores on Psychoticism Personality Trait among Male Handball Players based on Playing Positions (N=150)

Playing Positions	N	Psychoticism	
		Mean	S.D.
Left Wing	30	4.50	3.05
Left Back	30	5.60	3.77
Line Players	30	6.63	3.69
Right Back	30	6.10	1.76
Right Wing	30	4.86	1.85
F=2.60, p<.05			

Perusal of table 1 indicate that psychoticism among male handball players differ significantly based on their playing positions. The psychoticism was highest in line players, followed by right back, left back, right wing and left wing players.

Back players (left and right) and line players exhibit higher psychoticism, as their performance depends on physical dominance, assertiveness, and willingness to take risks during shooting, blocking, and duels at the 6-meter line. Their aggressive energy and confrontational style often serve as the driving force in breaking through the opponent's defense. Wing players, on the other hand, display lower psychoticism, since their success is rooted in discipline, precision, and calculated execution rather than impulsivity. Here, excessive aggression or risk-taking can hinder accuracy in fast breaks and acute-angle finishing.

Conclusion

Overall, the findings suggest that psychoticism levels in male handball players vary systematically across playing positions, with back players and line players exhibiting higher psychoticism and wing players showing lower levels. This distribution reflects the psychological demands of each position and highlights the importance of diverse personality traits for achieving balance and effectiveness in team performance.

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EFFECTIVENESS OF TRIPLE-MODE INTERVENTION PROGRAM (REACTIVE NEUROMUSCULAR TRAINING, TRADITIONAL YOGIC PRACTICES AND WALKING MEDITATION) AS A COMBINED PHYSIOTHERAPY AND YOGIC APPROACH ON PERONEAL TENDINITIS IN A BASKETBALL PLAYER: A SINGLE CASE STUDY

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Abstract

Background: Peroneal Tendinitis is one of the unnoticed injury which results in chronic lateral ankle pain which is most common among basketball players. Player's complaint pain along the posterolateral ankle that on mechanical loading reproduces symptoms which resolves upon unloading. And these are often linked with abnormal foot posture, repetitive lateral movements and improper landing. The target of this study is determine how useful Reactive Neuromuscular Training, Traditional Yogic Practice and Walking Meditation on reducing the symptoms of peroneal tendinitis.

Case Presentation and Management: A 23 year old, male basketball player with 5 years of playing experience presented with persistent pain along the posterolateral side of ankle. On assessment Cumberland Ankle Instability Tool (CAIT) and Visual Analog Scale (VAS) were noted as 17 out of 30 and 6 out of 10. On further, special tests were taken to confirm the diagnosis. A four week combined program of physiotherapy intervention as Reactive Neuromuscular Training, Traditional yoga asana and walking medications were administrated for 3 sessions per week and each session for a duration for 1 hour. Post intervention showed a marked improvement with CAIT changed to 27 and VAS reduced to 3. The player expressed gratification, with none of the side-effects.

Conclusion: This study reported that by combining reactive neuromuscular training, traditional yoga asana and walking meditation there may be effective reduction in pain and increases functional independence by correcting abnormal foot posture and movement pattern in basketball players with Peroneal tendinitis, supporting a safe and accessible therapeutic strategy by reducing injury recurrence by correcting faulty movement pattern, by enhancing player safety and training efficiency and as a whole improves functional performance.

Keywords: Basketball, Reactive Neuromuscular Training, Traditional Yoga Asana, walking meditation, CAIT, VAS.

Introduction:

Basketball is a branch of team sport often regarded as the game of intelligence, which encompasses fundamental movements of running, jumping, turning, throwing, catching, shooting and landing. This game is best described as a high-intensity, multidirectional sport requiring explosive power, agility, neuromuscular control and cognitive adaptability. Therefore, player injuries are very different and sometimes it even becomes fatal. Among many overuse injuries Peroneal Tendinitis is an unnoticed injury among basketball players that are linked to abnormal foot posture, ankle instability and weakness in eversion. The player complains along the posterolateral ankle pain. The peroneus tendon as brevis and longus provides maximum power of about 63% on eversion of the foot. Hence, it proves to provide contraction on sudden inversion stress on ankle that happens due to repetitive sudden movements that affects the dynamic instability of the lateral ankle complex. Repetitive stress on the peroneal tendon can cause inflammation causing pain along the outer ankle. The cause of this may be due to faulty movement pattern, improper landing, poor foot biomechanics, improper techniques and sometimes hard or irregular surface of play. Reactive Neuromuscular Training (RNT) is a structured program that increases attention due to its function in decreasing the injury by correcting faulty movement patterns. Traditional Yoga asana of Virabhadrasana that activates peroneal tendon to prevent inversion, Adho Mukha Svanasana that provides calf flexibility and Vrikshasana improves ankle dorsiflexion. Walking meditations improves controlled tendon loading and enhances proprioception. Functional instability of the ankle was assessed using (CAIT) Cumberland Ankle Instability Tool and pain intensity was measured Visual Analog Scale (VAS) before and after intervention. The purpose of this research is to find out the potency of integrating reactive neuromuscular training, traditional yoga asana and walking meditations as an intervention in a basketball player with peroneal tendinitis by aiming on its effects to decrease

pain, improve sports performance by correcting abnormal foot posture, movement pattern and enhancing ankle stability.

Case Explanation and management:

A 23 year old male basketball player who has been playing for 5 years came with a complaint of persistent pain over the area of outer ankle on the right side for the past four months found difficulty on foot workout, landing also experienced by the player leading to instability to relax and reduced concentration in his game. Pain during and after activity limits performance. He had no history of relevant past medical history, sprain, strain or other fracture and his genetic history was with none as known to be family history, neurological or other orthopedic disorders. During, routine clinical evaluation, no serious medical symptoms were observed in the patient. He had not previously received intervention. At the baseline, a diagnostic tool as a questionnaire were used to assess the severity of functional ankle instability and pain intensity. The Cumberland Ankle Instability Tool (CAIT) has a valid 9-item, 30 points to be marked by self-report. The CAIT was recorded as pre-assessment which scored 17 out of 30 which means less stable (figure.1). VAS was recorded as 5 out of 10(figure.2)

Figure.1

Describes pre-assessment of CAIT in the player

Source: CAIT assessment portol-Orthotoolkit, assessed on 3.November 2025

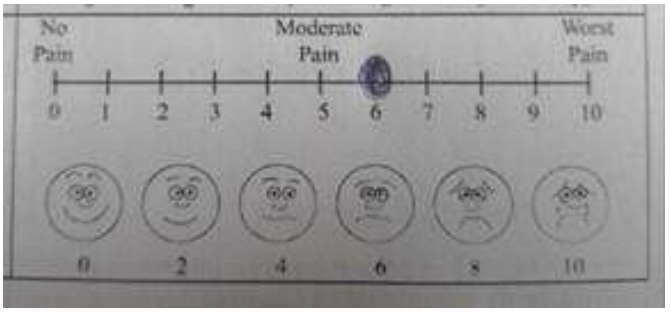


Figure.2

Describes the pre-assessment of VAS in the player

The special test of peroneal compression test and eversion test also showed positive with mild inflammation of peroneal tendon in radiological examination confirming the diagnosis as "Peroneal Tendinitis". The duration of this study is from November 2025 to December 2025. The participant provided written informed consent for study participation and publication of anonymized findings.

Figure 3

Figure 4

Physical assessment of the patient

A four week combined program of Reactive Neuromuscular Training (RNT), Traditional Yoga Asana and walking meditation was introduced, conducted for a period of 1 hour under as a supervised session, five sessions per week in a calmly setting.

Week 1

Comprised of ankle pumps, ankle circles, toe curls, vertical jump (fig.5,6) and lateral jump (fig.6) focuses on RNT with theraband , Adho Mukha Svanasana as Yoga (fig.7) and 10 minutes' walk on heel to toe gait pattern on a comfortable pace as walking meditation (fig.8). This phase aims on mobility and initial activation that improves circulation, ankle mobility and initiates neuromuscular activation.

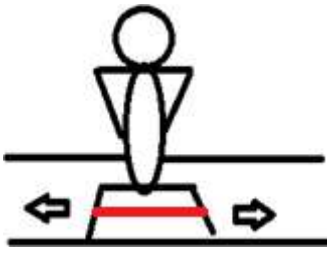


Figure.5 (Lateral Jumps)

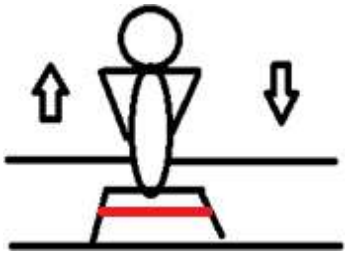


Figure.6 (Vertical Jump)

Figure.7 (Adho Mukha Svanasana)

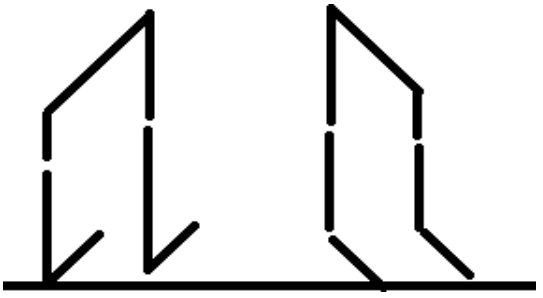


Figure.8 (Heel-Toe walking)

Week 2

Included forward lunge (fig.9) and lateral bound (fig.10) as RNT, Virabhadrasana (fig.11) in Yoga and symmetrical stride length and posture was maintained on the instruction of "Place your hands both hands in front of the body and concentrate on the movement". The aim of this phase is build movement confidence, increase load tolerance, strengthen ankle stability muscles in forward position and improve proprioception by tendon remodeling.

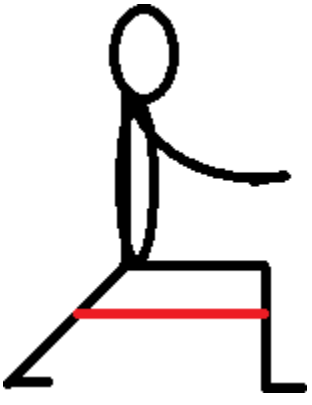


Figure.9
Resisted Forward Lunge

Figure.10
Player initiating the position of lateral bound

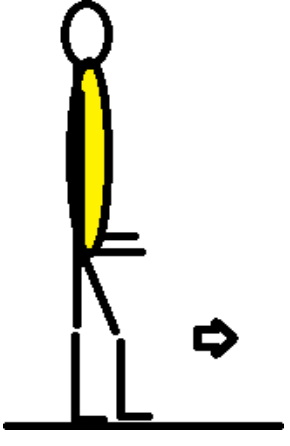


Figure.11
Viradhadrasana

Figure.12
Symmetrical stride length and posture

Week 3

Included unilateral wall squat (figure.13) and resisted heel slide initially without resistance band and followed by use of theraband (RNT focus). Yogic approach of Vrikshashasana, the walking meditation included backward walking, tandem walking and sideway walking. The main aim of this phase is to correct faulty foot biomechanics, enhance lateral ankle neuromuscular control and increase single-leg balance stability.

Figure.13
Unilateral wall squat without resistance band

Figure.14
Vrikshashasana (Tree pose)

Week 4:

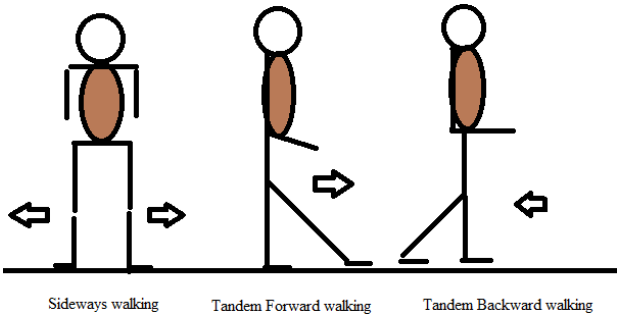
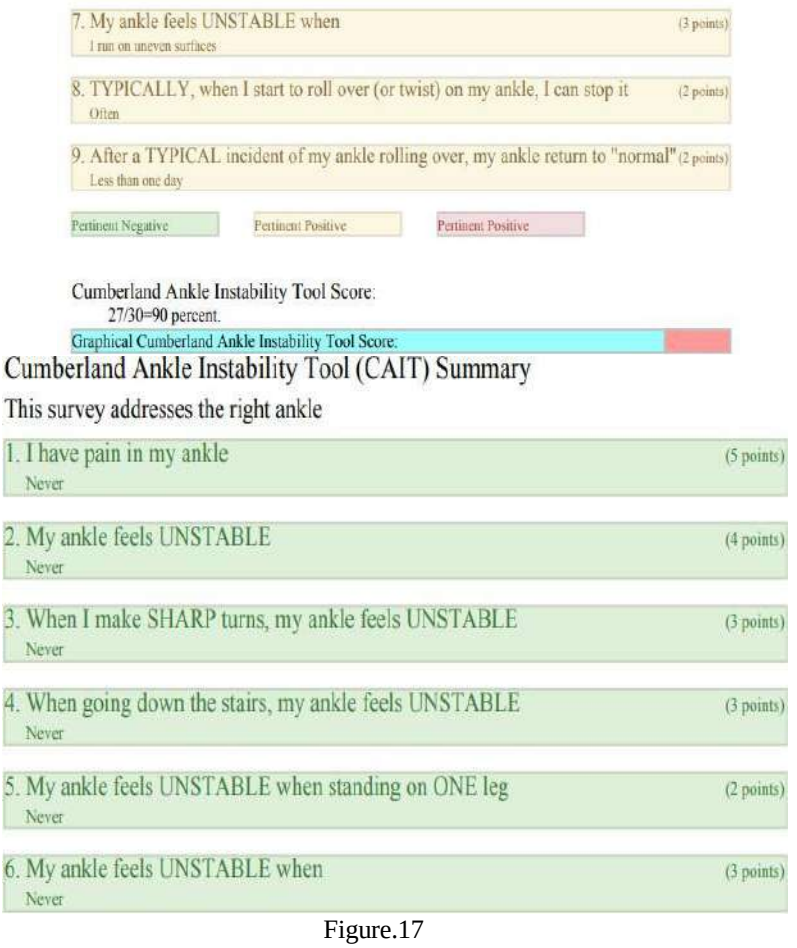


Figure.15 walking meditation

Included sprint-hold, Multi-directional sprint drill, and W- pattern drill as sports-specific training. Virabhadrasan (fig.16) was done with dynamic transition. To check the difference patient practiced virasana and found no pain or discomfort. For 20 minutes he was allowed to do natural speed walking with breath synchronization. The aim of this phase was to return the player back to his sport.

Figure.16 Virasana

After four weeks post intervention review with same tools indicated considerable gains. Total CAIT improved from 17 to 27 (fig.17), VAS dropped from 6 to 3 (fig.18). And the player expressed satisfaction with the program.



7. My ankle feels UNSTABLE when (3 points)
I run on uneven surfaces

8. TYPICALLY, when I start to roll over (or twist) on my ankle, I can stop it (2 points)
Often

9. After a TYPICAL incident of my ankle rolling over, my ankle return to "normal" (2 points)
Less than one day

Pertinent Negative | Pertinent Positive | Pertinent Positive

Cumberland Ankle Instability Tool Score:
27/30=90 percent.

Graphical Cumberland Ankle Instability Tool Score:

Cumberland Ankle Instability Tool (CAIT) Summary

This survey addresses the right ankle

1. I have pain in my ankle (5 points)
Never

2. My ankle feels UNSTABLE (4 points)
Never

3. When I make SHARP turns, my ankle feels UNSTABLE (3 points)
Never

4. When going down the stairs, my ankle feels UNSTABLE (3 points)
Never

5. My ankle feels UNSTABLE when standing on ONE leg (2 points)
Never

6. My ankle feels UNSTABLE when (3 points)
Never

Figure.17

Describes post-assessment of CAIT in the player

Source: CAIT assessment portol-Orthotoolkit, assessed on 3.December 2025

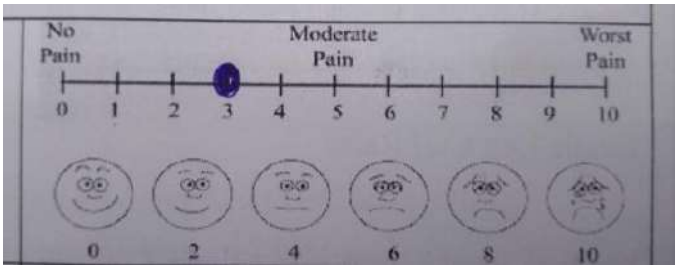


Figure.18
Describes the post-assessment of VAS in the player

The patient as a player experienced decrease in pain. He perceived the session's manageable and reported better sport functioning and overall quality of life.

Study Discussion:

The target is to find out the usefulness of integrative reactive neuromuscular training (RNT), traditional yoga asana and walking meditation in a 23 year old basketball player diagnosed with peroneal tendinitis, a pain along the lateral or outer ankle. Diagnosis of Peroneal tendinitis was done by special tests, functional instability was done by CAIT and VAS which identifies the intensity of pain. This study focuses on specially reducing pain, stabilizing ankle joint, correcting the abnormal foot posture and improve functional outcomes by use of corrective movement pattern.
Participant underwent a 4-week intervention program, undertaking reactive neuromuscular training integrating with traditional yoga asana and walking meditation as an aim to integrate physiotherapy and yogic approach. The target of this study research is to both improve movement pattern and correct the stability of ankle joint that leads to proper foot biomechanics also thereby reducing pain and inflammation. The combined intervention successfully reduced pain and abnormal foot posture, both crucial elements of poor foot mechanics and incorrect movement patterns in the population of basketball player in the post intervention assessment. The findings from this case align with existing literature explaining on chronic ankle instability that is primarily due to peroneal tendon [1] [2] that reactive neuromuscular training exercises improve movement pattern particularly in players with improper foot biomechanics and ankle joint instability [3] [4]. And further yogic practices and walking meditation [5] can also be used to enhance player performance. Several studies reports that the peroneal tendinitis causes pain along the posterolateral ankle associated more commonly with chronic ankle instability [6] whose functional instability was measured using the Cumberland Ankle Instability Tool (CAIT) [7] and pain intensity was measured using Visual Analog Scale (VAS) [8]. For instance, a six week Training and the presented results indicated that the injury prevention program could well modify the players of basketball movement pattern which is often associated with pain and faulty movements.

Conclusion of the Study:

Reactive neuromuscular training combined with traditional yogic practices and walking meditation could be regarded as an evidence based , non-pharmacological pain management technique and inflammation caused by peroneal tendinitis in basketball player, aligning with the border literature on management of proper foot mechanics, reduce excessive ankle instability and correct faulty movement pattern. Further studies with longer follow-up periods are necessary to confirm the generalizability and long-term effectiveness of this combined interventions.

Recognition:

I extend my gratitude to the original contributors who developed the standardized outcome measures used in this study namely the Cumberland Ankle Instability Tool (CAIT) and Visual Analog Scale (VAS) which were invaluable in the assessment and evaluation process. I also extend my gratitude to my guide for providing me guidance throughout is study. I extend my heartfelt thanks to the participant (player) for his cooperation and trust in the intervention program. I am deeply thankful to my parents for their unwavering support .I also express my appreciation to the organization for providing me this opportunity and finally, I offer my humble gratitude to the almighty.

Conflict of Interest:

We do not have any conflict of interest.

Data availability statement:

We confirm that the data supporting the findings of the study will be shared upon reasonable request.

Supplementary file:

None.

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"DIGITAL GAME BASED COGNITIVE AND VISUAL BIO-FEEDBACK TRAINING ON REACTION TIME AND AGILITY AMONG JUNIOR ELITE SQUASH PLAYERS"

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Insitution: Avinashilingam Insitute of Home Science and Higher Education for women (deemed to be University) recognized under under the Category "A" by MHRD, re-accredited with A+ Grade by **NAAC,** Coimbatore, and TamilNadu, India.

Abstract

Background of The Study: Squash is a quick indoor racket game that requires good coordination, fast reflexes, and the ability to move swiftly to handle sudden changes in direction. How well squash players perform isn't just about their physical shape; it also relies on their mental skills like how well they see, make decisions, and react quickly. Most of the time, training concentrates on the physical side and doesn't pay much attention to the mental parts of playing. Lately, a new way to train has popped up: using digital games with visual feedback to help athletes, especially those still developing, get better neuromuscular and hand-eye coordination, and react more efficiently.

Methodology:

This research aimed to see if training with digital games and visual feedback could improve reaction time and agility in young, top-level squash players. The study used an experimental setup with measurements taken before and after the training. Twenty junior elite squash players, aged 14 to 17, were chosen based on specific criteria. For six weeks, these players participated in a structured digital training program, with sessions lasting 20 to 30 minutes. Their reaction time was measured using a visual reaction time test, and their agility was assessed with the Illinois agility test, both before and after the training period. The gathered information was analyzed using averages, standard deviations, and a paired T-test to determine statistical significance.

Conclusion:

The results showed a clear improvement in both reaction time and agility. This suggests that digital game-based training is a useful extra method for boosting aspects of performance in junior elite squash players.

Introduction:

Squash is a high-intensity and fast-paced racket sport that demands rapid decision-making ability, along with agility and reaction time. Cognitive processing plays a crucial role in improving sports performance. In competitive situations, players are required to respond rapidly to unpredictable visual stimuli while maintaining balance and direction control. Traditional training methods often focus on improving physical fitness without integrating cognitive elements, such as perception, attention, and decision–making ability. However, modern sports science emphasizes the importance of integrating cognitive and perceptual training into athletic development. Digital game-based cognitive training has emerged as an innovative approach that enhances hand-eye coordination, visual processing speed, and neuromuscular response through interactive and feedback-based training systems.

In Junior squash players, declining visual and cognitive abilities are mostly caused by a mix of training-related problems, lifestyle modifications, and developmental variables. A lack of sufficient stimulation during this critical period of brain and sensory system development can have a detrimental effect on junior athletes' cognitive, perceptual, and general sports performance. Aspects including decision-making, memory, speed, direction, attention, and recall, all of which are frequently disregarded, are typically neglected in favor of physical fitness and skill-based training. Consequently, there is a shortage of systematic drills aimed at boosting reaction time and anticipation. Slower reaction times, worse tactical decisions, and diminished concentration during gameplay are the results of limited involvement with game-based cognitive demands and sport-specific thinking abilities. The ability to develop visual abilities in daily life may be hampered by relying only on their natural vision without any training. Inadequate development in visual object tracking, depth perception, and peripheral vision can result in reduced agility, delayed ball tracking, and incorrect speed and distance estimations. Overuse of video games and cell phones can be

detrimental to one's visual and mental health. Training regimens mainly stress endurance, physical training, strength, and skill, often overlooking cognitive-visual elements. Slower reaction times and less efficient movement might result from improper integration of sensory input and motor output. Making tactical decisions all the time might cause delayed motor responses, especially in junior players whose cognitive control mechanisms are still maturing.

Visual processing is essential for cognition, with approximately 80-90% of sensory input during sporting activities being derived from visual information. It encompasses both dorsal and ventral pathways along with the cortex. Deficits related to pathophysiology can occur due to issues with depth perception and diminished visual tracking capabilities. This is particularly relevant for individuals aged 10-18 years, as underdeveloped visual pathways may result in delayed motor responses. Such delays can impact agility, hand-eye coordination, and decision-making under time constraints.

The specific goal of cognitive and visual biofeedback training is to improve brain plasticity. Biofeedback provides instantaneous sensory information, frequently related to athletes visual performance, which supports the best possible reactions. At the brain level, this training promotes synaptic efficiency through the production of neurotrophins, strengthens cortico-motor connections, and improves sensory integration. Neuroplastic alterations are encouraged by regular participation in task-specific cognitive and visual tasks. Enhancing mental abilities like attention, memory, processing speed, decision-making, and reaction time is the goal of cognitive training. It is essential for making accurate decisions and predicting movements. Neural plasticity is enhanced by game-based cognitive training.

Digital game-based cognitive and visual biofeedback training enhances task-specific motivation and repetition. These training interventions stimulate overall reaction time by minimizing stimuli to improve anticipatory skills. Primarily, both interventions in sports are grounded in neural adaptation and optimization of motor-sensory functions. Biofeedback training addresses deficits by fostering neuroplasticity and increasing reaction efficiency.

Need of the Study:

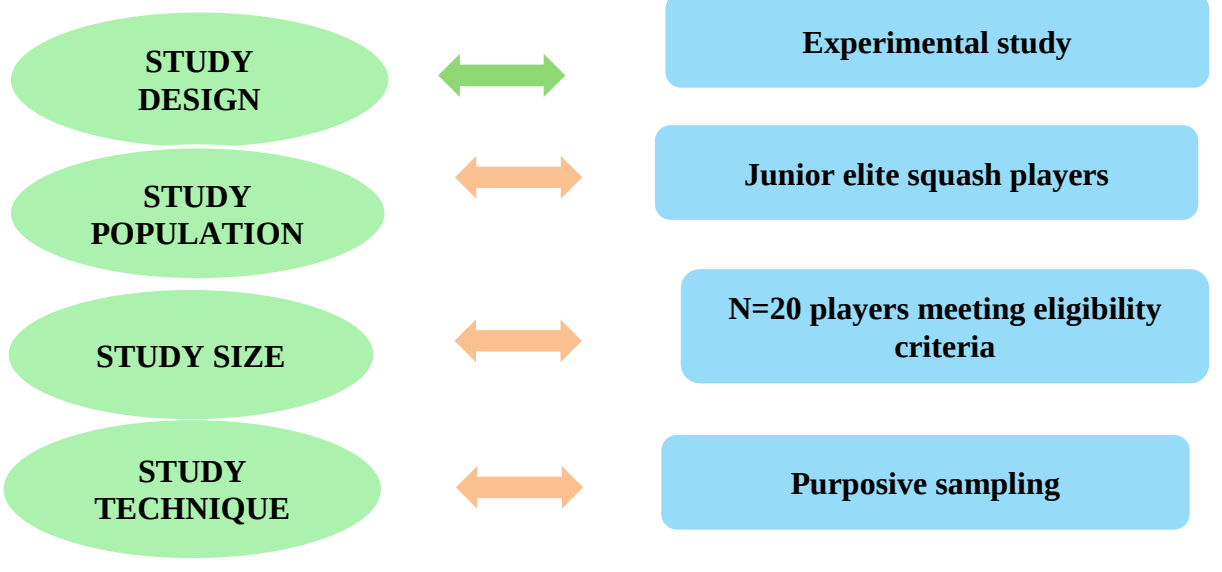
In fast-paced squash sports, agility and reaction time are essential for responding quickly to visual cues and improving decision- making ability. However, there is a limited sport-specific research examining its combined effects on reaction time and agility among junior elite squash players. Therefore, this study aims to provide scientific evidence to support its integration into structured training programs.

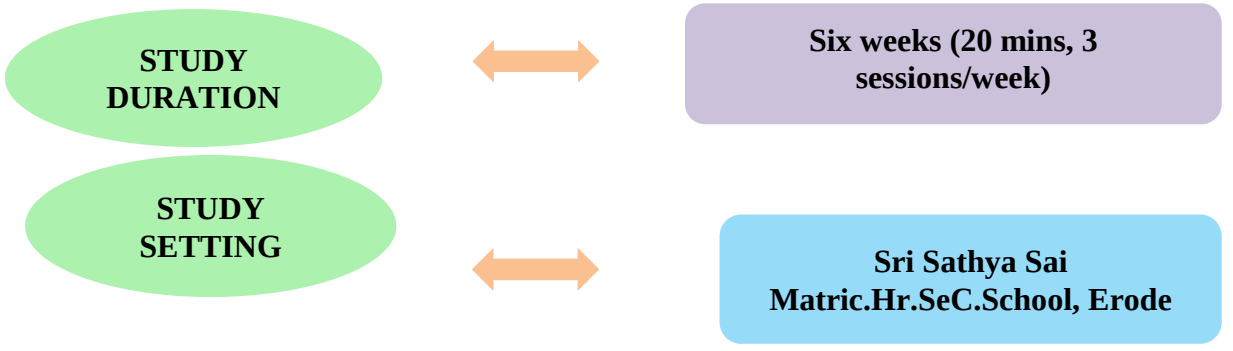
Research Gap:

In the Indian sports training context, despite being proven, this technique is not commonly implemented in routine Squash training.

There is a lack of evidence from controlled studies evaluating combined digital cognitive and visual biofeedback training together with agility drills specifically in junior squash populations.

Research Methodology:





Inclusion Criteria:

- Junior squash players age between(14-17yrs)
- Both male and female players
- Players currently undergoing regular squash training
- Normal or corrected to normal vision.
- Players actively participating in competitive or elite level squash training
- Minimum (1-2 yrs) of regular game based training sessions.
- Willingness to participate in digital app based training sessions

Exclusion Criteria:

- Aged above 18 years
- Recent upper limb or lower limb injury (within the last 3 months)
- Players currently engaged in other cognitive or perceptual training programs
- Neurological, cognitive or visual disorders.

Procedure:

Participant Selection:

Twenty junior elite squash players were selected based on the inclusion and exclusion criteria.

Pre- Test Assessment:

Before the training program, baseline measurements were taken for;

- Reaction time [using digital reaction time test]
- Agility [using the Illinois agility test]

Training Intervention:

Participants underwent DIGITAL GAME-BASED COGNITIVE AND VISUAL BIO-FEEDBACK TRAINING for six weeks, with three sessions per week. Each training session lasted for 20-30 minutes.

Training protocol:

- Visual stimulus –based digital games
- Decision-making tasks
- Hand –Eye coordination activities
- Real-time visual biofeedback response tasks

Monitoring:

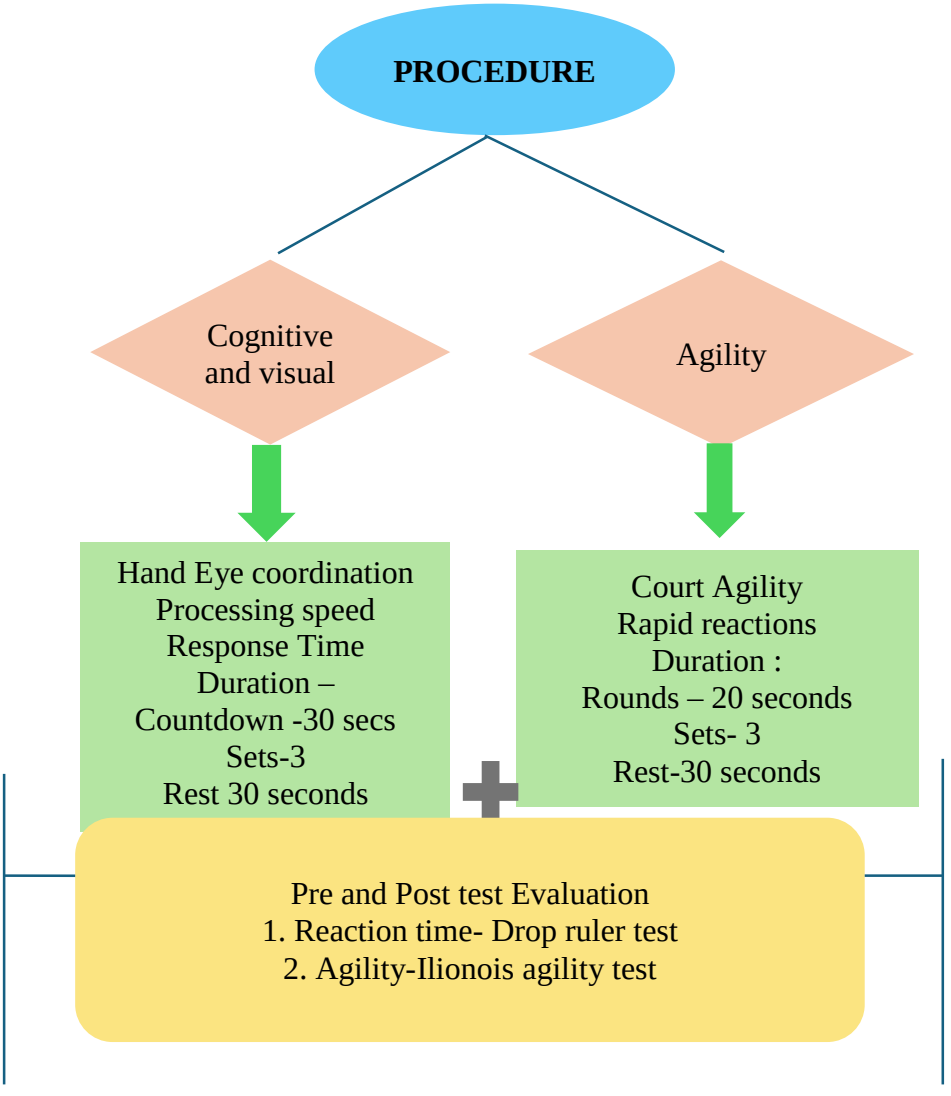
All sessions were conducted under supervision to ensure correct performance and adherence to the training program.

Post –Test Assessment:

After completion of the training program, reaction time and agility were measured again using the same tests as in the pre-test.

Data Collection:

Pre-test and Post- test values were recorded for further statistical analysis.



Intervention:

The intervention consisted of a structured Digital Game–Based Cognitive and Visual Bio-Feedback Training program designed to improve reaction time, decision making, and agility-related performance in junior elite squash players.
Each training session lasted 20-30 minutes and was conducted three times per week for a total duration of six weeks. The training protocol included:

- Interactive visual stimulus response games requiring rapid identification of moving targets.
- Cognitive decision –making drills embedded within digital game scenarios.
- Visual tracking task to enhance eye-hand coordination.
- Real-time feedback provided through screen based performance indicators[response time, accuracy score, movement efficiency]

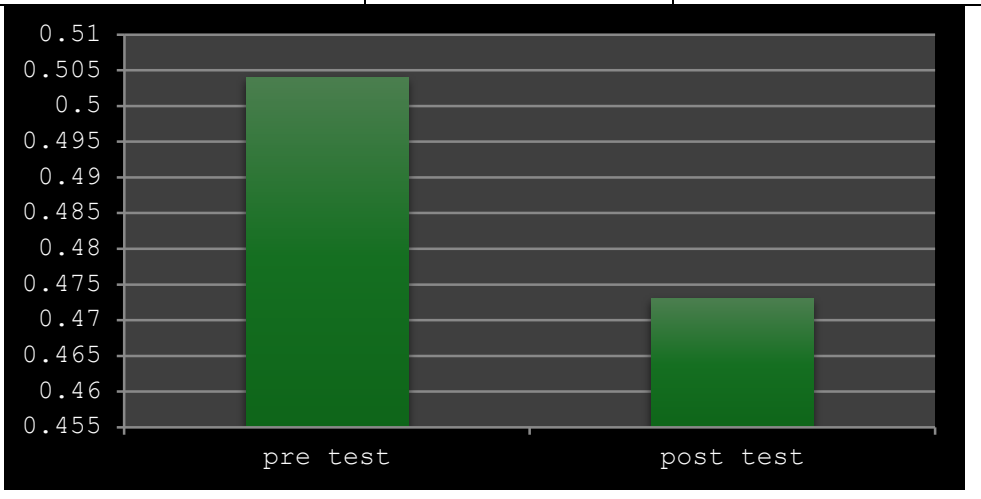
Agility –based movement responses triggered by unpredictable visual cues displayed on a digital interface.

The difficulty level of the game was progressively increased based on the athlete's performance to ensure continuous adaptation and neuromuscular engagement. All sessions were supervised to ensure correct movement execution and adherence to the training protocol.

DATA ANALYSIS:

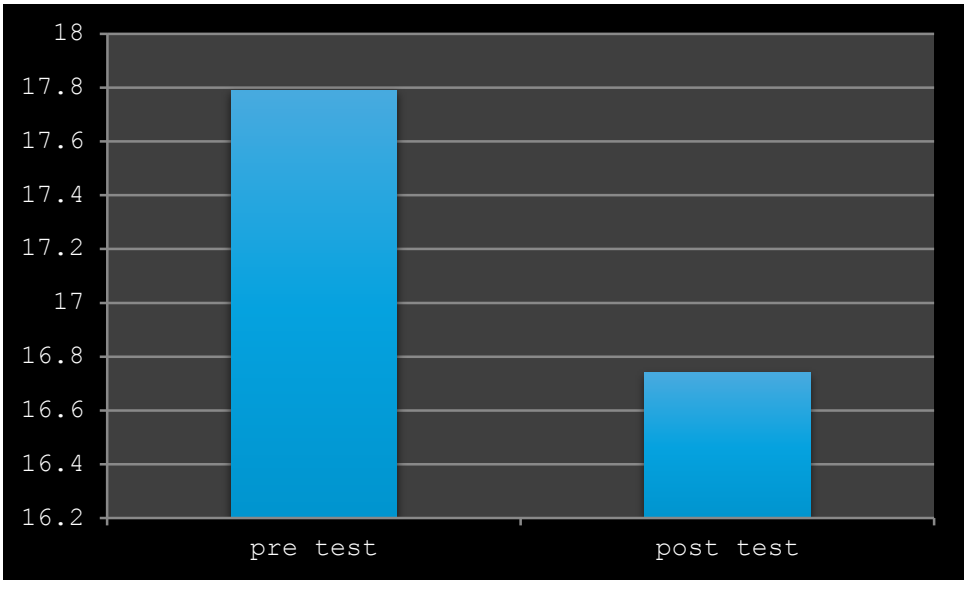
REACTION TIME

VARIABLES	MEAN(sec)	STANDARD DEVIATION(sec)
PRE-TEST	0.504	0.00275
POST-TEST	0.473	0.0240



AGILITY TEST:

PLAYER	MEAN (sec)	MEAN DEVIATION (sec)
PRE -TEST	17.79	0.48
POST-TEST	16.74	0.43



Results:

The results revealed that the mean reaction time of the junior elite squash players with the pre-test for reaction time score is (0.504sec) with the mean deviation for (0.0025) and significantly reduced with the post-test score of (0.473sec) with the mean deviation (0.0240) with the significance of $p < 0.05$. The calculated t-value (7.71) is greater than the actual table value (2.093) at the 0.05 level of significance. This reduction in mean as well as variability indicates that there is a significant reduction, and indicates that players respond faster and more consistently after the training period.

The results of the mean pre-test agility of the players were found to be (17.79 + 0.48), whereas the mean post-test agility test score was (16.74 + 0.43) seconds. The post-test mean value was lower than the pre –test mean value, indicating the improvements in agility performance. The calculation paired-t test value is 7.29, which is greater than the table value of 2.09, which is significant at the 0.05 level.

Discussion:

Reaction time plays a vital role in squash performance as the sport demands rapid decision-making and immediate response to visual stimuli. The observed improvement among the players may be attributed to the digital game-based cognitive and visual bio-feedback, which enhances the speed, attention, and neuromuscular coordination. The reduction in mean and standard deviation suggests that training improved, along with the players' consistency. The results of the study showed a significant improvement in reaction time among junior elite squash players after six weeks of training. The reduction in reaction time indicates that the training enhanced visual processing speed, decision-making ability, and neuromuscular coordination. The use of interactive digital tasks and real-time biofeedback may have helped the players respond faster to visual stimuli, which is essential in a fast-paced sport like squash.

The findings of the present study revealed a significant improvement in agility performance with the reduction in post-test agility, which indicates enhanced motor response, improved visual processing ability, and better coordination. The integration of digital training with the biofeedback mechanisms may have contributed to faster reaction to visual stimuli and improved movement efficiency during agility tasks.

Limitations:

The present study was conducted with a relatively small sample of junior elite players, which may limit the generalization of the findings to a wider population, and also with the lack of a control group. The duration of the intervention was short, and the long –term effects of digital game-based cognitive and visual bio-feedback training were not examined.

Recommendations:

Digital game-based biofeedback training can be incorporated into the regular training schedule of junior elite squash players. Coaches and the squash trainers are encouraged to adopt technology–assisted cognitive–visual training methods along with traditional drills for neuromuscular coordination. Similar training protocols can be implemented for players of different age groups to obtain more generalized long term affects. Future studies may increase the sample size and duration of intervention.

Conclusion:

The findings of the present study revealed a significant improvement in reaction time and agility performance among the junior players after undergoing Digital game based cognitive and visual biofeedback training. It can be concluded that digital game-based cognitive and visual bio-feedback training serves as a supplementary training method for enhancing performance-related components among junior elite squash players.

Funding

This research received no external funding

Conflict Of Interest:

The authors declare that there is no conflict of interest.

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MODULATION OF EEG OSCILLATIONS AND AUTONOMIC ACTIVITY FOLLOWING HEARTFULNESS AND BELL MEDITATION

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Abstract

Meditation is associated with coordinated neural and autonomic regulation; however, the differential effects of Heartfulness and Bell meditation on electrophysiological and cardiovascular markers remain underexplored. This randomized exploratory pilot study examined resting EEG and autonomic indices following 21 days of practice. Nine healthy male university students were allocated to a Heartfulness meditation group (HMG; n = 3), Bell meditation group (BMG; n = 3), or control group (CG; n = 3). The intervention groups practiced 30 minutes per session, five days per week, for three weeks. Resting EEG gamma and sensorimotor rhythm (SMR) amplitudes, along with blood volume pulse–derived heart rate (HR) and heart-rate variability (HRV) measures—including low-frequency percentage (LF%) and HRV amplitude—were recorded pre- and post-intervention. Outcomes were summarized descriptively using Hedges' g with 95% confidence intervals. The HMG demonstrated large-to-very-large increases in gamma and SMR ($g \approx 1.0–2.3$). The BMG showed a very large increase in SMR with only a small change in gamma, whereas the CG exhibited minimal electrophysiological change. HR decreased across all groups. LF% declined in both meditation groups but increased in the CG. HRV amplitude decreased in all groups. These preliminary findings suggest that Heartfulness and Bell meditation may differentially influence neural oscillatory activity and autonomic modulation, with Heartfulness showing stronger gamma engagement and Bell meditation primarily enhancing SMR. Interpretation is limited by the small, male-only sample, short duration, and use of BVP-derived HRV metrics. These results require confirmation in larger, well-powered trials employing broader neurobehavioral assessments.

Keywords: Heartfulness meditation; Bell meditation; EEG oscillations; gamma activity; sensorimotor rhythm; autonomic regulation; heart rate variability.

1. Introduction

Meditation refers to the intentional cultivation of mindfulness or directed focus on tangible or intangible objects [1]. Contemporary research increasingly situates meditation within the framework of brain–body integration, highlighting how meditative states align neural oscillations with autonomic rhythms to enhance cognitive function, emotional stability, self-regulation, and overall well-being [2]. Neural–cardiac coupling, defined as the dynamic interaction between cortical processes and autonomic cardiac control, is commonly assessed using simultaneous neural (EEG, fMRI) and cardiac (heart rate, HRV) measures. This bidirectional loop reflects the top-down influences of cortical oscillations on autonomic tone and bottom-up vagal afferents shaping cognition and affect through neural–autonomic interplay [3, 4]. Enhanced synchrony between EEG activity and HRV is considered a psychophysiological marker of balanced arousal and resilience, providing an empirical index linking brain function, autonomic health, and psychological wellbeing.

A growing body of evidence shows that meditation enhances synchrony between high-frequency EEG rhythms (e.g., alpha and gamma) and parasympathetic HRV indices (HF power), suggesting improved autonomic and cognitive-affective regulation [5, 6]. Gamma oscillations (~30–80 Hz) have been linked to neuroplastic adaptations in attentional networks and are associated with heightened attention, with increases observed in both long-term practitioners and novices following brief training [7]. Mindfulness practices also enhance SMR activity, which supports sensorimotor integration, motor planning, and attentional control [8]. Parallel findings in autonomic physiology demonstrate that HRV, a key marker of parasympathetic regulation, increases reliably during meditation, reflecting improved vagal tone and autonomic balance[8]. These changes correspond to enhanced emotional regulation, greater stress resilience, reduced sympathetic arousal, and improved cardiovascular health, establishing HRV as a robust biomarker of the benefits of meditation [9].

Despite extensive research on mindfulness, Zen, and transcendental meditation, heartfulness meditation (HM), a modern, heart-centered practice emphasizing thoughtfulness and inner development—remains underexplored in terms of EEG and HRV outcomes, with most studies limited to experienced practitioners [10]. Similarly, bell meditation, which uses auditory cues such as periodic bells or Tibetan singing bowls to anchor attention [11], has ancient roots but little systematic neurophysiological evaluation has been conducted. Comparative data across these distinct styles in healthy novices are rare, even though meditation type, duration, and expertise influence EEG and HRV profiles.

To address this gap, the present study conducted a randomized three-arm pre–post design comparing 21 days of Heartfulness meditation, Bell meditation, and a usual-routine control. EEG indices (gamma, SMR) and HRV parameters (HR, LF%, and amplitude) were recorded before and after the intervention. Given its exploratory nature and very small sample size, the analyses were descriptive, focusing on individual trajectories and group-level change scores. This pilot study offers preliminary psychophysiological profiles of Heartfulness and Bell meditation in novices, extending the comparative map of contemplative practices and providing a foundation for future adequately powered trials.

2. Methods

2.1. Study Design and Participants

This exploratory, three-arm, parallel-group randomized pre–post study included the Heartfulness meditation group (HMG), Bell meditation group (BMG), and control group (CG). Nine healthy male university students completed both baseline (pre) and post-intervention (post) assessments (N = 9; n = 3 per group; see *Table 1*). The study was approved by the Institutional Ethics Committee for Human Research, Visva-Bharati (Ref. No. VB/IECHR/03/2024), and all the participants provided written informed consent.

2.2. Interventions

Over 21 days, the HGM group practiced silent, heart-focused meditation for 30 min/session, 5 days/week, guided by a certified trainer using a standardized protocol [12]. The BMG engaged in daily 30-min sound-based sessions using Tibetan singing bowl recordings with progressive tonal sequences, delivered according to a validated protocol [13]. The CG continued their usual routine without any structured practice. Outcome assessment and recording procedures. Physiological recordings were obtained pre- and post-exercise. During each session, the participants sat comfortably in a dimly lit room and completed a 10-min eyes-closed resting-state recording.

2.3. Procedure

All recordings were performed in a quiet, temperature-controlled room using a NeXus-10 MKII system (Mind Media BV, Netherlands). EEG data were acquired at a sampling rate of 256 Hz with Ag/AgCl electrodes placed at Fp1, Fp2, and O2 sites according to the international 10–20 system, and ground and reference electrodes were positioned at the right and left mastoids, respectively. The electrode impedance was maintained below 10 kΩ. Preprocessing and spectral analysis were conducted using BrainVision Analyzer (v2.01) using standard filtering and artifact rejection procedures. Sensorimotor rhythm (SMR) was defined as 12–15 Hz, while gamma band analysis followed the device/software's default definition. Band power (absolute or log-transformed, as exported) was calculated as the mean across the artifact-free epochs and channels. Autonomic measures were simultaneously recorded using a NeXus peripheral sensor. Blood volume pulse (BVP) signals were used to derive the heart rate (HR, beats per minute). Heart rate variability (HRV) indices included LF% (low-frequency component in normalized units, computed by the device software's algorithm) and HRV amplitude (an amplitude-based metric, exported in arbitrary units).

2.4. Outcomes and Statistical Analyses

The outcomes comprised EEG band-power indices (gamma, SMR) and autonomic measures derived from BVP (HR, HRV-LF%, HRV amplitude). Data were maintained in long format and summarized for each Group×Time cell (Pre, Post) using mean, SD, median, and 95% CIs (n=3 per arm). Given the pilot sample, the analyses were descriptive and exploratory; no null hypothesis tests or between-group inferences were performed. Within-group pre–post magnitude was expressed as Hedges' g (small-sample bias corrected) with 95% CIs, alongside the percent change to aid interpretability. Confidence intervals for cell means used t-distributions with df = n − 1; effect size estimates

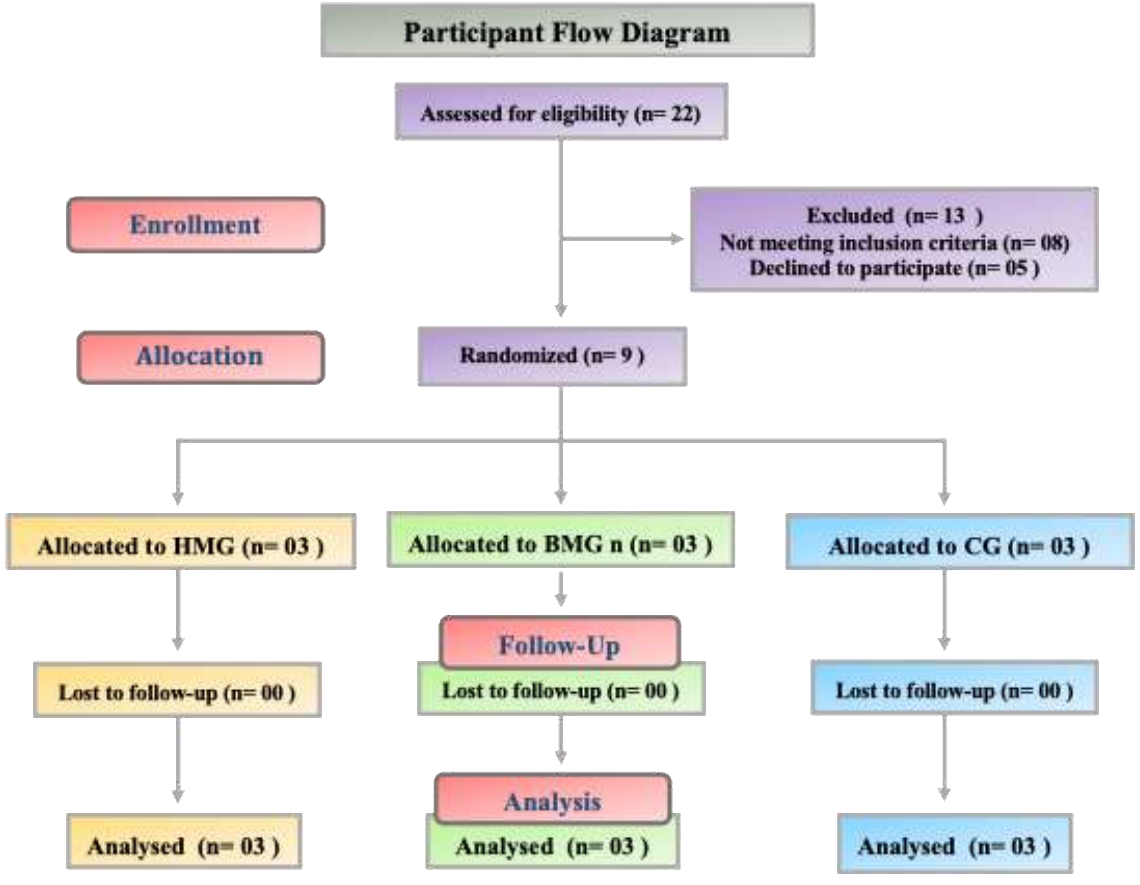
and CIs followed jamovi defaults. Descriptive statistics were computed using jamovi 2.6 (macOS), and figures were produced in R 4.4 via RStudio 2025.05.0+496 using ggplot2.

3. Results

3.1. Participants and Baseline Characteristics

Of the 22 students screened, 13 were excluded (8 not meeting the inclusion criteria and five declined), leaving nine randomized to the HMG (n = 3), BMG (n = 3), or CG (n = 3). All completed both assessments with no losses, protocol deviations, or adverse events. The baseline characteristics were comparable across the groups as shown in *Table 1*. The participant flow is illustrated in *Figure 1*.

Figure 1. Participant flow diagram



Note: Assessed for eligibility (n = 22); excluded (n = 13: not meeting inclusion criteria, n = 8; declined, n = 5). Randomized (n = 9) to HMG (n = 3), BMG (n = 3), CG (n = 3). No loss to follow-up; all analyzed (n = 3 per arm).
Table 1: Baseline Characteristics of the Participants (n = 9)

Characteristic	Heartfulness (n = 3)	Bell (n = 3)	Control (n = 3)
Age (years), Mean ± SD	19.7 ± 0.58	20.0 ± 1.00	19.3 ± 1.15
Gender, n (%)			
- Male	3 (100%)	3 (100%)	3 (100%)
Height (cm), Mean ± SD	158.3 ± 6.1	157.0 ± 5.8	155.3 ± 6.7
Weight (kg), Mean ± SD	52.0 ± 5.0	55.3 ± 6.1	54.5 ± 5.5
BMI (kg/m²), Mean ± SD	20.7 ± 1.2	22.4 ± 1.6	22.1 ± 1.4
GHQ-12 Score (Mean ± SD)	1.7 ± 1.0	1.3 ± 0.6	2.0 ± 1.2
Cleared PAR-Q, n (%)	3 (100%)	3 (100%)	3 (100%)

Educational Level			
- 10+2	3 (100%)	3 (100%)	3 (100%)
Marital Status			
- Unmarried	3 (100%)	3 (100%)	3 (100%)
Socioeconomic Status			
- Lower	0	0	1 (33.3%)
- Upper Lower	1 (33.3%)	1 (33.3%)	0
- Lower Middle	2 (66.7%)	2 (66.7%)	2 (66.7%)
- Upper Middle / Upper	0	0	0

Note: Values are presented as mean ± SD or n (%). GHQ-12: 12-item General Health Questionnaire; PAR-Q: Physical Activity Readiness Questionnaire. No statistically significant between-group differences were observed at baseline (all descriptive $p > .05$).

3.2. EEG Outcomes

From pre- to post-assessment, gamma power exhibited an increase of 109.6% in the High Meditation Group (HMG) ($g = 1.03$, CI [0.12, 1.94]), 6.6% in the Basic Meditation Group (BMG) ($g = 0.22$, CI [−0.64, 1.08]), and 30.3% in the Control Group (CM) ($g = 0.39$, CI [−0.50, 1.28]). Additionally, sensorimotor rhythm (SMR) power increased by 173.2% in the HMG ($g = 2.31$, CI [1.07, 3.55]) and by 132.3% in the BMG ($g = 2.52$, CI [1.24, 3.80]), with a comparatively smaller change of 10.1% in the CM ($g = 0.25$, CI [−0.63, 1.13]). Individual pre–post trajectories are depicted in *Figure 2*, group means with 95% confidence intervals are illustrated in *Figure 3*, detailed cell-wise descriptive statistics are provided in *Table 2*, and change score distributions are presented in *Figure 4*.

Table 2. Summary of pre–post changes in EEG and autonomic indices by group: means, percent change, and within-group effect sizes (Hedges' g, 95% CI)

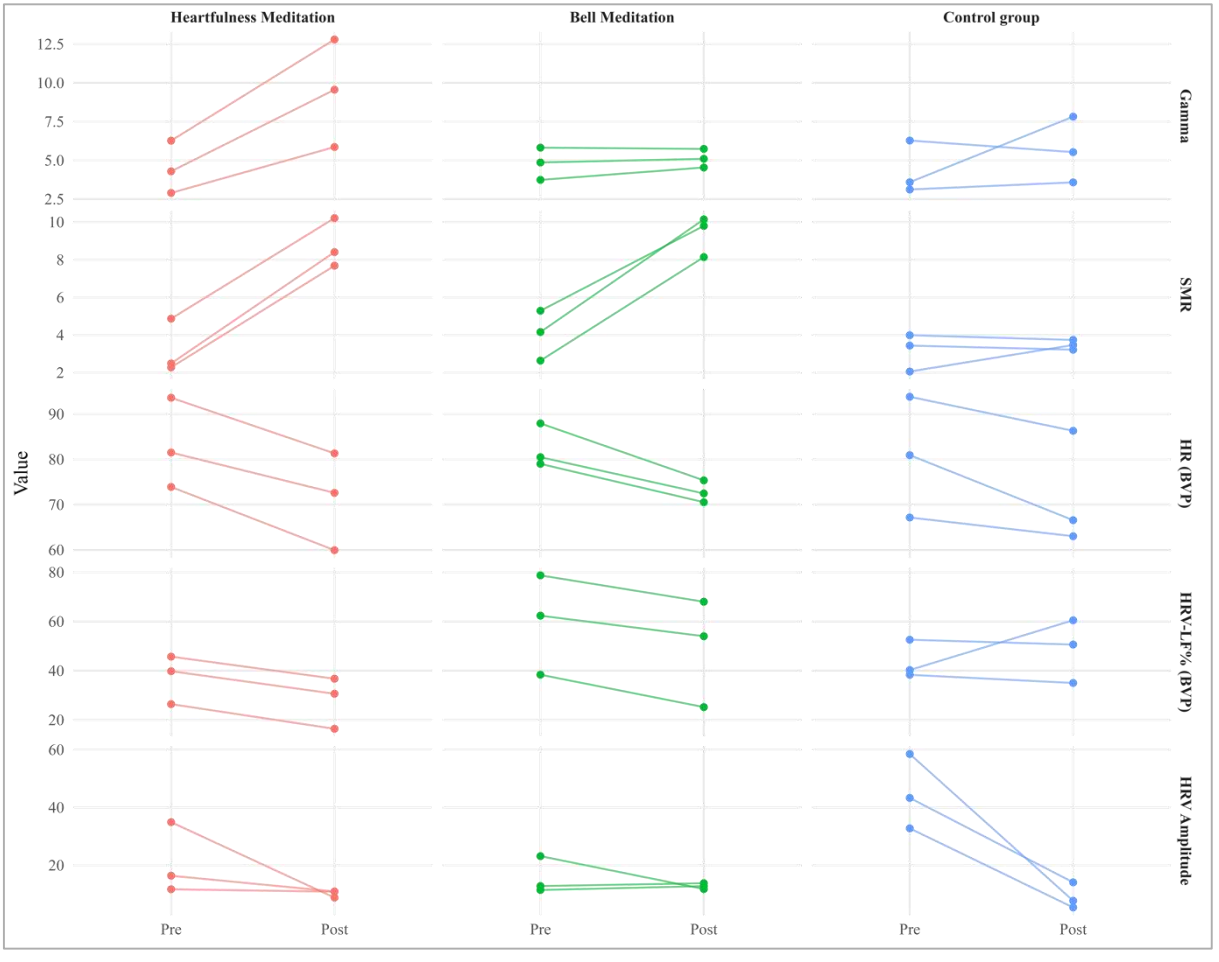
Outcome	Group	Pre Mean	Post Mean	Mean Change	% Change	Effect Size (g)	95% CI Lower	95% CI Upper
Gamma	Heartfulness	4.49	9.41	4.92	109.6	1.03	0.12	1.94
Gamma	Bell	4.81	5.13	0.32	6.6	0.22	-0.64	1.08
Gamma	Control	4.33	5.64	1.31	30.3	0.39	-0.5	1.28
SMR	Heartfulness	3.21	8.77	5.56	173.2	2.31	1.07	3.55
SMR	Bell	4.03	9.36	5.33	132.3	2.52	1.24	3.8
SMR	Control	3.16	3.48	0.32	10.1	0.25	-0.63	1.13
HR (BVP)	Heartfulness	83.02	71.29	-11.73	-14.1	-0.65	-1.46	0.16
HR (BVP)	Bell	82.48	72.8	-9.68	-11.7	-1.46	-2.27	-0.65
HR (BVP)	Control	80.65	71.97	-8.68	-10.8	-0.38	-1.19	0.43
HRV-LF%	Heartfulness	37.33	27.93	-9.4	-25.2	-0.53	-1.18	0.12
HRV-LF%	Bell	59.85	49.1	-10.75	-18.0	-0.29	-0.94	0.36
HRV-LF%	Control	43.75	48.73	4.98	11.4	0.27	-0.38	0.92
HRV Amplitude	Heartfulness	21.01	10.21	-10.8	-51.4	-0.8	-2.05	0.45
HRV Amplitude	Bell	15.82	12.79	-3.03	-19.2	-0.42	-1.67	0.83
HRV Amplitude	Control	44.86	9.08	-35.78	-79.8	-1.77	-3.02	-0.52

Note: Pre and Post denote baseline and post-intervention, respectively; Δ = Post − Pre; $\%\Delta = 100\times\Delta/\text{Pre}$. Effect sizes were within-group Hedges' g (bias-corrected) with 95% CIs; analyses were descriptive (n = 3 per arm). EEG band power (Gamma, SMR) in μV^2; HR in bpm (BVP-derived); HRV-LF% in percent; and HRV amplitude in arbitrary units. Abbrev.: SMR = sensorimotor rhythm; HRV = heart-rate variability; BVP = blood-volume pulse.

3.3. Autonomic Outcomes

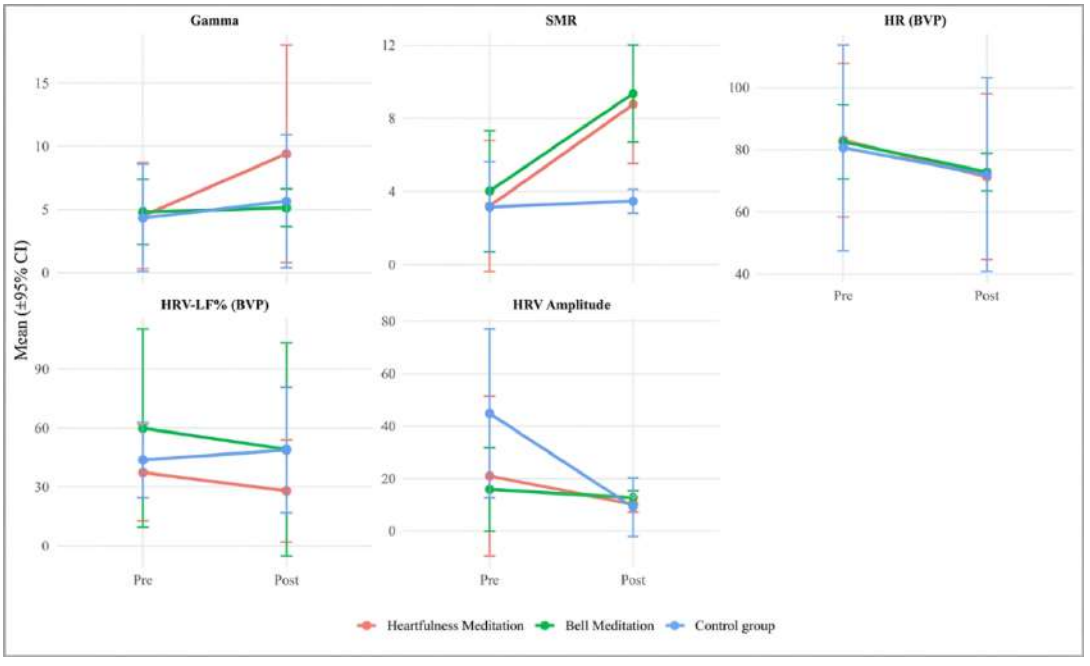
These outcomes were observed from pre- to post-assessment. The heart rate, derived from BVP, decreased by 14.1% in the HMG (g = −0.65, CI [−1.46, 0.16]), by 11.7% in the BMG (g = −1.46, CI [−2.27, −0.65]), and by 10.8% in the CM (g = −0.38, CI [−1.19, 0.43]). HRV-LF% showed a decline of 25.2% in HMG (g = −0.53, CI [−1.18, 0.12]) and 18.0% in BMG (g = −0.29, CI [−0.94, 0.36]), while it increased by 11.4% in CM (g = 0.27, CI [−0.38, 0.92]). The HRV amplitude decreased by 51.4% in HMG (g = −0.80, CI [−2.05, 0.45]), by 19.2% in BMG (g = −0.42, CI [−1.67, 0.83]), and by 79.8% in CM (g = −1.77, CI [−3.02, −0.52]). These patterns of change are illustrated in *Figure 3* and *Table 2*, with the distribution of change scores depicted in *Figure 4*. Given the pilot sample size, the findings are presented descriptively rather than inferentially.

Figure 2. Individual pre–post trajectories for EEG and autonomic outcomes by group



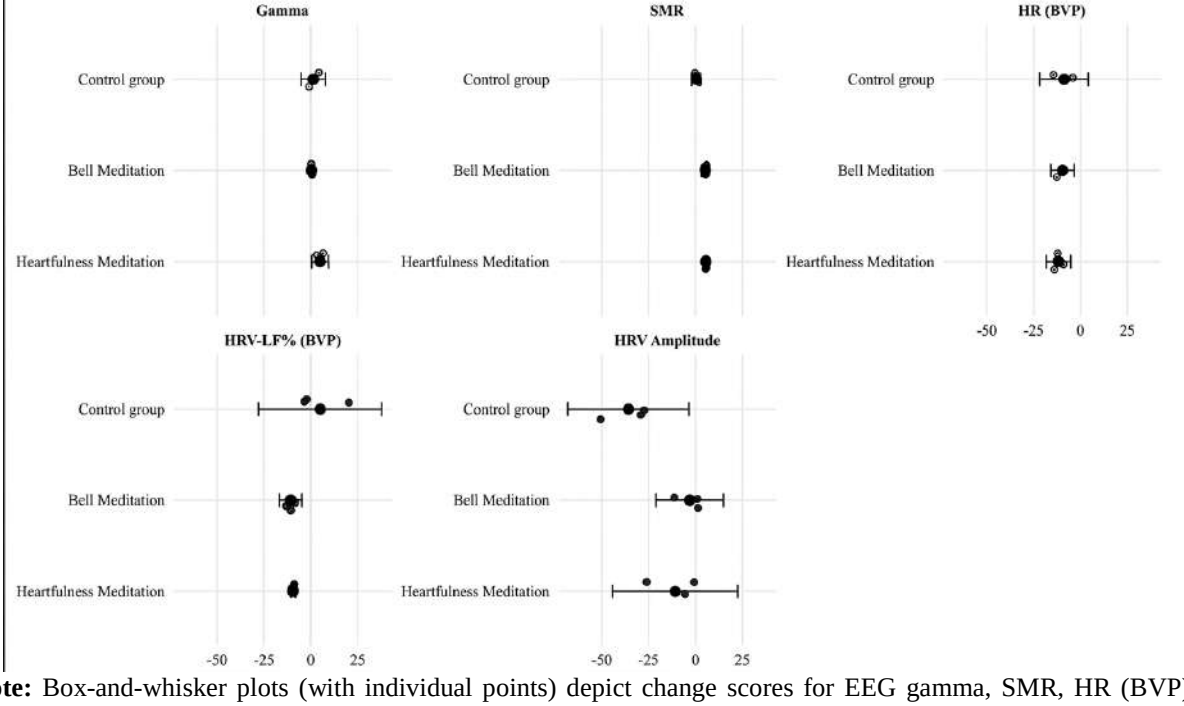
Note: The lines show individual participant values (N = 3 per group) for EEG gamma, SMR, HR (BVP), HRV-LF%, and HRV amplitude at baseline (Pre) and post-intervention (Post). Red = Heartfulness meditation, green = Bell meditation, blue = control.

Figure 3. Group mean (±95% CI) changes in EEG and autonomic outcomes



Note: Mean values with 95% confidence intervals are displayed for each group at pre- and post-intervention. The outcomes included EEG gamma, SMR, HR (BVP), HRV-LF%, and HRV amplitude. Red = Heartfulness meditation, green = Bell meditation, blue = Control.

Figure 4. Change scores (Post – Pre) for EEG and autonomic outcomes by group



Note: Box-and-whisker plots (with individual points) depict change scores for EEG gamma, SMR, HR (BVP), HRV-LF%, and HRV amplitude. Groups: Heartfulness meditation, Bell meditation, and Control. Positive values indicate increases; negative values indicate decreases from baseline.

4. Discussion

This exploratory investigation examined changes in EEG activity and autonomic regulation following 21 days of Heartfulness and bell meditation in healthy novice practitioners. Both meditation groups demonstrated increased gamma and sensorimotor rhythm (SMR) power. Heartfulness practice produced the most pronounced effects, with

a large increase in gamma activity (g = 1.03) and a very large increase in the SMR power (g = 2.31). These results support earlier evidence that even short-term meditation can enhance the high-frequency oscillations associated with attentional engagement and sensory integration [7, 14]. Gamma oscillations (~30–80 Hz) are robust markers of meditation-induced neuroplasticity, [15] reflecting integrative attentional processes.[16] The particularly strong gamma enhancement with Heartfulness aligns with reports that heart-centered meditation evokes heightened gamma activity in both novice and experienced practitioners [17]. The SMR enhancement observed in both meditation arms suggests the facilitation of calm alertness and relaxed focus [18]. Bell meditation yielded a smaller gamma gain (g = 0.22) but a very large increase in the SMR (g = 2.52). This pattern is consistent with its auditory entrainment mechanism: Tibetan singing bowls are known to synchronize low-frequency theta rhythms (~6–7 Hz), [6] which promote deep relaxation and parasympathetic activation [19]. The relatively modest gamma effect but pronounced SMR gain highlights how sound-driven practices may preferentially cultivate states of relaxation rather than intensive attentional engagement. By contrast, the control group (CG) exhibited only small–moderate gamma (g = 0.39) and small SMR (g = 0.25) changes [20, 21]. Collectively, these results indicate that both meditative practices strongly promoted SMR-related calm engagement, whereas heartfulness uniquely amplified gamma activity tied to attentional integration.

Autonomic markers showed converging evidence of meditation-linked regulation. The heart rate (HR) decreased across all groups, reflecting general relaxation [22]. However, effect sizes differed: heartfulness produced a moderate reduction (g = −0.65), bell meditation yielded a large decline (g = −1.46), and controls showed only a small–moderate change (g = −0.38). The low-frequency heart-rate variability (HRV) percentage (LF%) declined in both meditation arms, signifying a shift toward parasympathetic dominance: moderate in Heartfulness (g = −0.53) and small in bell (g = −0.29). In contrast, the LF% increased slightly in the controls (g = 0.27). These findings align with prior work showing Heartfulness stabilizes cardiac rhythms and reduces resting heart rate, while singing-bowl interventions enhance cardiovascular and psychological well-being [23, 24]. Notably, HRV amplitude decreased in all groups, underscoring the need for more reliable indices, such as the root mean square of successive differences (RMSSD) or high-frequency() powerer), in future studies. Meta-analyses remain inconclusive regarding resting vagal HRV improvements from mindfulness-based programs, suggesting the present LF% results are preliminary but consistent with session-based vagal enhancement. [8]

The parallel EEG and autonomic changes point toward early movement toward neural–autonomic synchrony. Specifically, the combination of large high-frequency EEG gains with LF% reductions suggests a trend toward integrated brain–heart regulation [25]. Distinct style-specific profiles emerged: heartfulness emphasized attentional/gamma engagement alongside a moderate vagal shift, while bell meditation emphasized relaxation and HR reduction with robust SMR increases [23]. Prior studies have shown experienced Heartfulness practitioners exhibit strong EEG–ECG (electrocardiography) coupling; the present findings suggest that even brief training may foster this integration [23, 26, 27].

4.1. Limitations

Interpretation is constrained by the very small sample size (n=3 per arm), descriptive analyses, and male-only participants. The short duration (21 days) and reliance on blood volume pulse (BVP)-derived HRV also limit generalizability. Outcomes were measured only at rest and not during meditation sessions, which could obscure state effects. Broader EEG montages, multimodal imaging, and the inclusion of psychological endpoints will enrich future analyses. Active controls (e.g., relaxation or biofeedback) are required to isolate the specific effects of meditation.

4.2. Future Directions

Larger gender-diverse samples with longitudinal tracking could clarify the dose–response relationships and trait-level changes. Continuous EEG–HRV recordings during meditation revealed dynamic synchrony patterns. Comparing diverse techniques—heart-centered, sound-based, mindfulness, or movement —may delineate unique versus shared mechanisms. The integration of behavioral outcomes, such as cognition and emotion regulation, could link physiology to lived benefits. Finally, advanced methods (e.g., network connectivity and nonlinear dynamics) could be used to map how meditation cultivates adaptive neurocardiac states

5. Conclusion

This pilot study provides preliminary profiles of two understudied meditation styles. Heartfulness promoted robust gamma enhancement and vagal-shifted HRV, whereas bell meditation induced more modest neural changes but

likely operated via auditory-driven relaxation. Both foster EEG–HRV patterns consistent with balanced arousal and resilience. Although limited, these findings generate hypotheses for larger controlled studies exploring how different contemplative traditions support neurocardiac health and well-being.

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NEURAL ACTIVATION WITHOUT AFFECTIVE SHIFT: EEG AND BEHAVIOURAL EFFECTS OF NADANUSANDHANA MEDITATION

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Abstract

Background: Meditation-based interventions are increasingly employed within educational settings to enhance attention regulation and emotional stability. While focused-attention meditation is linked to alpha-band suppression is an indicative of cortical engagement, the behavioural correlates of these neural changes in adolescents remain underexplored. Nadanusandhana meditation, a yogic dhyana, which centres on sustained awareness of inner silence (nada), emphasizes equanimity, suggesting heightened alertness devoid of emotional bias.

Objective: This study investigated whether a structured Nadanusandhana Meditation Module (NMM) influences Global Alpha Power (GAP), Frontal Alpha Asymmetry (FAA), and behavioural indices of sustained attention and inhibitory control.

Methods: Thirty right-handed adolescents (aged 12–18 years) participated in a 21-session NMM intervention. Resting-state eyes-closed EEG recordings were obtained pre- and post-intervention, using a 14-channel system. GAP (8–13 Hz) and FAA (F4–F3) were calculated. Behavioural performance was assessed using the Psychology Experiment Building Language (PEBL) Continuous Performance Test (CPT).

Results: Post-intervention analyses indicated a significant reduction in the GAP, reflecting increased cortical activation. Behavioural outcomes demonstrated significant reductions in commission and omission errors, along with improved Reaction Time. The FAA remained statistically unchanged, suggesting a preserved emotional hemispheric balance.

Conclusions: Nadanusandhana meditation enhances attentional engagement and inhibitory control, as evidenced by alpha desynchronization and improved CPT performance, without inducing shifts in emotional lateralization. These findings provide neurophysiological support for *Samatvam*, a state of alert equanimity.

Keywords: Nadanusandhana; EEG; Yoga; adolescents; focused-attention meditation

1. Introduction

Meditation practices have been extensively linked to enhancements in attention regulation and emotional stability, particularly during adolescence, a developmental phase characterized by increased neuroplasticity and the ongoing maturation of executive functions (Albert et al., 2013). Neurophysiologically, attentional modulation is often measured through alpha-band oscillations (8–13 Hz). According to the inhibition–timing hypothesis, alpha synchronization reflects the functional inhibition of task-irrelevant cortical regions, whereas alpha desynchronization (suppression) indicates the release of this inhibition and increased cortical excitability (Rihs et al., 2007). While relaxation-oriented practices typically result in enhanced alpha power, focused attention meditation has been shown to induce alpha suppression, reflecting sustained cortical engagement and improved attentional control (Davanger et al., 2010; Lagopoulos et al., 2009). Frontal Alpha Asymmetry (FAA) further elucidates emotional processing: relatively greater left-frontal activation is associated with approach-related affect, whereas right-frontal dominance is linked to withdrawal-related states (Zhao et al., 2018). However, classical yogic frameworks emphasize *Samatvam*, emotional equanimity characterized by balanced, non-reactive awareness—rather than the amplification of positive affect.

Nadanusandhana meditation (NM), a focused attention practice involving sustained awareness of inner sound or silence, necessitates continuous cognitive engagement rather than passive relaxation. Based on its attentional demands, we hypothesized that the NM would elicit global alpha desynchronization, reflecting heightened cortical arousal and sustained attentional processing. Behaviourally, this enhanced engagement was expected to manifest as improved performance on the Continuous Performance Test (CPT), specifically in terms of faster reaction times and

reduced omission and commission errors (Raine & Jones, 1987). Additionally, we anticipated stable frontal alpha asymmetry, indicating the preservation of emotional equanimity rather than a directional shift toward approach-or withdrawal tendencies (Coelli et al., 2015). By integrating EEG metrics with objective behavioural measures from the PEBL CPT in adolescents, the present study aimed to bridge the gap between neurophysiological mechanisms and observable cognitive outcomes in focused-attention meditation practice.

2. Materials and Methods

2.1. Participants

Thirty healthy, right-handed adolescents, novice to meditation, aged 12 to 18 years, from a CBSE-affiliated school in Assam, participated in the study. The participant characteristics are detailed in *Table 1*. All participants received K6 medical clearances (Prochaska et al., 2012).

Table 1. Sociodemographic characteristics of the participants (N = 30)

Characteristic	Category / Level	Value	Category / Level	Value
Age (years)	—	14.57 ± 1.63	**Weight (kg)**	52.65 ± 10.16
Height (cm)	—	164.34 ± 7.56	**BMI (kg/m²)**	19.76 ± 3.14
Gender	*Male*	16 (53.33%)	*Female*	14 (46.67%)
Current Standard				
VII	***VIII***	***IX***	***X***	***XI***
5 (16.67%)	5 (16.67%)	5 (16.67%)	5 (16.67%)	5 (16.67%)
Socioeconomic Class*				
Lower	***Upper Lower***	***Lower Middle***	***Upper Middle***	***Upper***
0 (0.00%)	0 (0.00%)	1 (3.33%)	21 (70.00%)	8 (26.67%)

Note. Socioeconomic status was assessed using the Modified Kuppuswamy Scale, 2025.

2.2. Intervention

Over the course of the intervention, participants engaged in 21 organized sessions of NMM, as detailed in *Table 2*.

Table 2. The 7-step nadanusandhana meditation module.

Step	Component	Duration	Procedure
1	Opening Mantra	2 min	Chant *Moha Mudgara* (Verse 20).
2	Preparing the Body	10 min	*Dandasana* (base position) followed by joint loosening (*Pawanmuktasana* Part 1) and spinal movements.
3	Preparing the Mind	4 min	Chant "AUM" (3 times) followed by *Bhramari Pranayama* (1 round).
4	Ear Blocking & *Shambhavi Mudra.*	1 min	Sit in *Siddhasana* (or any comfortable pose), block ears with cotton/earplugs, and hold *Shambhavi Mudra*.
5	Focusing on *Nada*	15 min	Focus on inner silence; gradually shift attention to subtler inner silence or anahata nada.
6	Concluding Mantra	2 min	Chant the nada mantra *Hatha Yoga Pradipika* (Verse 4:102).
7	Reorientation	1 min	Palming and deep breathing.
Total	**All Steps**	**35 min**	***(Scheduled for 45 mins to allow transitions)***

Note. The seven-step NMM was content-validated by 25 subject matter experts using Lawshe's method (CVI = 0.71).

2.3. EEG Acquisition

Resting state EEG data were collected under eyes-closed conditions, both before (pre) and after (post) the 21-session intervention, utilizing non-invasive, saline-based electrodes with the Emotiv EPOC X system, at a sampling rate of 128 Hz (Emotiv Inc., San Francisco, CA) (Larocco et al., 2020), as depicted in *Figure 1* The recordings were conducted in a quiet, controlled environment to minimize external auditory and movement-related disturbances.

Figure 1. EEG device and electrode montage.

Note. (A) Emotiv EPOC X 14-channel EEG headset. (B) Electrode placement schematic based on the international 10–20 system.

2.4. EEG Pre-processing and Metrics

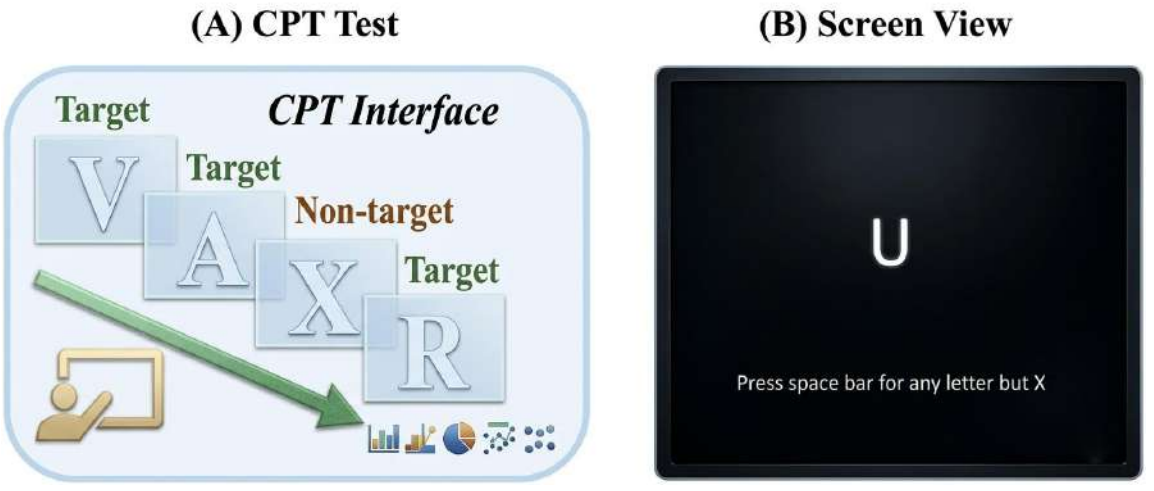
EEG data were processed using the MNE-Python toolbox (Gramfort, 2013). Continuous EEG signals underwent band-pass filtering between 1 and 40 Hz to retain relevant physiological frequencies while minimizing noise. Artifact management involved visual inspection of raw signals to identify significant contamination from movement or muscle activity, resulting in the exclusion of one participant from further analysis. Alpha-band activity was defined within the 8–13 Hz frequency range and subjected to log transformation prior to statistical evaluation.

From the pre-processed data, two EEG metrics were derived, namely – (1) GAP was calculated as the mean log-transformed alpha power averaged across all channels and served as a manipulation check to assess overall cortical engagement. (2) FAA was computed as the difference between log-transformed alpha power at homologous frontal electrodes (F4 − F3), with positive values indicating relative left-frontal dominance.

2.5. Behavioural Assessment

As illustrated in *Figure 2*, the Continuous Performance Test (CPT), conducted via the Psychology Experiment Building Language (PEBL) (Mueller & Piper, 2013), was used to evaluate sustained attention and inhibitory control. This computerized task requires participants to selectively respond to specific target stimuli while refraining from reacting to non-target stimuli over an extended period. Three behavioural metrics were derived: Commission Errors, which indicate impulsivity and poor inhibitory control due to responses to non-targets; Omission Errors, which signify lapses in sustained attention due to missed targets; and Reaction Time (RT) for correct responses, which reflects processing speed and attentional efficiency.

Figure 2. CPT Paradigm and Task Interface



Note. (A) Schematic illustration of the Continuous Performance Test (CPT) paradigm, showing a sequential stream of letters in which participants respond to target stimuli and withhold responses to the designated non-target (X). (B) Example of the task display screen instructing participants to "Press space bar for any letter but X.

2.6. Statistical Analysis

Pre–post changes in EEG (GAP and FAA) and behavioural (CPT: Reaction Time, Commission Errors, Omission Errors) outcomes were analysed after assessing normality. Paired-samples *t*-tests were used for normally distributed data, and Wilcoxon signed-rank tests were applied for non-parametric data. Analyses were conducted in Python (version 3.13.9) using SciPy and MNE-Python. Statistical significance was set at $p < 0.05$, with effect sizes calculated using Cohen's *d* or rank-biserial correlation (*r*), as appropriate.

3. Results

All the EEG and the CPT results are shown in *Table 3*.

Table 1. Pre–Post Comparison of Neurophysiological and Behavioural Measures

Domain	Variable	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)	Test Statistic	*p*-value	Effect Size
EEG	Global Alpha Power (μV²)	11.18 ± 7.84	4.76 ± 4.18	$t = -3.75$	0.0008***	$d = 1.02$
	Frontal Alpha Asymmetry (lnF4 − lnF3)	0.74 ± 1.09	0.61 ± 0.80	$t = -0.55$	0.585	$d = -0.10$
CPT	Commission Errors	21.00 (5.75)	10.50 (14.0)	$W = 367$	0.001	$r = 0.685$
	Omission Errors	12.70 (8.11)	8.07 (5.75)	$t = 2.44$	0.021	$d = 0.446$
	Reaction Time (ms)	389 (44.7)	361 (42.7)	$t = 2.52$	0.017	$d = 0.460$

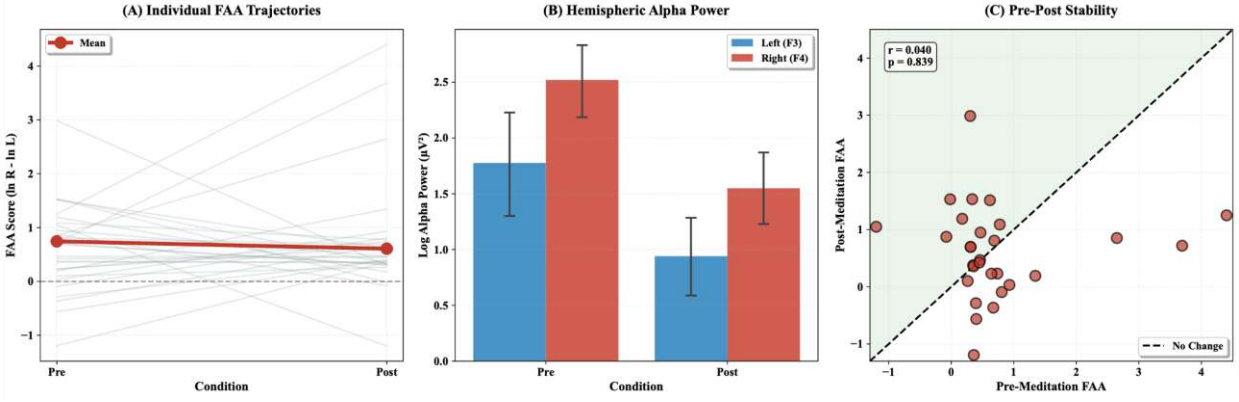
Note: Significance levels: $p < 0.05$; $p < 0.01$; $p < 0.001$.

3.1. Neurophysiological Outcomes

Global Alpha Power (GAP): A significant reduction in GAP was observed following the intervention ($t(29) = -3.75$, $p < 0.001$), with a large effect size (Cohen's $d = 1.02$). This reduction was bilateral and widely distributed indicating a global shift toward increased cortical activation.

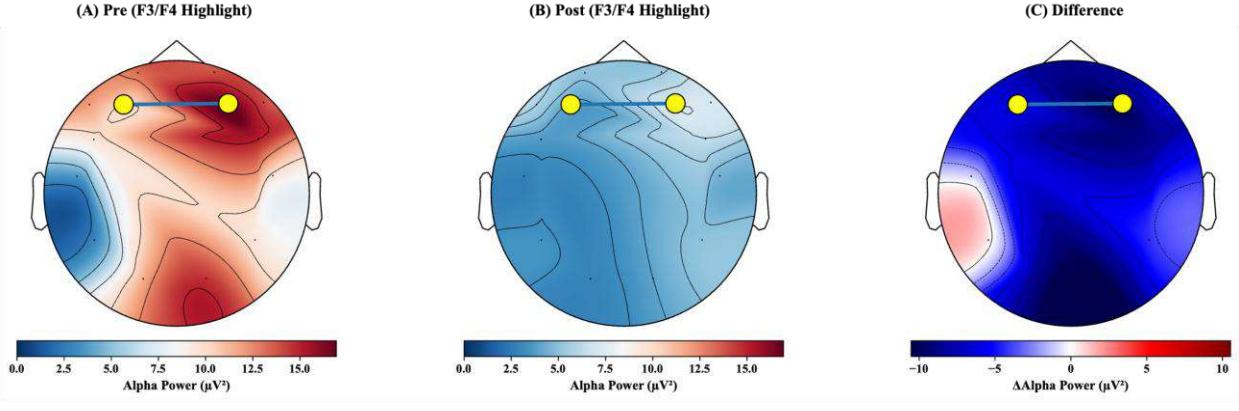
Frontal Alpha Asymmetry (FAA): Despite the overall decrease in alpha power, FAA did not change significantly between pre- (0.74 ± 1.09) and post-intervention (0.61 ± 0.80) conditions ($t(29) = -0.55$, $p = 0.585$). The effect size was negligible ($d = -0.10$), suggesting that the increase in cortical activation was symmetrical and not associated with a lateralized emotional bias, as illustrated in *Figures 3 & 4.*

Figure 3. Stability of Frontal Alpha Asymmetry (N=29).



Note. **(A)** Individual trajectories (grey) and group mean (red) showing no significant directional shift in asymmetry. **(B)** Hemispheric interaction plotting log-Alpha power at F3 (Left) vs. F4 (Right); error bars denote SEM. Note the symmetric power reduction across both hemispheres. **(C)** Pre-Post scatter plot; clustering along the diagonal (identity line) indicates high individual stability of hemispheric dominance despite global state changes.

Figure 4. Spatial alpha distribution and FAA regions of interest



Note. Topographic maps of Alpha power (8–13 Hz) at **(A)** Pre- and **(B)** Post-intervention. Black circles indicate the electrodes used for FAA calculation (F3 and F4). **(C)** Difference map (Post minus Pre) showing a uniform, bilateral reduction in frontal power, confirming that cortical activation was not lateralized.

3.2. Behavioural Outcome

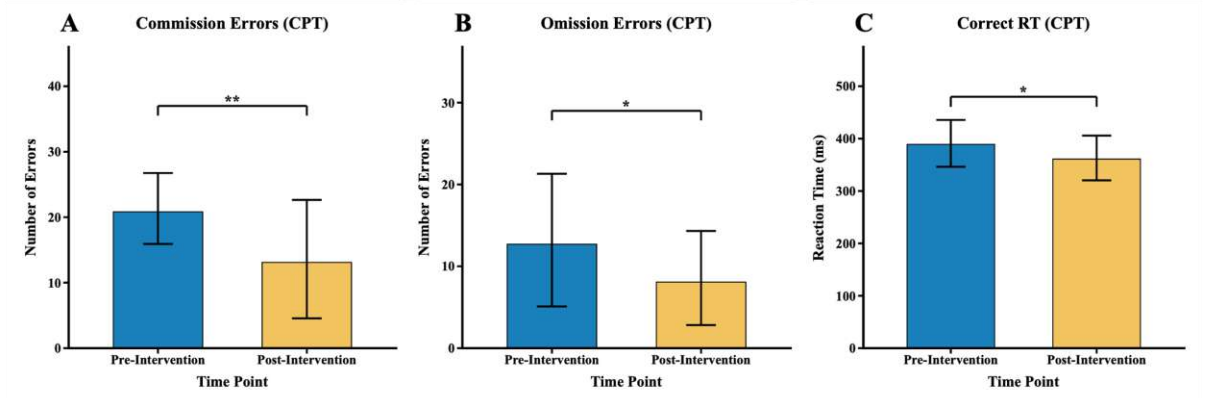
Behavioural findings corroborated the neurophysiological results, indicating significant enhancements across Continuous Performance Test (CPT) indices, as depicted in *Figure 5*.

Inhibitory Control (Commission Errors): The median number of commission errors decreased by 50%, from 21.00 (SD = 5.75) to 10.50 (SD = 14.00). This reduction was highly significant (Wilcoxon W = 367, $p = 0.001$), with large effect size (rank-biserial r = 0.685).

Sustained Attention (Omission Errors): Participants missed significantly fewer targets following the intervention (Mean = 8.07) compared to the baseline (Mean = 12.70), ($t(29) = 2.44$, $p = 0.021$, $d = 0.446$).

Processing Speed (Reaction Time): Correct reaction times improved significantly, decreasing from 389 ms (SD = 44.7) to 361 ms (SD = 42.7), (t(29) = 2.52, p = 0.017, d = 0.460).

Figure 3. CPT results across the three metrices



Note. Pre- and post-intervention comparisons of cognitive performance (Commission Errors, Omission Errors, Reaction Time) and trait mindfulness scores *(N=30). (N.B.: Bar heights represent mean values, except for Commission Errors which represent median values due to non-normal distribution.)*

4. Discussion

The present study presents an innovative integration of neurophysiological and behavioural data to elucidate the effects of Nadanusandhana meditation in adolescents. The principal finding is a strong alignment between brain activity and behaviour: the significant reduction in Global Alpha Power (GAP) serves as the neural substrate for the enhanced vigilance and processing speed observed in the CPT results. Notably, this enhancement of attentional resources occurred without emotional lateralization, supporting the concept of "equanimous alertness."

4.1. Cortical Activation and Behavioural Vigilance

The substantial reduction in GAP aligns with the hypothesis that focused-attention meditation induces a state of desynchronization. Alpha oscillations serve as an active inhibitory mechanism, and their suppression facilitates the flow of information to the cortex. In our study, this "release of inhibition" was not merely a physiological artifact but was functionally significant. The CPT results corroborate this finding. The marked decrease in Omission Errors (p = 0.021) indicates that the "activated" cortex was more adept at sustaining focus and detecting targets. Additionally, the improvement in Reaction Time (p = 0.017) suggests that the neural efficiency gained through alpha suppression resulted in faster cognitive processing.(Kelly et al., 2006) This is consistent with the findings of (Rodriguez-Larios et al., 2021) who associated alpha suppression with reduced mind-wandering and enhanced on-task focus.

4.2. Impulse Control and the Adolescent Brain

The most notable finding is the 50% reduction in Commission Errors (p = 0.001). In the context of the CPT, commission errors serve as an indicator of impulsivity, reflecting the inability to suppress responses to non-target stimuli. Adolescence is generally characterized by an underdeveloped prefrontal cortex and increased impulsivity. The significant improvement in inhibitory control attributed to Nadanusandhana suggests that this practice enhances top-down regulatory mechanisms. This observation is directly related to our EEG findings. Although the General Activation Potential (GAP) decreased, indicating a readiness to respond, the brain did not exhibit hyper-reactivity in a disorganized manner. Instead, the attentional system demonstrated increased precision(Bari et al., 2020; Hinshaw, 2003). This is consistent with the specific nature of Nadanusandhana, which necessitates that practitioners not only engage in listening (activation) but also filter out external noise to concentrate on subtle internal sounds (inhibition of distractors).

4.3. Samatvam: Stability Amidst Activation

A distinctive contribution of this study is the juxtaposition of enhanced performance with stable Frontal Alpha Asymmetry (FAA). FAA is a well-established correlate of emotional motivation, with interventions that induce joy

or relaxation often shifting FAA toward the left (approach), while stress shifts it toward the right (withdrawal). In this study, despite the intense cortical activation and behavioral improvement, FAA remained unchanged ($p = 0.585$). (Broelz et al., 2019; Zhao et al., 2018)This stability is not a null result but a significant finding in itself, providing empirical support for the Yogic concept of Samatvam—a state of balance where the mind is sharp and alert high (Yang et al., 2016) (CPT performance, low Alpha) yet remains emotionally neutral, free from the biases of "craving" (approach) or "aversion" (withdrawal). For adolescents, who are prone to emotional volatility, a practice that enhances cognitive performance without amplifying emotional reactivity is particularly valuable. It suggests that Nadanusandhana fosters a form of "cool executive function"—high-functioning cognition uncoupled from emotional turbulence.(Berger & Cassuto, 2013; Sun et al., 2017)

4.4. Limitations and Future Directions

While the incorporation of CPT data enhances the robustness of the study, certain limitations persist. The sample size (N=30) is relatively small, and the absence of an active control group constrains the ability to establish causal relationships. Furthermore, the EEG was recorded during a resting state rather than during the CPT task itself. Future research should utilize simultaneous EEG-behavioural paradigms to correlate real-time changes in alpha power with specific error types, such as omission versus commission.

5. Conclusion

This study demonstrates that a 21-session Nadanusandhana intervention induces a distinct psychophysiological state in adolescents. We observed a convergence of neural activation, indicated by reduced global alpha power, and behavioural efficiency, evidenced by fewer CPT errors and faster reaction times. Importantly, this heightened state of alertness was achieved without disrupting emotional hemispheric balance, as shown by stable FAA. These findings validate Nadanusandhana not merely as a relaxation technique but as a cognitive training tool that promotes *Samatvam*, equipping adolescents with the ability to maintain sustained, chemically-free focus and inhibitory control while remaining emotionally grounded. This profile positions Nadanusandhana as a potent, non-pharmacological intervention for enhancing cognitive and emotional well-being in educational settings.

Sources of funding

None

Conflict of interest

None

Declaration of generative AI in scientific writing

None.

Author Contributions

AR: Conceptualization, study design, literature search, data acquisition, data curation, statistical analysis, interpretation of data, manuscript preparation, manuscript revision, and manuscript editing.

PS: Conceptual guidance, supervision, methodological oversight, interpretation support, manuscript editing, and manuscript review.

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Data availability statement

The data generated and analysed during the current study are available from the corresponding author, Prof. Pailoor Subramanya, upon reasonable request.

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IMPACT OF HEARTFULNESS AND BELL MEDITATION ON NEURAL ACTIVITY AND AUTONOMIC REGULATION AMONG UNIVERSITY STUDENTS: AN EXPLORATORY INVESTIGATION

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Abstract:

Different meditation techniques may differentially modulate neuro-autonomic processes; however, comparative empirical evidence remains limited. This exploratory randomized study examined the effects of a 21-day Heartfulness and Bell meditation intervention on electroencephalographic (EEG) activity and galvanic skin response (GSR) in healthy university students. Nine eligible participants (aged 19–20 years) were randomly assigned to Heartfulness, Bell meditation, or passive control groups (n = 3 per group). Participants in the intervention groups practiced for 30 minutes daily under standardized conditions for 21 consecutive days, while the control group continued routine activities without structured meditation. Resting-state EEG recordings were obtained from Fp1, Fp2, and O2 sites using the NeXus-10 MKII system. Spectral power was computed for theta (4–7 Hz), alpha (8–12 Hz), and beta (13–30 Hz) frequency bands. Tonic GSR was simultaneously recorded via palmar electrodes. A two-way repeated-measures ANOVA evaluated Time × Group interaction effects, with partial eta squared (η^2p) and within-group Cohen's dz calculated as measures of effect size. No significant changes were observed in EEG spectral power across groups (all $p > 0.35$). In contrast, GSR demonstrated a significant main effect of time ($p = 0.032$, $\eta^2p = 0.57$), indicating reduced sympathetic arousal, with the largest reduction observed in the Bell meditation group (–3.90 µS, dz = –1.37).

Abbreviations: EEG = Electroencephalography; GSR = Galvanic Skin Response; ANOVA = Analysis of Variance; η^2 = Partial Eta Squared; d_z = Cohen's d (within-group).

Keywords: Meditation (Heartfulness meditation; Bell meditation); Electroencephalography; Electrodermal Response; Autonomic Nervous System; Students; Health Promotion

Running Title: Heartfulness and Bell Meditation on EEG and GSR

Introduction

Meditation practices have well-documented benefits for mental wellbeing and cognitive-affective processes.[1,2] Importantly, different types of meditation may engage distinct neural mechanisms, leading to differing neurophysiological profiles.[3–5] To objectively characterize these meditative states, researchers often measure brain activity and autonomic responses. Electroencephalography (EEG) is widely used to capture meditation-induced changes in brain oscillations, while galvanic skin response (GSR) reflects autonomic arousal via sweat gland activity.[6,7] Prior studies suggest that specific EEG frequency bands, particularly theta (~4–8 Hz), alpha (~8–13 Hz), and beta (~13–30 Hz), are modulated during meditation and correlate with mental states like attention, relaxation, and arousal.[3] Notably, heartfulness and bell meditation exhibit significantly higher theta and alpha power alongside lower beta power compared to non-meditators; such a pattern is indicative of a *"wakeful relaxation"* state with internalized attention,[8] aligning with the notion that meditation promotes a calm yet alert state of mind. Similarly, GSR is a well-established index of sympathetic nervous system activation, and the relaxation response during meditation is often accompanied by reductions in GSR (lower skin conductance), signifying decreased physiological arousal.[9] In sum, increases in alpha/theta activity and concomitant drops in beta activity and GSR are commonly reported signatures of the meditative state, corresponding to enhanced relaxation and focused attention in practitioners.[9]

Figure 1 illustrates the conceptual model underlying this investigation, outlining how internal (Heartfulness) versus external (Bell) attentional anchors are hypothesised to differentially influence EEG oscillations and autonomic responses (GSR).

Despite a rich literature on mindfulness, Zen, and transcendental meditation, there is a relative lack of data on specific emerging or less-studied techniques. Heartfulness meditation, a modern heart-centered meditation practice, has gained popularity but remains under-investigated in terms of detailed EEG/GSR characteristics. Only a few recent studies have begun quantifying its EEG correlates,[10] often focusing on long-term practitioners, and basic autonomic measures like GSR have rarely been reported for this technique. Likewise, bell meditation and the meditation approaches that use auditory cues, such as periodic bell sounds or singing bowls for focusing attention have centuries-old roots, yet scientific studies on their neurophysiological effects are scarce,[11–13] No published work to date has directly compared the psychophysiological patterns of heartfulness meditation with those of a sound-based bell meditation together. This presents a clear gap in the literature as descriptive data are lacking on how these two qualitatively distinct meditation practices, i.e., one emphasising internal heart-focused attention and the other anchored to an external auditory stimulus, are reflected in the brain-wave activity and autonomic arousal of the practitioners.
The present investigation is novel as it represents the first direct comparative analysis of Heartfulness meditation and Bell meditation in novice practitioners, utilizing both EEG and GSR indices within a short-term (21-day) intervention. By addressing this gap, the study advances preliminary empirical evidence regarding how distinct attentional anchors—namely, an internal heart-focused practice versus an externally cued auditory practice—may differentially modulate cortical oscillatory activity and autonomic arousal patterns.

The present study was designed to address this gap through an exploratory investigation. The study focused on a healthy, non-clinical sample of university students engaging in a short-term (21-day) meditation practice. Notably, the aim was not to evaluate clinical outcomes, cognitive performance, or stress reduction per se, but to characterize the neurophysiological signatures associated with each meditation technique under study. By measuring EEG band power (theta, alpha, beta) and GSR before and after a 21-day intervention, this study sought to observe any emerging patterns unique to heartfulness and bell meditation practices. Thus, this exploratory study aimed to profile the EEG and GSR changes accompanying these two meditation techniques in novices, providing preliminary insights into their associated psychophysiological states and guiding hypotheses for future research.

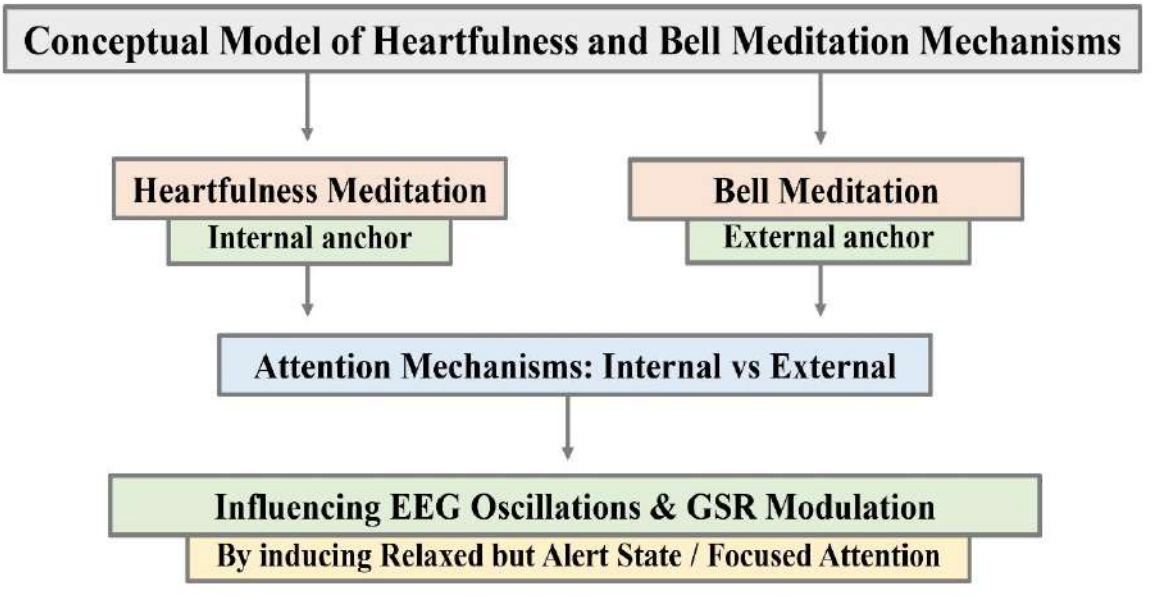
Figure 1. Conceptual framework illustrating the hypothesized mechanisms of Heartfulness and Bell meditation.

Materials and Methods

Study Design and Setting

This exploratory study is a randomized pre–post study that employed a three-arm, parallel-group design, highlighting two distinct meditation interventions alongside a passive control group. The research was conducted on the culturally rich heritage campus of Visva-Bharati University in Santiniketan, West Bengal, India, a UNESCO World Heritage Site.

Study Participants and Sampling



Twenty-two university students were screened against a priori eligibility parameters. To qualify for enrolment, individuals had to: (a) report no engagement in formal meditation during the preceding six months; (b) exhibit normative physical and psychological health, operationalized by a General Health Questionnaire-12 (GHQ-12) score of less than 3 and clearance on the Physical Activity Readiness Questionnaire (PAR-Q);[14,15] (c) provide written informed consent. Candidates were excluded if they presented with: (a) a current or prior neurological condition (e.g., epilepsy, traumatic brain injury) or a major psychiatric disorder; (b) ongoing use of psychoactive medication, alcohol, or recreational substances liable to distort electrophysiological indices; (c) uncorrected hearing impairment likely to impede engagement with bell-tone auditory stimuli. Application of these criteria yielded a final cohort of nine participants.

Data Collection Tool and Technique

Data were collected at two time points: baseline (pre-intervention) and after the 21-day intervention period (post-intervention). All assessments were conducted in a quiet, temperature-controlled room to minimize environmental distractions and physiological variability.

General Health Assessment

Psychophysiological wellbeing was evaluated using the GHQ-12 and the PAR-Q, both widely validated instruments for assessing overall health status.

Electrophysiological Recordings (EEG and GSR)

Electrophysiological signals, including EEG and GSR, were recorded using the NeXus-10 MKII biofeedback system (Mind Media BV, Netherlands), a clinically validated, multi-channel acquisition device widely used in psychophysiological research.[16,17] EEG signals were acquired from three scalp locations, namely, Fp1, Fp2, and O2, using Ag/AgCl electrodes by the international 10–20 system. The ground and reference electrodes were positioned at the right and left mastoids. All signals were sampled at a rate of 256 Hz, and electrode impedances were maintained below 10 kΩ to ensure signal quality.

Each participant underwent a 10-minute resting-state EEG recording session with eyes closed and seated comfortably in a dimly lit room. Simultaneously, GSR was measured via two surface electrodes attached to the palmar surface of the left hand, capturing tonic skin conductance levels as a peripheral marker of autonomic arousal. The EEG data were pre-processed and analysed using BrainVision Analyzer software (Version 2.01; Brain Products GmbH, Munich, Germany), which supports standard filtering, artifact rejection, and spectral decomposition procedures. This protocol aligns with established EEG-GSR acquisition practices in neurocognitive research employing the NeXus platform.[16,17]

Ethical consideration

Ethical approval was granted by the Institutional Ethics Committee for Human Research at Visva-Bharati (Ref. No. VB/IECHR/03/2024) and the study was registered under the University Research Project ID: **DYAS/VB/539- 2024-25**.".

Statistical Analysis Method

Recruitment and Randomization

Recruitment was undertaken through campus-wide flyers and in-class announcements. Interested students attended a briefing session, completed demographic and GHQ-12 and PAR-Q questionnaires, and, if eligible, provided informed-consent forms. An independent investigator generated three blocks of computer-based randomisation sequence (randomization.org). Sequentially numbered, opaque, sealed envelopes (SNOSE) were used to implement allocation concealment. The nine eligible participants were randomised in equal proportions to Heartfulness Meditation (HM, n = 3), Bell-focused Meditation (BM, n = 3), or a no-intervention control condition (CG, n = 3). Due to the interventions' behavioral nature, blinding participants was not feasible; however, investigators blinded to group allocation throughout the study carried out outcome assessment and data processing.

Intervention Protocol

The HMG engaged in silent, heart-focused meditation for 30 minutes per session, five days per week, over 21 days. Guided sessions were delivered by a certified heartfulness trainer following a validated intervention protocol.[18] Similarly, the BMG participated in daily 30-minute sound-based sessions using Tibetan singing bowl recordings, designed with progressive tonal frequencies to promote relaxation, following the corresponding validated intervention protocol.[19]

Results

Participant Flow

Twenty-two university students were assessed for eligibility, of which thirteen were excluded for eight for not meeting inclusion criteria. Five who declined participation, eventually nine students were randomized to Heartfulness Meditation Group (HMG, n = 3), Bell Meditation Group (BMG, n = 3), or Control (CG, n = 3). No losses to follow-up or protocol deviations occurred, and all randomized participants completed post-intervention assessments. The participants' flow diagram is shown in *Figure* 2.

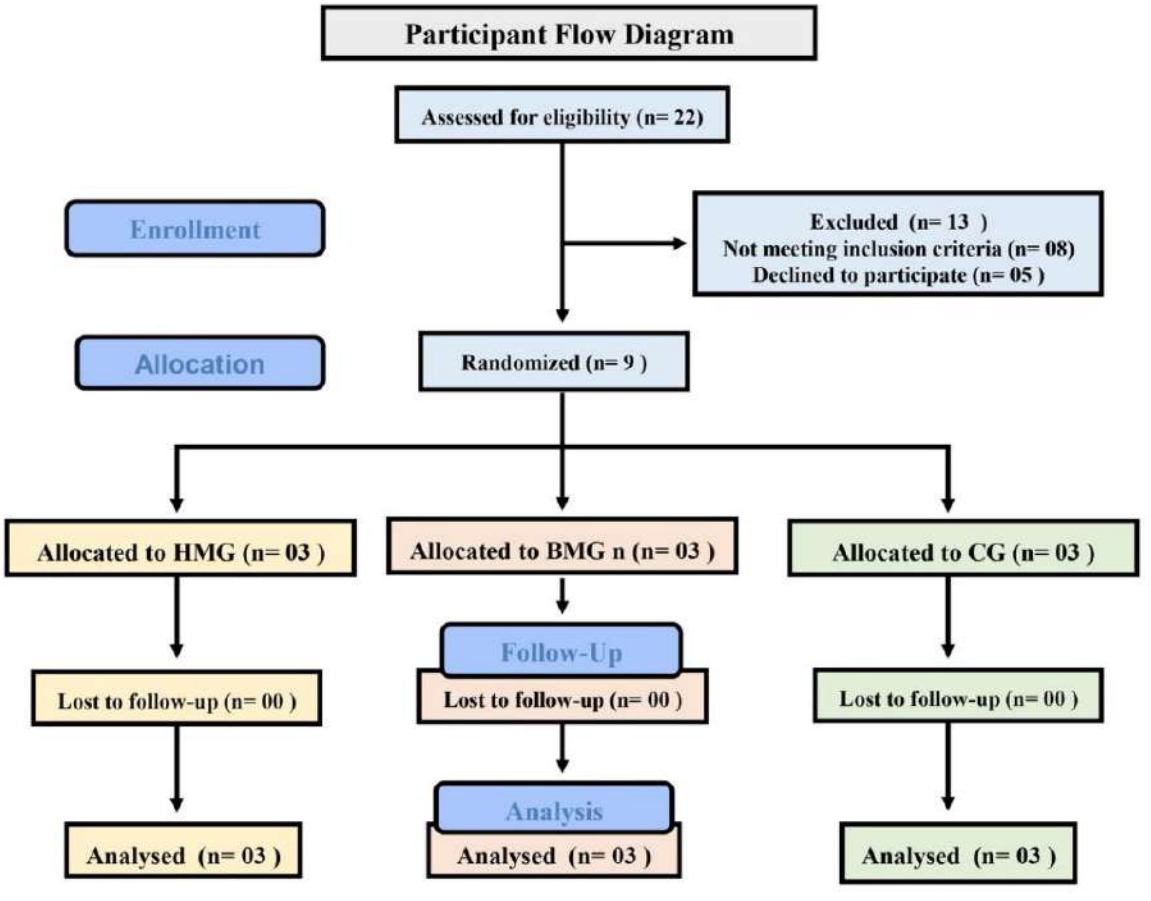


Figure 2: Participant Flow diagram showing recruitment and study procedures

Baseline Characteristics

As shown *in Table 1*, all nine participants were male undergraduates (10 + 2 level), unmarried, and cleared the Physical Activity Readiness Questionnaire (PAR-Q). Mean age was 19–20 years across groups, with comparable anthropometrics: height ranged 155–158 cm, weight 52–55 kg, and BMI 20.7–22.4 kg m^{-2}. General Health Questionnaire (GHQ-12) scores averaged ≤ 2 in each group, confirming good general health. Socio-economically, most students fell in the lower-middle category, with one control subject classified as lower status; no participant reported upper-middle or upper status. Overall, groups were broadly comparable at baseline.

Table 1: Baseline Characteristics of the Participants (n = 9)

Characteristic	Heartfulness (n = 3)	Bell (n = 3)	Control (n = 3)
Age (years), Mean ± SD	19.7 ± 0.58	20.0 ± 1.00	19.3 ± 1.15
Gender, n (%)			
- Male	3 (100%)	3 (100%)	3 (100%)
Height (cm), Mean ± SD	158.3 ± 6.1	157.0 ± 5.8	155.3 ± 6.7
Weight (kg), Mean ± SD	52.0 ± 5.0	55.3 ± 6.1	54.5 ± 5.5
BMI (kg/m²), Mean ± SD	20.7 ± 1.2	22.4 ± 1.6	22.1 ± 1.4
GHQ-12 Score (Mean ± SD)	1.7 ± 1.0	1.3 ± 0.6	2.0 ± 1.2
Cleared PAR-Q, n (%)	3 (100%)	3 (100%)	3 (100%)
Educational Level			
- 10+2	3 (100%)	3 (100%)	3 (100%)
Marital Status			
- Unmarried	3 (100%)	3 (100%)	3 (100%)
Socioeconomic Status			
- Lower	0	0	1 (33.3%)
- Upper Lower	1 (33.3%)	1 (33.3%)	0
- Lower Middle	2 (66.7%)	2 (66.7%)	2 (66.7%)
- Upper Middle / Upper	0	0	0

Values are mean ± SD or n (%). GHQ-12 = 12-item General Health Questionnaire; PAR-Q = Physical Activity Readiness Questionnaire. No between-group differences reached statistical significance (all descriptive $p > .05$).

Electroencephalographic Outcomes: Theta, Alpha, and Beta Power

A 2 (Time: pre, post) × 3 (Group: HMG, BMG, CG) repeated-measures ANOVA (*Table 2*) showed no significant main effects of Time for theta, alpha, or beta band power (all $p > 0.39$). Time × Group interactions were likewise non-significant (all $p > 0.35$), and no main effects of Group emerged (all $p \geq 0.25$).

Autonomic Outcome: GSR

For GSR, the ANOVA revealed a significant main effect of Time, $F(1, 6) = 7.79$, $p = 0.032$, $\eta^2 = 0.57$ (Table 1). The corresponding mean GSR change is depicted in **Figure 2D.** The Time × Group interaction approached significance, $F(2, 6) = 4.31$, $p = 0.069$, $\eta^2 = 0.59$. Descriptive pre-to-post changes were −0.63 µS (dz = -0.32) in HMG, −3.90 µS (dz = -1.37) in BMG, and −0.19 µS (dz = -0.17) in CG (*Figure 3D*). The Group main effect was insignificant ($p = 0.420$); adjusted pairwise contrasts did not reach significance.

Table 2: Two-way repeated-measures ANOVA (Time × Group) for EEG band power and GSR.

DV	F (Time)	P (Time)	η²p (Time)	F (Time×Group)	P (Time×Group)	η²p (Time×Group)	F (Group)	P (Group)	η²p (Group)
Theta	0.22	.653	.04	0.77	.504	.20	1.74	.253	.37
Alpha	0.06	.812	.01	1.24	.353	.29	0.27	.776	.08
Beta	0.83	.398	.12	0.85	.472	.22	0.02	.980	.01
GSR	7.79	.032*	.57	4.31	.069	.59	1.01	.420	.25

F = F-ratio; η²□ = partial eta-squared. "Time" compares pre- vs post-intervention; "Group" compares Heartfulness (HMG), Bell Meditation (BMG), and Control (CG). Asterisks denote descriptive p-value thresholds: *p < 0.05, p < 0.01, *p < 0.001*.

Figure 2: Group-wise pre- and post-intervention means (± SD) for each outcome variable

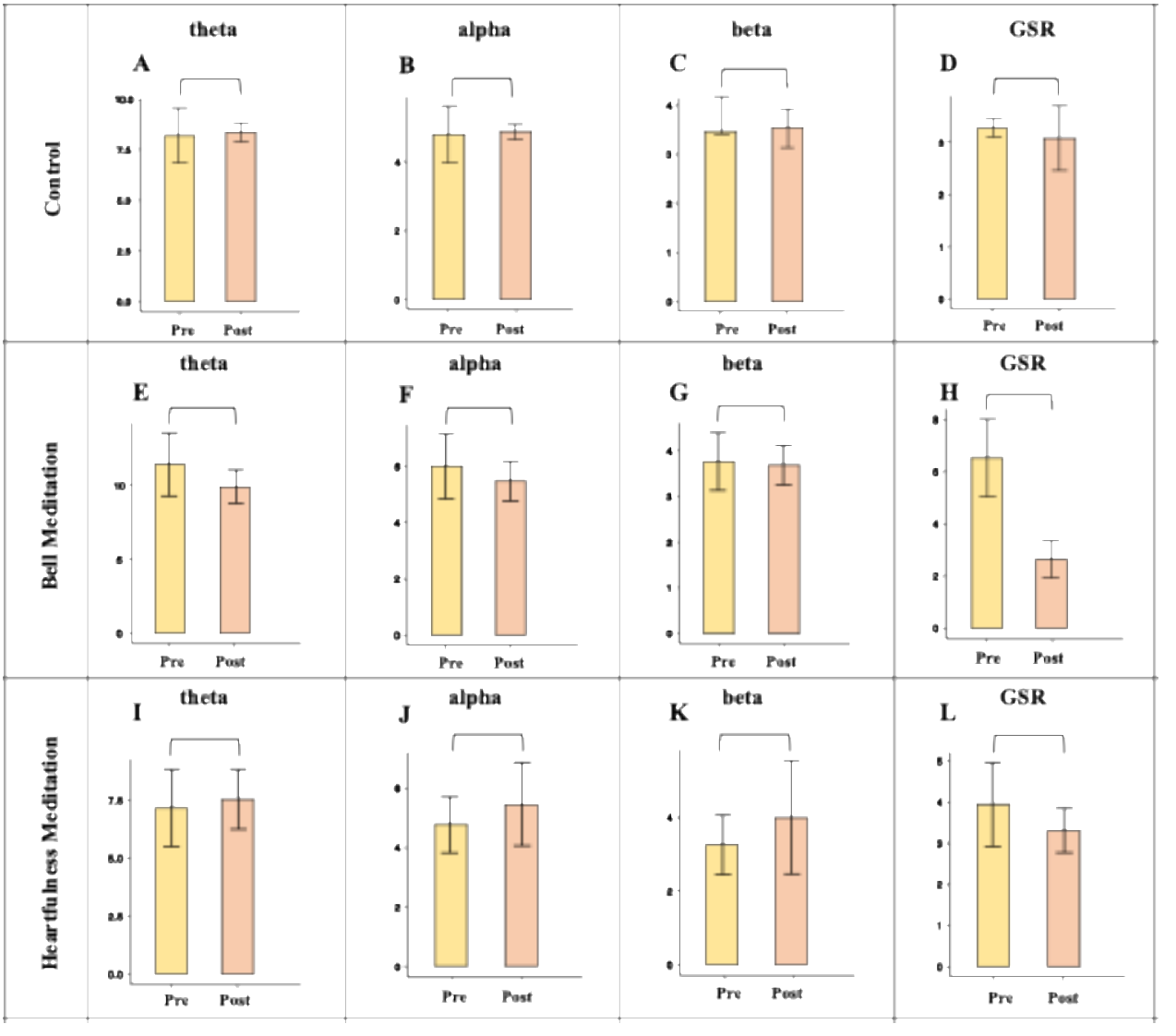


Figure 3: Mean (± SD) pre- (light yellow) and post-intervention (light orange) values. Panels **A–D** = Control, **E–H** = Bell Meditation, **I–L** = Heartfulness Meditation; theta, alpha, beta amplitudes (μV²) and GSR (μS) are displayed left to right within each row. No within-group pre–post differences were significant (paired *t*, $p > .05$).

Within-Group Descriptive Changes

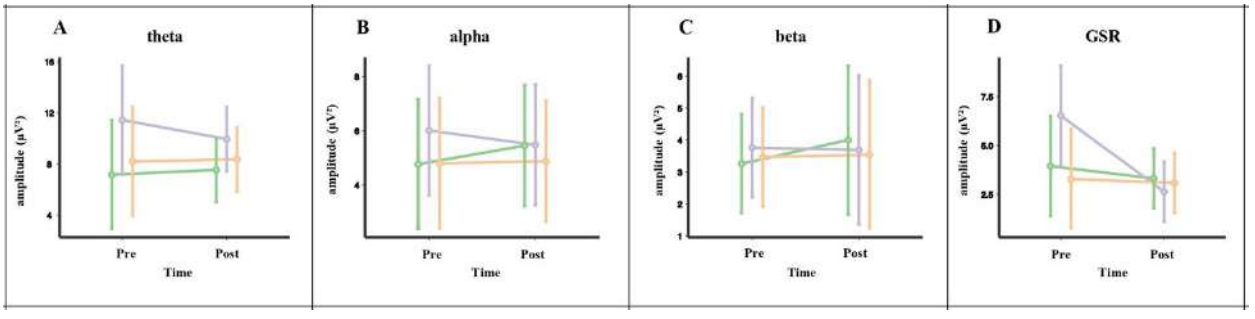
Descriptive changes are summarized in *Table 3* and illustrated in *Figure 2A–C*; confidence intervals were wide and overlapped across conditions. Heartfulness showed small increases in theta (+0.38 μV, dz = 0.10), alpha (+0.68 μV, dz = 0.23), and beta (+0.74 μV, dz = 0.25). Bell Meditation tended toward decreases in theta (-1.45 μV, dz = -0.35) and alpha (-0.53 μV, dz = -0.23) with negligible change in beta, while Control exhibited minimal fluctuations (dz ≤ 0.07 for all bands).

Table 3: Pre- to post-intervention descriptive statistics and within-group effect sizes.

Group	Variable	Pre (M ± SD)	Post (M ± SD)	Change (M ± SD)	Cohen's dz
HMG	theta	7.17 ± 2.86	7.55 ± 2.23	+0.38 ± 3.63	0.10
HMG	alpha	4.77 ± 1.63	5.45 ± 2.42	+0.68 ± 2.92	0.23
HMG	beta	3.26 ± 1.41	4.00 ± 2.67	+0.74 ± 3.02	0.25
HMG	GSR	3.94 ± 1.76	3.31 ± 0.94	-0.63 ± 2.00	-0.32
BMG	theta	11.40 ± 3.69	9.95 ± 1.95	-1.45 ± 4.17	-0.35
BMG	alpha	6.01 ± 1.98	5.48 ± 1.19	-0.53 ± 2.31	-0.23
BMG	beta	3.76 ± 1.09	3.69 ± 0.75	-0.07 ± 1.32	-0.05
BMG	GSR	6.53 ± 2.58	2.63 ± 1.22	-3.90 ± 2.85	-1.37
CG	theta	8.20 ± 2.33	8.37 ± 0.81	+0.17 ± 2.47	0.07
CG	alpha	4.80 ± 1.43	4.88 ± 0.40	+0.08 ± 1.48	0.05
CG	beta	3.47 ± 0.66	3.54 ± 0.69	+0.07 ± 0.95	0.07
CG	GSR	3.28 ± 0.29	3.09 ± 1.08	-0.19 ± 1.12	-0.17

Change = Post – Pre (mean ± SD). Cohen's d_z = MeanΔ / SD_{change}, with benchmarks 0.2 = small, 0.5 = medium, 0.8 = large. SD_{change} was approximated by √(SD_{pre}² + SD_{post}²). EEG amplitudes are in μV; GSR is in μS. HMG = Heartfulness Meditation Group; BMG = Bell Meditation Group; CG = Control Group.

Figure 3: Individual pre-to-post-trajectories for EEG band power and GSR



Lines trace each participant's change from baseline to follow-up: Heartfulness (green), Bell Meditation (orange), and Control (purple). Panels depict theta (**A**), alpha (**B**), beta (**C**) power, and GSR (**D**). Vertical bars denote ± 1 SD about the group mean at each time point, illustrating within-group variability.

Adherence and Safety
Session attendance was 100 % across all groups, and no adverse events were reported.

Additional Baseline Observations

Within the broader screened cohort (*Table 1*), intervention and control pools differed in height ($p = 0.019$) and BMI ($p = 0.003$), while age, weight, GHQ-12 scores, and gender distribution were comparable (all $p > 0.05$). All participants were unmarried undergraduate students who cleared the PAR-Q.

Discussion

This current study is the first to investigate EEG waves (theta, alpha, beta) and GSR of two distinct meditation styles, namely, Heartfulness (internally heart-focused) and Bell meditation (bell-anchored focused-attention practice), within the same protocol. Over the 21-day intervention, it was observed (i) no reliable group-level modulation of resting EEG power, yet (ii) a significant time-related reduction in skin conductance that was driven almost entirely by the Bell group (η^2 □ ≈ 0.59, d_z = –1.37). [These findings are exploratory and should be interpreted cautiously; they suggest that different meditation modalities may exert selective influences on autonomic versus cortical markers, depending on the attentional anchor and practice duration.] [20] Thus, while cortical oscillatory indices remained stable in this short training window, the auditory-cued practice was *associated with* a robust downshift in sympathetic arousal, consistent with a "wakeful relaxation" state described in prior EEG research.

To strengthen the interpretation of non-significant EEG findings, it should be acknowledged that oscillatory shifts in novices may require longer durations of consistent practice (≥ 8 weeks) to consolidate neuroplastic changes. The 21-day training employed here was likely insufficient to elicit measurable trait-level EEG modulation despite producing detectable autonomic effects. [21, 22]

Null EEG findings are not unprecedented in brief interventions with novice meditators. Attentional-state models suggest that sustained frontal theta or posterior alpha increases often emerge only after several weeks to months of consistent practice, reflecting experience-dependent plasticity in fronto-parietal networks.[23,24] For instance, five-day mindfulness meditation programmes seldom alter baseline power spectra but do affect task-evoked rhythms.[25] Recent work has further highlighted that meaningful spectral changes in alpha and theta are more reliably observed after eight weeks or longer[26].The small sample of this study and the 21-day intervention period likely fell below the threshold required to shift trait-level oscillatory activity. Accordingly, the absence of significant EEG change in the present study may reflect both the limited sample size and the relatively short duration of training, indicating that oscillatory adaptations may require longer exposure than autonomic indices.

The pronounced GSR drop in the BMG aligns with the neurovisceral-integration model, which links prefrontal modulation of brain-stem cardioautonomic circuitry to flexible emotion regulation.[25,27] Focused-attention practices using exteroceptive anchors (e.g., breath sounds, bell tones) repeatedly recruit ventrolateral prefrontal and anterior insula regions to reorient attention, thereby enhancing top-down parasympathetic drive and dampening sympathetic output.[27] Recent neuroimaging studies also suggest that auditory meditation practices promote enhanced connectivity between the anterior insula and medial prefrontal cortex, which supports autonomic calming[28,29]. Sound-based meditations may amplify this mechanism via rhythmic auditory entrainment that slows respiration and lowers cortical arousal,[30] explaining the significant GSR effect registered here.[31] While HMG showed only modest GSR change and slight upticks in theta/alpha power, consistent with prior work in experienced practitioners, where slow-wave increases accompany inward, affective focus.[10,32,33] Comparable findings were also reported in school-based meditation programs, where autonomic but not cortical indices showed early responsiveness[34,35].By contrast, the bell meditation may elicit marked autonomic calming without apparent EEG change, supporting the notion that different techniques preferentially target distinct components of the mind-body axis.[36,37] However, the group contrasts must be viewed cautiously, given $n = 3$ per group, effect-size patterns rather than significance thresholds guide inference in such exploratory work. Taken together, these observations indicate that the initial hypothesis of concurrent EEG and autonomic modulation was only partially supported. Different meditation styles may preferentially modulate distinct physiological systems, with autonomic indices appearing more responsive than cortical oscillations in early practice.

The GSR findings concur with a randomised controlled trial in college students, where a single Tibetan-singing-bowl session reduced electrodermal activity more than silent mindfulness.[19] Likewise, meta-analytic evidence indicates that auditory mantra/chant practices yield larger heart-rate-variability gains than breath-focused methods, [27,30]

suggesting that rhythmic sound may be a potent gateway to autonomic down-regulation. Conversely, the minimal EEG change concords with the early-stage of Heartfulness meditation studies reporting negligible spectral shifts after ≤ 4 weeks in novices.[32,38] Taken together, the literature and present data imply that cortical oscillatory markers may lag behind autonomic indices in early practice, particularly when sample sizes are small. A recent pilot RCT also observed that novice practitioners require sustained exposure before EEG adaptations become detectable, underscoring the time-dependent nature of cortical plasticity[39]. Overall, the present findings lend partial empirical support to the study hypotheses, suggesting that autonomic markers are more sensitive than EEG measures to short-term meditation training. Larger and longer-duration trials are warranted to fully test the hypothesised cortical changes.

Strengths and Limitations

Strengths of the study include randomisation, objective psychophysiological endpoints, and 100 % adherence with zero attrition. Key limitations are the *small sample size*, male-only subjects, short intervention period, resting-state EEG only use, and absence of behavioural or affective measures that might contextualise physiological shifts. The control group's slightly higher BMI also cautions against over-interpreting between-arm differences in autonomic tone. Furthermore, the very small cohort size (n = 9; 3 per group) reduces statistical power, and the findings should be regarded as preliminary; future studies should perform an a priori power analysis, with approximately 30 participants per group required to detect medium effect sizes with adequate power ($\alpha = 0.05$, power = 0.80).

Implications and Future Directions

Preliminary evidence that bell meditation significantly lowers sympathetic arousal demands larger trials powered to detect medium effects ($\geq n \approx 30$ per arm, based on current η^2 □). Future studies should employ longer follow-ups to test the durability of GSR change and delayed EEG adaptation, include mixed-gender, culturally diverse samples, integrate cognitive tasks (e.g., sustained-attention paradigms) and heart-rate-variability metrics to triangulate neurovisceral effects, and compare additional exteroceptive anchors (drumming, chanting) to delineate sound-specific mechanisms.

Conclusion

In conclusion, among university students, auditory bell meditation produced a uniform reduction in electrodermal arousal across 21 days, whereas heartfulness meditation showed only modest autonomic and non-significant cortical changes. These divergent physiological signatures indicate that similar contemplative practices can differentially engage neural–autonomic networks in the early stages of learning. Although exploratory, the present findings lay essential groundwork for hypothesis-driven trials to clarify how sensory modality and attentional strategy sculpt the neurophysiology of meditation.

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EXPLORING THE PREVENTIVE POTENTIAL OF HATHA YOGA IN REDUCING LOWER LIMB MUSCULOSKELETAL INJURY IN PHYSICALLY DEMANDING OCCUPATIONS: A THEMATIC REVIEW

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Abstract

Musculoskeletal injuries (MSIs) to the lower limbs are frequently encountered by those in physically demanding occupations, such as military personnel, police officers, firefighters, and construction workers. Hatha yoga, which emphasizes postures, breath control, and relaxation strategies, has shown promise in improving musculoskeletal function and reducing pain; nevertheless, its effectiveness in preventing lower limb MSIs in work settings has yet to be thoroughly explored. This thematic review consolidates existing evidence regarding the preventive effects of Hatha yoga on lower-limb musculoskeletal injuries (MSIs) in physically demanding professions and suggests a framework for future research and practice. A narrative synthesis was performed utilizing clinical trials, systematic reviews, and occupational health studies relevant to Hatha yoga and musculoskeletal injury and disorders. Key themes related to lower-limb biomechanics, neuromuscular control, pain modulation, and psychosocial factors were identified. The findings suggest that Hatha yoga enhances lower-limb flexibility, strength, balance, and joint mobility, while also alleviating pain and disability in individuals with musculoskeletal disorders. Programs incorporating yoga in the workplace have been linked to a reduction in musculoskeletal symptoms and improvements in coping strategies. Nevertheless, only a limited number of studies specifically focus on preventing lower-limb injuries in high-risk work sectors, and there is considerable variability in the protocols concerning content, duration, and level of supervision.Future research should employ occupation‑specific cohorts, standardized yoga protocols, and objective biomechanical and injury‑surveillance outcomes to confirm its preventive efficacy and safety.

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Keywords: Hatha yoga, lower limb, musculoskeletal injury, physically demanding occupations, injury prevention, thematic review.

Introduction

Musculoskeletal injuries (MSIs) affecting the lower limb, especially the hip, knee, ankle, and foot, are significant contributors to pain, disability, and time lost from work among individuals in physically demanding roles. These injuries often result from high mechanical exposure, including extended periods of standing, walking on uneven terrain, climbing stairs, lifting, pushing, pulling, and making quick directional changes. Professions such as military personnel, police officers, firefighters, construction workers, and healthcare providers often experience these challenges (Canetti et al., 2020, 2020; Murphy et al., 2023a; Ngan et al., 2010). These injuries often arise from repetitive stress, extended periods of standing, lifting heavy objects, abrupt changes in direction, accumulated fatigue, and compressive, shear, and torsional forces on the hip, knee, and ankle joints. These factors can make workers susceptible to conditions such as tendinopathy, ligament sprains, meniscal injuries, patellofemoral pain, and osteoarthritis related to overuse. (Murphy et al., 2023a; Ngan et al., 2010).

Epidemiological research involving military and police groups indicates that there are significant occurrences of lower-limb injuries, particularly during basic training and while on deployment (Lyons et al., 2021; Murphy et al., 2023b). Firefighters and construction workers also display increased instances of knee and ankle sprains, stress fractures, and low-back-related compensatory strain in the lower limbs. Factors contributing to these injuries include

insufficient physical conditioning, muscle imbalances, restricted flexibility, poor recovery practices, and psychosocial stressors that heighten pain sensitivity and promote risk-taking behavior (Lyons et al., 2021).

Hatha yoga, a segment of traditional yoga that focuses on postures (asana), controlled breathwork (pranayama), and relaxation techniques, has been increasingly researched as a mind-body approach for managing musculoskeletal conditions (da Costa et al., 2020; McCaffrey & Park, 2012). Recent clinical reviews indicate that yoga can enhance pain relief, functional ability, and quality of life for individuals with issues affecting the spine, hip, knee, and shoulder, typically resulting in low rates of adverse effects (Denham-Jones et al., 2022). The current evidence regarding the diagnosis, prevention, and treatment of lower-limb injuries is generally rated from very low to moderate quality, underscoring the need for high-quality research to bolster confidence in effect estimates, while most existing studies primarily concentrate on treating established conditions rather than focusing on preventing primary or secondary injuries in high-risk occupational groups (Ishøi et al., 2020). Hatha yoga provides a multimodal approach that complements conventional exercise by integrating flexibility, strength, balance, and mindfulness within a single practice, thereby potentially enhancing joint mobility and muscle adaptability, improving lower-limb strength and endurance.

Various biomechanical factors, such as flexibility in back and hamstrings, the presence of high or low arches, bone structure, genu valgum, limitations in ankle dorsiflexion, and increased inversion of the hind foot, are known to make individuals more susceptible to injuries (Kotwal, 2012). In 2021, there were 1.686 billion reported cases of musculoskeletal disorders (MSDs) worldwide, marking a 95% rise since 1990. Despite upward trends in total cases, Disability-Adjusted Life Years (DALYs), and projected figures (expected to reach 2.161 billion by 2035), both age-standardized incidence and mortality rates are on a downward slope, with MSD-related deaths decreasing each year by 0.265% (Liu et al., 2025).

Preventive approaches in work environments have focused on ergonomic modifications, load management strategies, and specific programs for strengthening and stretching (Shariat et al., 2018). However, there is a more limited and varied body of evidence regarding the prevention of injuries specifically related to the lower limbs (Sundstrup et al., 2020).

This thematic review intends to methodically compile and evaluate the available evidence regarding the impact of Hatha yoga on the biomechanics of the lower limbs, neuromuscular coordination, and pain perception; to investigate its potential as a primary and secondary preventive measure against lower-limb musculoskeletal injuries (MSIs) for those in physically demanding occupations; and to suggest a comprehensive framework for research and implementation to assist in the design, methodological rigor, and practical integration of future intervention studies in occupational environments.

Methods

Study Design

This article uses a thematic review approach, organizing existing literature by key conceptual themes rather than aggregating data statistically. The focus of the review is on Hatha yoga as a preventive or supplementary intervention for lower-limb musculoskeletal disorders in physically demanding occupations.

Search Strategy and Inclusion Criteria

A narrative synthesis was performed based on clinical trials, systematic reviews, and occupational health studies sourced from major databases (PubMed, Scopus, Web of Science) using search terms like “Hatha yoga,” “yoga,” “musculoskeletal disorders,” “lower limb,” “injury prevention,” “occupational health,” “military,” “police,” and “law enforcement.” Articles published in English from 2000 to 2025 were given priority.

Inclusion criteria were:

- Studies evaluating Hatha or closely related yoga styles.
- Outcomes related to lower‐limb musculoskeletal function, pain, or injury.
- Populations, including workers in physically demanding occupations or clinical groups with lower‐limb musculoskeletal injury.

Exclusion criteria were:

- Non‐peer‐reviewed sources.
- Case reports without follow‐up data.
- Studies focusing solely on mental‐health outcomes without musculoskeletal measures.

Data Extraction and Thematic Synthesis

Key information extracted included: population characteristics, hatha yoga, outcomes (pain, function, flexibility, strength, balance, injury incidence), and reported adverse events. Extracted data were organized into thematic categories reflecting biomechanical, neuromuscular, psychosocial, and occupational‐health dimensions.

Thematic Findings

Improving Lower‐Limb Conditioning

Hatha yoga integrates flexibility, strength, and endurance training within a single practice, making it a potentially effective modality for lower‐limb conditioning (LaSala et al., 2021; Namdev, 2025; Raub, 2002). Biomechanical analyses of common Hatha yoga postures show that standing and seated asanas place appreciable demands on the ankle, knee, and hip, with moderate to high muscle activity in the quadriceps, hamstrings, gluteals, and calf muscles (Kaur & Ahluwalia, 2025; Punam & Patel, 2025).

The majority of yoga therapies include femur head distraction, which lowers the intra-articular pressure that the femur head places on the acetabulum. As in Gomukhasana, Garudasana, Supta Matsyendrasana, Ardha Matsyendrasana, and Ardha Padmasana, hip distraction is achieved by compound hip movement (flexion, abduction, and external rotation) with the knee flexed; Eka Pada Rajakapotasana, Adho Mukha Svastikasana, Parivrtta Utkatasana, Parivrtta Baddha Parsvakonasana, and Parivrtta Trikonasana. Marichyasana, Uttanasana, Ardha Uttanasana, Aschwa Sanchalanasana, Balasana, Darmikasana, Adho Mukha Virasana, Shashankasana, Apanasana, Janu Sirsasana, Padangustasana, Pada Hastasana, and Supta Padangustasana are the poses that result in the femur head's posterior glide. Purvottanasana, Setu Bandha Sarvangasana, Ardha Chakrasana, Virabhadrasana I, Anjaneyasana, Astha Chandrasana or Alanasana, Dhanurasana, Urdhva Dhanurasana, Ardha Urdhva Dhanurasana, and Ustrasana are the poses that accomplish anterior gliding of the femur head. Eka Pada Rajakapotasana, Bharadvajasana, Parivrtta Parsvakonasana, and Sukhasana are asanas that include rotation in one or both hip joints. These poses are extremely strong and effective at relieving joint compression as well as muscle stiffness and retraction. Urdhva Hastasana, Virabhadrasana I, Vrksasana, Adho Mukha Svanasana, Parivrtta Parsvakonasana, Astha Chandrasana, Anjaneyasana, Dandayamna Bharmanasana, Shashankasana, Darmikasana, Adho Mukha Svastikasana, and Gomukhasana are asanas that involve hip flexion or hyperflexion, either with or without external rotation or medial rotation. Dwikonasana, Purvottanasana, Setu Bandha Sarvangasana, Viparita Karani, Halasana, Marichyasana, Yoga Mudrasana, Matsyasana, and Salabhasana are asanas for hip extension or hyperextension with abduction or adduction and external rotation or medial rotation. Tadasana, Tiryaka Tadasana, and Kati Chakrasana are asanas that include hip abduction or hyperabduction (Cheung et al., 2014; Gandolfi et al., 2025a).

Poses such as *Virabhadrasana* (Warrior I/II), *Utkatasana* (Chair), and *Trikonasana* (Triangle) require eccentric and concentric contractions across multiple planes, resembling functional tasks such as squatting, lunging, and single‐leg stance (Salem et al., 2013). Thus, Hatha yoga offers a holistic, functional approach to lower-limb conditioning that mirrors the multi-joint, multi-planar demands of physically demanding work.

Clinical studies indicate that yoga‐based programs can improve hip extension, stride length, and joint mobility in older adults and individuals with hip and knee osteoarthritis (DiBenedetto et al., 2005; Lu et al., 2024; Salem et al., 2013). In randomized controlled trials on knee pain, 8‐week Hatha yoga interventions significantly reduced self‐reported pain and improved knee function compared with no-intervention controls (Abafita et al., 2025; Ghasemi et al., 2013). The findings suggest that improvements in lower-limb strength, flexibility, hip and ankle mobility, quadriceps and hamstring strength, and core stability brought about by yoga may improve resilience to physically demanding occupational tasks and lower the risk of acute musculoskeletal strains during awkward or dynamic movements.

Enhancing Postural Control and Balance

Hatha yoga includes numerous standing and balancing postures that challenge proprioception and neuromuscular coordination. Examples include *Vrksasana* (Tree), *Garudasana* (Eagle), and single‐leg variants of Warrior poses.

Studies in older adults demonstrate that 8–12 weeks of yoga practice can improve balance, gait stability, and mobility, with reductions in fall‐related risk factors (Kanaujia & Srivastava, 2024, 2024; Kumar et al., 2016). Hatha yoga-induced several conflict in the visual, vestibular, and somatosensory systems that are important mechanisms for maintain these systems working well through the asana like Chatarunga Dandasana, Dekasana, Rajahamsasana, and padangustasana (Prado et al., 2014).
In occupations that require physical exertion, employees frequently work on unstable or irregular surfaces (such as uneven ground, rubble, stairs, vehicles, or slick floors), heightening the risk of slips, trips, and falls. Consequently, yoga-based balance training could be an effective addition to traditional conditioning programs by enhancing dynamic stability and lowering the incidence of fall-related injuries to the lower limbs in high-risk populations. (Floyd et al., 2022).

Reducing Pain and Disability

A growing quantity of research suggests that Hatha yoga can help people with musculoskeletal conditions experience less pain and incapacity. Yoga can help relax the neural system, lower stress levels, and increase pain tolerance by combining gradual, gentle movements, careful concentration, and controlled breathing (Gandolfi et al., 2023). According on certain research, Hatha yoga can enhance mood, boost confidence in day-to-day activities, and reduce pain-related anxiety and negative thoughts (Bennell et al., 2022; Gandolfi et al., 2025a; Riley & Park, 2015). When compared to no-intervention controls, yoga-based programs for osteoarthritis in the hips and knees improved self-reported physical performance, pain, stiffness, and short-term physical performance scores (Kuntz et al., 2018). Yoga decreased pain and enhanced function in knee-pain groups, sometimes producing results that were on par with traditional physical therapy. (da Costa et al., 2020; Gandolfi et al., 2025b).

The mechanisms driving pain reduction, such as increased self-efficacy, reduced muscular tension, and greater joint mobility, may also have preventive implications, even though the majority of this research concentrate on therapy rather than prevention. Yoga-based therapies that target the mental and physical components of pain may assist preserve functional ability while lowering compensatory movement patterns that put too much strain on the lower limb (da Costa et al., 2020; Gandolfi et al., 2025b).

Psychosocial and Behavioral Factors

High occupation physical demands and little recuperation time are common characteristics of physically demanding occupations, all of which can exacerbate chronic stress and exhaustion. The mindfulness and relaxation techniques of yoga may help employees manage their stress reactions, get better sleep, and lead healthier lives, all of which may indirectly lower their risk of injury.

Yoga programs in the workplace have been linked to decreases in functional impairment, pain severity, and perceived stress. When hospital personnel with musculoskeletal symptoms participated in a 12-week intervention that combined health education and Hatha yoga, their pain, disability, and psychological distress decreased more than those in a control group (da Costa et al., 2020).

According to these results, yoga-based programs might promote a proactive approach to injury prevention and health management as opposed to a reactive one.

Discussion

Preventive Mechanisms of Hatha Yoga

Hatha yoga may reduce lower-limb MSIs in physically demanding employment through a number of pathways, according to the reviewed research. First, by incorporating strength, flexibility, and endurance training into functional movement patterns, yoga enhances lower-limb fitness. Second, yoga improves balance and postural control, both of which are important for avoiding falls and unsteady landings. Third, yoga might potentially halt the progression from subclinical signs to more serious injuries by reducing pain and incapacity. Last but not least, the mindfulness and relaxation elements of yoga may improve coping mechanisms and ease stress-related muscle tension, hence lowering the chance of injury.

Occupational‑ Specific Considerations

Despite these encouraging findings, there is a significant lack of occupation-specific research aimed at preventing lower limb injuries. It is challenging to separate impacts on lower-limb injuries in high-risk occupational groups since the majority of clinical studies enroll diverse populations with mixed MSD diagnoses. Furthermore, most research relies on self-reported pain and disability measures rather than injury incidence, time-loss days, or objective biomechanical results. (Krause et al., 2001; Wasiak et al., 2006).

Future studies should use injury-surveillance systems to monitor lower-limb MSIs throughout time and give priority to prospective, occupation-specific cohorts (construction workers, frontline responders, recruits). These studies should also examine the effects of program duration, frequency, and intensity, as well as dose-response connections between yoga exposure and injury outcomes.

Safety and Individualization

Yoga is typically safe; some poses might cause or worsen musculoskeletal problems, especially in the knee, hip, and spine, according to case-series and evaluations of adverse occurrences. If done improperly, standing positions involving deep knee flexion or excessive hip rotation can put a lot of strain on delicate joints (Kaur & Ahluwalia, 2025; Lee et al., 2019).

Therefore, individualization, contraindications, and cautious growth must be the main focus of preventive yoga programs for physically demanding vocations. To reduce danger and maximize benefit, pre-participation screening, customized adjustments, and trained instruction are crucial. Programs must include instruction on correct technique, warm-up and cool-down exercises, and symptom self-monitoring.

Integration with Existing Occupational Health Programs

Hatha yoga should be integrated as a complementary component alongside conventional occupational health measures, with structured programs combining yoga-based conditioning to enhance lower-limb strength, flexibility, balance, and injury prevention; given its demonstrated feasibility in hospital settings, similar on-site or duty-hour models may be effectively adapted for firefighters, police personnel, and armed forces to optimize adherence and occupational health outcomes.

Conclusion

By improving strength, flexibility, balance, pain modulation, and psychological resilience, hatha yoga is a viable multimodal strategy for lower-limb musculoskeletal disorders in physically demanding occupations. While the majority of the evidence currently available focuses on rehabilitation rather than prevention, well-structured, occupation-specific programs integrated into existing fitness and occupational health frameworks under qualified supervision offer a practical, evidence-informed approach. However, more high-quality, occupation-focused research is required to standardize protocols, validate safety, and demonstrate its preventive efficacy.

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STRESS, MENTAL HEALTH, AND EMOTIONAL WELL-BEING THROUGH YOGIC PRACTICES

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Abstract

In today's busy lifestyle our health is get effected, with the help of the yoga it helps to balance out between our physical health, mental health, and as well as emotional health. In Ayurvedic classical Samhita's Acharya explained the different types of asana, pranayama which helps to calm and focus the mind and overall improve the productivity of the humans. By doing yoga regularly it releases happy hormones that helps in to make happy with inner peace and boost the mind. Pranayama, which is breath control, directly affects the autonomic nervous system, helping the body switch from a stress mode to a relaxed, rest mode. Yoga is a strong, affordable and empowering way to improve the public health. When people include these practices in their everyday lives, they can create a lasting sense of emotional balance and clear thinking, helping them face the pressures of today's world more effectively. Clinical studies show that regular practice helps lower cortisol, which is the main stress hormone, and boosts the release of GABA and endorphins. These changes in the body are linked to better mood, less anxiety, and a stronger ability to handle depression. Also, this practice improves your awareness of how your body feels from inside, helping you stop and deal with stress early before it turns into long terms problems.

Keywords: Yoga, Emotional Well-being, Healthy lifestyle, mental health, Stress, Physical activity

Introduction

In today's lifestyle yoga helps to balance out all four dimensions of health that is physical health, mental health, emotional health, and the spiritual health. In Ayurvedic classical samhita (Charak Samhita sutra sthana 30/36) the swasth person definition is given:

- **प्रयोजनं चास्य स्वस्थस्य स्वास्थ्य रक्षणं**
- **आतुरस्य विकार प्रशामनं च ।**
- **(च. सू. 30/26) (अर्थदशमहामूलीय अध्याय)**

Ayurveda was developed to support good health and help people stay free from illness. To keep a healthy person in good condition it's important to live in a healthy way. When someone is sick, medical treatment is necessary to bring them back to good health.

In Ayurveda there is description of asthanga yoga (Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhayana, and Samadhi) which helps in building physical power, stamina, and flexibility, which also helps to clear the mind and reduce stress.

Relation of Yoga with four dimensions of health:

1. **Physical health:**

   समदोषः समाग्निश्च समधातुमलक्रियः ।
   प्रसन्नात्मेन्द्रियमनः स्वस्थ इत्यभिधीयते ॥
   (Sushruta Samhita, Sutra-sthana, 15.41)

The shloka says that when the three bodily energy or doshas, are balanced along with a strong Agni (Digestive fire), Dhatu (Healthy body tissues) and Mala (Elimination of waste) . It also includes a peaceful state of the soul, senses, and mind, which is exactly what Yoga aims to develop.

2. Mental health

योगश्चित्तवृत्तिनिरोधः ॥
(Yoga Sutras of Patanjali, 1.2)

Yoga is about stopping the constant changes in mind, which are called vrittis that happens in mind.

3. Emotional health

योगस्थ: कुरु कर्माणि सङ्गं त्यक्त्वा धनञ्जय |
सिद्ध्यसिद्ध्यो: समो भूत्वा समत्वं योग उच्यते ||
(Bhagavad Gita, 2.48)

- Yoga stha- It means acting from within, not driven by emotions
- Siddhy-asiddhyo samo bhutva- It is the key to emotional well being that is being steady in good or bad time
- Samatva yoga ucyate- Balance is called as yoga

4. Spiritual health

तं विद्याद् दुःखसंयोगवियोगं योगसञ्ज्ञितम् ।
स निश्चयेन योक्तव्यो योगोऽनिर्विण्णचेतसा ॥
(Bhagavad Gita, 6.23)

- Duhkha sanyoga viyoga- Breaking free fromthr connection with suffering
- Yoga Sanjnitam- Being free from suffering is called as yoga

यत्रोपरमते चित्तं निरुद्धं योगसेवया |
यत्र चैवात्मनात्मानं पश्यन्नात्मनि तुष्यति ||
(Bhagavad Gita, 6.20)

- When the mind trained through yoga, it becomes calm and you can see the true yourself through a pure mind and find happiness within yourself

Different types of Kosha (Layers)

Sr. No.	Kosha	Level of health	Treatment for impurities in Panchkosha
1.	Annamaya	Physical health	By practicing Yama, Niyam, and Asana and by practicing of Shat kriya
2.	Pranamaya	Physiological health	Through Pranayama
3.	Manomaya	Mental health	Through practicing of Pratyahara and Dharana
4.	Vijnanamaya	Intellectual health	By Dhayan
5.	Anandmaya	Spiritual health	By Samadhi

Astanga yoga

Sr. No.	Name
1.	Yama
2.	Niyama
3.	Asana

4.	Pranayama
5.	Pratyahara
6.	Dharana
7.	Dhyaan
8.	Samadhi

1. Yama-

अहिंसासत्यास्तेय ब्रह्मचर्यापरिग्रहा यमाः . (पा. यो. सू. सा./30)

Sr. No.	Types of Yama	Shloka with meaning
1.	Ahimsa	अहिंसा प्रतिष्ठायां तत्सन्निधौ वैरत्यागः . (पा. यो. सू. 2/35) It means that not causing harm
2.	Satya	सत्यप्रतिष्ठायां क्रियाफलाश्रयत्वम् . (पा. यो. सू. साध .5/36) Be honest
3.	Asteya	अस्तेय प्रतिष्ठायां सर्वरत्नोपस्थानाम् . (पा. यो. सू. साधनपाद/37) Not taking things that doesn't belongs to you
4.	Brahmacharya	ब्रह्मचर्यप्रतिष्ठायां वीर्यलाभः . (पा. यो. सू. साधनपाद/7) Controlling desires
5.	Aparigraha	अपरिग्रहस्थैर्ये जन्मकथन्तासम्बोधः . (पा. यो. सू. साधनपाद 9/39) Not holding or collecting too many things together

2. Niyama

शौचसन्तोषतपस्वाध्यायेश्वरप्रणिधानानि नियमाः . (पा. यो. सू. साधन पाद 12/32)

Sr. No.	Types of Niyama	Shloka with reference
1.	Shaucha	शौचात्स्वांगजुगुप्सा परैरसंसर्गः . सत्वशुद्धिसौमनस्यैकाग्रेन्द्रियजात्मदर्शन योग्यत्वानि च . (पा. यो. सू. साधनपाद 40-41) Cleanse your body and mind to reach a State of peace
2.	Santosha	सन्तोषादनुत्तमः सुखलाभः . (पा. यो. सू. साधनपाद 42) Achieve inner calm by letting go desires for things you don't really need
3.	Tapas	कायेन्द्रियसिद्धिरशुद्धिक्षयात्तपसः . (पा. यो. सू. साधनपाद 43) इच्छानिरोधो तापः Control over Sharir, Prana, Indriya, and Mana
4.	Svadhyaya	स्वाध्यायादिष्ट देवतासंप्रयोगः . (पा. यो. सू. साधनपाद) स्वाध्याय प्रणवादि पवित्राणां जपो मोक्ष शास्त्राध्ययनं . (पा. यो. सू. 2/1) Chanting of religious Mantra
5.	Ishvarapranidhana	ईश्वर प्रणिधानं सर्वक्रियायां परमगुरावर्पणं तत्फलसंन्यासो वा . (पा. यो. सू. साधनपाद 2/1 पर व्यास भाष्य) समाधिसिद्धिरीश्वर प्रणिधानात् . (पा. यो. सू. 2/45) Dedicating your actions and life to God (Ishvar)

3. Asana

स्थिरसुखमासनम् . (पा. यो. सू. साधनपाद 2/46)

The state where the body is kept in a particular position for a set of amount of time without causing any physical and mental discomfort

प्रयत्नशैथिल्यानन्तसमापत्तिभ्याम् . (पा. यो. सू. 2/47)

By practicing the asana regularly, the body become more flexible and mind becomes free from distractions, allowing it to focus on the eternal divine consciousness.

Numbers of Asana according to different texts:

Sr. No.	Texts	Numbers
1.	घेरण्ड संहिता	32 (2/3-6)
2.	हठयोग प्रदीपिका	84 (1/34-36)
3.	योगकुण्डलिन्युपनिषद्	2
4.	योगचूडामण्युपनिषद्	3
5.	अमृतनादोपनिषद	18
6.	ध्यानबिन्दूपनिषद	43
7.	शाण्डिल्योपनिषद	8/9
8.	दर्शनोपनिषद	9
9.	वराहोपनिषद	11
10.	त्रिशिख ब्राह्मणोपनिषद	17
11.	ध्यानबिन्दूपनिषद	असंख्य

Types:

Maharishi Patanjali didn't mention the exact no. of asanas. However based on their usefulness, asana can be categorised in three no.

Sr. No.	Types	Examples
1.	शरीर संवर्धनात्मक आसन	सूर्यनमस्कार, स्वास्तिकासन, सर्वाङ्गासन
2.	विश्रामात्मक आसन	शवासन, मकरासन आदि
3.	ध्यानात्मक आसन	पद्मासन, सिद्धासन, सिद्धयोनि आसन, सुखासन आदि.

On the basis of prabhava

1. ध्यानात्मक आसन
2. विश्रान्तिकारक आसन
3. शरीर संवर्धनात्मक आसन
4. कठिनात्मक आसन
5. शिथिलीकरण व्यायाम

According to position of body

Sr. No.	Types	Examples
1.	खड़े होकर करने वाले आसन (Standing Series)	सूर्यनमस्कार, अर्धकटि चक्रासन, ताड़ासन, अर्धचक्रासन
2.	बैठकर करने वाले आसन (Sitting Series)	पद्मासन, वज्रासन, पश्चिमोत्तानासन, गोमुखासन, सुखासन
3.	पेट के बल पर करने वाले आसन (Prone Series)	पवनमुक्तासन, सर्वांगासन, हलासन
4.	पीठ के बल पर करने वाले आसन (Supine Series)	भुजंगासन, शलभासन, धनुरासन

5.	सिर के बल पर करने वाले आसन (Inverted Series)	शीर्षासन

Uses of Asana

Sr. No.	Uses
1.	शरीर की स्थिरता
2.	आरोग्यता
3.	लघुतादि का प्राप्त होना.
4.	ध्यानादि का साधन

Brief description of different Asana

Sr. No.	Name of the Asana	Description	Uses
1.	Surya Namaskar	A dynamic sequence of 12 steps combining prayer, forward, and backward bends to honor the sun	Full body workout, Improves blood circulation, Enhances flexibility
2.	Ardh kati chakrasan	A lateral bending pose where one arm is raised and the body streches to the opposite side	Reduce waist fat, Improves spine flexibility, Stimulates abdominal organs
3.	Padahastasana	A standing forward bend where the hands are placed beside the feet, streching the hamstrings	Improve digestion, Thin the waist, Increases height in children
4.	Ardhchakrasana	A standing backward bend that open the chest and stretches the front of the body	Relieves back pain, Stimultes neck muscles
5.	Padmasana	The classic lotus pose with crossed legs and feets resting on opposite thighs for deep meditation	Calms the mind, Improve posture, Aids focus and concentration
6.	Siddhasana	The perfect pose achieved by tucking heels into the perineum, ideal for long term seated meditation	Regulates sexual energy, Stabilize the nervous system, Purifies the Nadis (Channels)
7.	Swastikasana	An auspicious sitting posture where the toes are tucked into the folds of knees comfortably	Good for meditation, Improves hip mobility, Relieves leg stiffness
8.	Sukhasana	The easy pose with a crossed leg position used for breathing exercise and basic seated meditation	Reduce anxiety, Strengthen the back, Promotes mental peace
9.	Bhadrasana	The Butterfly pose where soles touches heels are pulled towards the groin	Strengthens pelvic muscles, Good for knee health, Aids reproductive health

10.	Shashankasana	The Rabbit pose involving sitting on heels and bending forward to touch the forehead on the floor	Relieves stress, Toned pelvic muscles, Relieves constipation
11.	Gomukhasana	The cow face pose involving interlocked arms behind the back and stacked knees in the seated position	Fixes frozen shoulder, Improves lung capacity, Relieves sciatica
12.	Paschimottasana	A seated forward bend where the body folds over extended legs to touch the toes	Calms the brain, Reduce belly fat, Streches the entire spine
13.	Vakrasana	A simple seated spine twist where one leg is bent and the torso rotate towards it	Correct spinal slouching
14.	Dhanurasana	The Bow pose where one lies on the belly and holds the ankles, arching the body upwards	Strengthen back muscles, Improve menstrual health
15.	Tadasana	The mountain pose standing tall with arms reaching upwards, focusing on alignment and form grounding	Correct posture, Improve balance, Toned core muscles
16.	Savasana	The Corpose pose, lying flat on the back with total relaxation of every muscle and limb	Lowers blood pressure, Deep muscle recovery, Relieves insomnia

4. Pranayama

It is made up of two words Prana and Aayam.

प्राणस्य आयामः प्राणायामः .
Prana is a life force that all living beings rely on, and it is connected to breathing. The act of breathing starts the moment a person is born. Pranayama refers to the practice of controlling or managing the breathing process, which involves either stopping or regulating it.

Necessity in Pranayama practice:

आदौ स्थानं तथा कालं मिताहारं तथापरम्.
नाडीशुद्धिं ततः पश्चात् प्राणायामं च साधयेत् . (घेरण्ड संहिता 5/2)

Before starting the pranayama:

- Choosing the right place is important
- Choose time
- Consider diet
- Consider purification of nerves

Time for practicing the pranayama

प्रातर्मध्यंदिने सायमर्द्धरात्रे च कुम्भकान् .
शनैरशीतिपर्यन्तं चतुर्वारं समभ्यसेत . (ह. यो. प्र. 2/11)

In a day we do pranayama a total four times a day and night that is प्रातः काल, मध्याह्न, सांय काल, and अर्द्धरात्रि

हेमन्ते शिशिरे ग्रीष्मे वर्षायां च ऋतौ तथा
योगारम्भं न कुर्वीत कृते योगो हि रोगदः
वसन्ते वाऽपि शरदि योगारम्भ समाचरेत्
तथा योगो भवेत्सिद्धो विनाऽऽयासेन कथ्यते . (घेरण्ड संहिता. 15/15)
वसन्त, शरद ऋतु-योग्य काल (साधारण काल)
हेमन्त, शिशिर, ग्रीष्म, वर्षा-अयोग्य काल.

5. Pratyahara

प्रत्याहारः स विज्ञेयोऽभ्यासनीयोमुहुर्मुहुः . (ब्रह्मणोपनिषद्)
स्वविषयासंप्रयोगे चित्तस्वरूपानुकारेवेन्द्रियाणां प्रत्याहारः . (पा. यो. सू. 2/54)
The senses that make the mind drift away are taken away from what they are focusing is called as Pratyahara.

Withdrawal measures of Pratyahara

- प्राणायाम
- अजपाजप मन्त्रोच्चारण
- त्राटक-बाह्य एवं अन्तः.
- भ्रामरी कुम्भक

6. Dharana

देशबन्धश्चित्तस्य धारणा . (पा. यो. सू. विभूतिपाद् 1)
It is the practice of focusing the mind on a specific place by using concentration. After withdrawing the senses from outside objects through Pratyahara, Dharna involves directing the mind to the different parts of the body.

Ways to wear Dharna:

- बाह्य देश- Where the attitude should be stabilized that is Moon, Pole, Lamp, Idol of worshipable of god
- आन्तरिक देश- Navel chalra, Heat lotus, Mudra jyoti, Tongue tip, Nose tip

Dhyaan

तत्र प्रत्ययैकतानता ध्यानम् . (पा. यो. सू. विभूतिपाद 3/2)

Meditation is when you keep your focus on the object you are meditating on, which means staying with that specific point of focus on your mind continuously.

Types

- स्थूल ध्यान- Involves focusing on the idol of your favourite god
- ज्योति ध्यान- Meditating on fire, light or radiance associated with Shiva or shakti
- सूक्ष्म ध्यान- Meditating on Bindumaya Brahma and kundalini

According to शाण्डील्योपनिषद्

1. सगुण ध्यान
2. निर्गुण ध्यान

8. Samadhi

तदेवार्थमात्रनिर्भासंस्वरूपशून्यमिव समाधिः . (पा. यो. सू. 3/3)

When meditating, if only the goal is seen by the mediator, and both the meditation and the goal merge, the soul becomes absorbed in the form of God. This happen when the form becomes like nothing, and this state is known as samadhi.

Types

- सम्प्रज्ञात समाधि (सविकल्प अथवा सबीज समाधि)
- असम्प्रज्ञात समाधि (निर्विकल्प अथवा निर्बीज समाधि)

Stages

- वितर्क
- विचार
- आनन्द
- अस्मित

Yoga enhances Stress management and emotional well being:

1. **Regulates the cortisol hormone-** Regular practice helps reduce the levels of cortisol, the main stress hormone allowing the body to return in a balanced state.
2. **Activate parasympathetic nervous system**- Through deep breathing, yoga moves the body from a state of alertness to a more relaxed state.
3. **Enhances GABA levels-** Research shows yoga increases Gamma- aminobutyric acid in the brain which is linked with reduce anxiety and improved mood.
4. **Improves heart rate variability** – Higher HRV is a sign of strong nervous system, and yoga is the one of the best ways to improve it.
5. **Develop mindfulness-** Yoga teaches you to observe your thoughts and feelings without judgement, helping you break the cycle of emotional reactivity.
6. **Physical release of trauma-** Emotions are often stored as physical tension in the body and yoga posture help release these blockages
7. **Focuses the wandering mind- T**he concentration required to balance poses acts as a moving meditation, helping to quiet unwanted thoughts.
8. **Regulates sleep pattern-** Practices like yoga nidra improves sleep quality, which is essential for mental health
9. **Promotes neuroplasticity**- Regular meditation and movement can causes changes in the brain, particularly in the areas related to memory and emotional control.
10. **Encourages self compassion**- Yoga increases the principle of Ahimsa which means being kind to yourself during tough emotional times
11. **Improves respiratory efficacy**- Breathwork technique like pranayama increases oxygen flow to the brain, helping to clear mental fog.
12. **Builds Resilience-** Practice challenging poses teaches the mind to stay calm and steady even when the body is uncomfortable.
13. **Balances the endocrine system-** Certain poses like inversion and twists stimulate glands that produce hormone that helps stabilize mood.
14. **Provides a sense of agency-** Taking action for your health gives a psychological boosts and a sense of control over your life.
15. **Integration of mind and body- Y**oga connects the body with the mind, leading to a more grounded and concious way of living.

Conclusion

Yogic practice offers a strong solution to the stress and disconnection we often feels in today's fast paced world. Yoga is more than just the exercise it's a way of understanding and managing ourselves that connects your body and mind. By using asana to relieve tension in the body, pranayama to calm the nervous system, and Dhayan to bring the mind back to the present, individuals can develop a deep sense of inner calm. At its core, yoga helps build strength and balance. The path to emotional health doesn't depend on difficult poses, but rather on staying present and showing up regularly. As the body becomes more flexible and breathing becomes smoother, the mind naturally calm down, leading to a state of equanimity- being steady and peaceful even when life gets challenging.

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THE EFFECT OF A STRUCTURED YOGA PROGRAMME ON THE PREVENTION OF OVERUSE INJURIES IN ATHLETES.

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Abstract

Overuse injuries are common among athletes due to repetitive training loads, biomechanical imbalances, and insufficient recovery. Preventive strategies focusing on flexibility, balance, and neuromuscular control are essential. Yoga, integrating physical postures, breathing techniques, and relaxation, may help reduce injury risk by improving functional movement and recovery. The objective of this study was to examine the effect of a structured yoga programme on the prevention of overuse injuries and selected injury-risk factors in athletes. Thirty male athletes (age 18–25 years) were randomly assigned into two groups: a Yoga Group (n=15) and a Control Group (n=15). The yoga group followed a yoga training programme alongside regular sports training, while the control group followed regular sports training only. Outcome measures included the incidence of overuse injuries, flexibility, balance, functional movement score (FMS), and perceived recovery status. Pre- and post-test data were analyzed using paired and independent t-tests. After 08 weeks, the yoga group showed a significantly lower incidence of overuse injuries (13.3%) compared to the control group (33.3%). Significant improvements were observed in flexibility, balance, functional movement, and perceived recovery in the yoga group ($p < 0.05$). Yoga appears to be an effective preventive strategy for reducing overuse injuries and improving injury-related physical and functional parameters in athletes.

Conclusion

Yoga training significantly reduced overuse injury incidence and improved flexibility, balance, functional movement, and recovery in athletes. Therefore, yoga can be recommended as an effective and practical preventive strategy for athletes, especially in university-level sports programs.

Keywords: Structured Yoga Programme on the Prevention of Overuse Injuries in Athletes.

Introduction

Overuse injuries develop gradually due to repetitive mechanical stress exceeding the tissue's ability to recover. Such injuries are prevalent in both team and individual sports and often lead to decreased performance and training interruptions. Understanding these injury mechanisms is a key component of preventing injuries in sport. Furthermore, a dynamic model of etiology highlights the recursive nature of risk and causation in sport injuries.

Traditional preventive approaches emphasize conditioning, flexibility training, and load management. For instance, strength training and core training have been evaluated for their effects on preventing sports injuries and improving balance. However, yoga offers a holistic practice combining asanas (postures), pranayama (breathing techniques), and relaxation. Research suggests that yoga enhances flexibility, balance, proprioception, and recovery—factors directly linked to injury prevention. Yoga has been shown to offer physical and perceptual benefits, positively effect cardiorespiratory fitness, and improve musculoskeletal pain and disability. Despite evidence outlining the health benefits of yoga, limited experimental studies have examined yoga specifically as a preventive strategy for overuse injuries in athletes, particularly in small-sample controlled settings. Therefore, this study aims to evaluate the effectiveness of yoga in preventing overuse injuries among athletes using a controlled experimental design.

Objectives of the Study

7. To determine the effect of yoga on overuse injury incidence in athletes.

8. To assess the effect of yoga on flexibility.
9. To examine changes in balance and functional movement.
10. To evaluate perceived recovery status following yoga training.

Hypotheses

3 **H_1 :** Yoga training will significantly reduce overuse injuries in athletes.
4 **H_2 :** Yoga training will significantly improve flexibility, balance, and functional movement.
5 **H_3 :** Yoga training will significantly enhance perceived recovery.

Review of Literature

Bahr & Krosshaug (2005) explained that overuse injuries occur when repetitive mechanical loading exceeds tissue recovery capacity. They emphasized that injury prevention must focus on correcting biomechanical faults, improving neuromuscular control, and enhancing movement efficiency rather than relying solely on rehabilitation after injury. (British Journal of Sports Medicine)

Cowen & Adams (2005) reported that regular yoga asana practice significantly improves flexibility, balance, muscular endurance, and body awareness. These improvements help reduce abnormal stress on muscles and joints, which are primary contributors to overuse injuries in athletes. (Journal of Bodywork and Movement Therapies)

Myer et al. (2014) demonstrated that athletes with poor Functional Movement Screen (FMS) scores had a higher risk of musculoskeletal and overuse injuries. The study suggested that movement-based corrective interventions, such as yoga, can reduce injury risk by improving mobility and stability. (Journal of Sports Rehabilitation)

Sovová et al. (2015) examined the physiological effects of yoga and found improvements in cardiorespiratory efficiency and recovery capacity. Enhanced recovery reduces cumulative fatigue, which is a major risk factor for repetitive stress and overuse injuries in athletes. (Journal of Alternative and Complementary Medicine)

McGill (2010) emphasized that inadequate core stability and poor postural control increase mechanical stress on peripheral joints. Yoga postures that activate deep trunk muscles were suggested as effective tools for improving spinal stability and reducing injury risk. (Strength and Conditioning Journal)

Polsgrove, Eggleston, and Lockyer (2016) found that a 10-week yoga intervention significantly improved flexibility and balance in collegiate athletes compared to controls. Improved balance and flexibility are critical for reducing compensatory movements that often lead to overuse injuries. (International Journal of Yoga)

Arbo et al. (2020) conducted a feasibility study and reported that yoga effectively reduced antecedents of sports-related injuries such as fatigue, poor movement awareness, and psychological stress. The study supported yoga as a practical preventive intervention in athletic training programs. (Complementary Therapies in Medicine)

Hewett et al. (2016) highlighted that neuromuscular training programs focusing on movement control and balance significantly reduce injury rates. Yoga's emphasis on controlled movement and proprioception aligns closely with these neuromuscular injury-prevention principles. (American Journal of Sports Medicine)

Gupta et al. (2016) reported significant improvements in flexibility, balance, and musculoskeletal efficiency among university athletes following a yoga-based intervention. The authors suggested that yoga may reduce injury susceptibility by improving functional fitness and postural alignment. (Indian Journal of Physiology and Pharmacology)

Cramer et al. (2013) reviewed the safety and musculoskeletal effects of yoga and concluded that yoga has a low risk of adverse events when properly supervised. They emphasized that structured and progressive yoga programs can be safely integrated into athletic training for injury prevention. (PLoS ONE)

Methodology

Study Design and Participants this study utilized an experimental pre-test and post-test control group design. The participants consisted of thirty male athletes (n = 30) selected from university sports teams, specifically football, athletics, and kabaddi. The participants ranged in age from 18 to 25 years. They were randomly assigned into two

groups: the Yoga Group (YG) consisting of 15 participants, and the Control Group (CG) consisting of 15 participants.

Intervention The intervention was conducted over a duration of 08 weeks. The yoga group followed a 12-week yoga training programme design in addition to their regular sports training. Sessions were held at a frequency of 3 sessions per week, with each session lasting 60 minutes. The control group continued their routine sports training without the inclusion of yoga.

The structured yoga programme included the following components:

- **Warm-up:** Warm-up and loosening exercises.
- **Asanas:** Tadasana, Trikonasana, Virabhadrasana, Bhujangasana, Paschimottanasana, and Vrikshasana.
- **Pranayama:** Nadi Shodhana and Bhramari breathing techniques.
- **Relaxation:** Shavasana.

Variables and Tools Several variables were measured using specific tools to assess the effectiveness of the intervention.

- Overuse injury incidence was tracked via medical observation and injury records.
- Flexibility was measured using the Sit-and-Reach Test.
- Balance was assessed using the Stork Balance Test.
- Functional movement was evaluated through the Functional Movement Screen (FMS).
- Perceived recovery was quantified using the PRS Scale ranging from 0 to 10.

Statistical Analysis Data analysis involved calculating the Mean and Standard Deviation. A paired t-test was used for within-group comparsons, and an independent t-test was utilized for between-group comparisons. The level of significance for all tests was set at 0.05.

Results

Overuse Injury Incidence Following the 08-week intervention, the yoga group demonstrated a significantly lower incidence of overuse injuries.

Group	Number of Injuries	Percentage
Yoga Group (n=15)	2	13.3%
Control Group (n=15)	5	33.3%

Physical and Functional Variables (Post-Test) Significant improvements were observed in flexibility, balance, functional movement, and perceived recovery in the yoga group, with p-values indicating significance at the 0.05 level.

Variable	Yoga Group (Mean ± SD)	Control Group (Mean ± SD)	t-value
Flexibility (cm)	34.6 ± 4.1	29.2 ± 3.8	3.52*
Balance (sec)	46.8 ± 6.5	38.4 ± 5.9	3.12*
FMS Score	16.9 ± 1.4	14.8 ± 1.6	3.45*
PRS Score	7.8 ± 1.1	6.1 ± 1.2	3.09*

Significant at 0.05 level

Discussion

The findings indicate that athletes who practiced yoga demonstrated fewer overuse injuries and better functional fitness than those following routine training alone. The incidence of overuse injuries was markedly lower in the yoga group at 13.3%, compared to 33.3% in the control group. Improvements in flexibility and balance may have reduced mechanical stress on joints and soft tissues. Enhanced functional movement and recovery perception suggest better neuromuscular control and physiological readiness.

These results align with existing evidence indicating that yoga improves musculoskeletal balance and recovery, making it a suitable complementary injury-prevention strategy in sports. Functional movement is vital in injury prevention, and interventions that target these mechanics play a key role in sports medicine.

Limitations and Recommendations This study has several limitations, notably a small sample size of 30 participants, a short intervention duration, and a demographic restricted to male athletes only. For future research, it

is recommended that larger sample studies should be conducted. Additionally, female athletes should be included to broaden the applicability of the findings, and long-term follow-up is recommended to assess the sustained impact of yoga on injury prevention.

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IMPACT OF SPIRAL-BASED MULTI-PLANAR INTEGRATIVE CONDITIONING ON CORE ENDURANCE AND EXPLOSIVE PERFORMANCE IN COMPETITIVE FEMALE ARTISTIC GYMNASTS: A PRE–POST EXPERIMENTAL STUDY

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Introduction

Artistic gymnastics is a high-intensity sport involving repetitive jumping, tumbling, rotational movements, and aerial skills that require high levels of neuromuscular coordination and explosive power. Female artistic gymnasts are often subjected to high ground reaction forces during landing, large ranges of spinal extension, and trunk rotations in multiple planes, which, when combined, impose significant biomechanical loads on the musculoskeletal system. Effective force transfer from the trunk to the lower limbs is critical for optimal skill performance, landing, and injury prevention.

Core stability is an essential component of gymnastics, as it provides proximal control for distal movement. The trunk acts as a stabilizing organ that controls the distribution of forces during take-off, aerial rotation, and landing. Trunk instability has been linked to changes in landing patterns, increased knee valgus, poor force absorption, and decreased explosive force. Moreover, poor neuromuscular coordination in the transverse and frontal planes could affect the accuracy of movement patterns in rotational skills, which are basic to artistic gymnastics skills.

Explosive force, especially vertical jump ability and reactive strength, is also a factor that determines success in gymnastics. It is directly related to tumbling height, skill distance, and dynamic movement between skills. Although traditional strength and conditioning training focuses on sagittal plane strengthening and plyometric training, it may not adequately target trunk stability in multiple planes and rotational stability, which are essential components of gymnastics skills.

Landing biomechanics also play an equally important role, as gymnasts are known to impact forces several times their body weight during dismounts and tumbling passes. Incorrect landing mechanics, such as excessive dynamic knee valgus, trunk instability, or delayed muscle activation, can have a detrimental effect on performance quality and cumulative joint loading. As such, training programs aimed at improving trunk stiffness, neuromuscular timing, and controlled multi-planar movement may help improve landing efficiency and performance sustainability.

In recent years, yogic movement therapies have also received attention for their potential use in improving flexibility, balance, proprioception, and muscular endurance. Traditional yogic asanas include controlled postural alignment, breathing-coordinated movements, and sustained muscle activation. Recent studies have indicated that yoga-based training programs may help improve neuromuscular regulation, proprioceptive perception, and core endurance in athletic populations. However, most studies have been conducted on general fitness outcomes, stress management, and injury rehabilitation rather than sport-specific performance.

Spiral-oriented yogic conditioning, rooted in multi-planar movement concepts and spiral control methods, combines controlled trunk rotation movements, diagonal loading patterns, and breathing-synchronized neuromuscular activation. These movement patterns are very similar to the rotational and transverse plane movements required in artistic gymnastics. Through the focus on three-dimensional trunk control and dynamic alignment, spiral-oriented conditioning could potentially improve proximal joint stability, optimize force transmission, and improve landing technique.

Although the theoretical application of spiral-oriented training methods appears relevant to artistic gymnastics, there is a lack of empirical studies investigating the impact of such training methods on performance-related variables in competitive gymnasts. Current conditioning regimens are mostly linear in their strengthening and plyometric progression, with minimal incorporation of yogic spiral movement patterns. Moreover, the correlation between spiral-oriented yogic conditioning and objective variables such as core endurance, explosive power, and landing biomechanics has yet to be explored.

In light of the biomechanical complexity of artistic gymnastics and the growing trend towards integrative training models in sports sciences, there is a need to examine innovative, performance-related interventions that merge traditional yogic concepts with modern athletic conditioning. Therefore, the present study aims to evaluate the effect of spiral-based yogic conditioning on core stability, explosive power, and landing biomechanics in competitive female artistic gymnasts.

Research Gap

While core stability and explosive power are acknowledged to be essential factors of success in artistic gymnastics, the existing conditioning programs have been found to focus largely on the sagittal plane strengthening, plyometric training, and linear resistance training. While these methods are effective in enhancing overall strength and power, they may not be adequate in dealing with the complex multi-planar and rotational movements that are involved in gymnastics.

Recent studies have emphasized the need for trunk stability, neuromuscular timing, and proximal-to-distal force transmission for optimal landing techniques and minimizing compensatory movement patterns. However, existing performance training models in gymnastics fail to provide systematic interventions for transverse plane control and spiral movement integration. Since artistic gymnastics skills involve rotational torque, controlled spinal extension, and diagonal loading patterns, there is a clear mismatch between the existing training models and sport-specific biomechanics.

Yogic exercise has been shown to be beneficial in improving flexibility, balance, proprioception, and muscular endurance in both athletic and non-athletic individuals. However, the preponderance of research evaluating yoga-based interventions has been directed at general wellness endpoints, injury rehabilitation, and psychological variables rather than objective performance outcomes such as explosive strength or landing technique. Moreover, yoga research is rarely integrated with systematic biomechanical analysis or sport-related functional performance evaluation.

Spiral-based yogic conditioning, which combines systematic trunk rotation, diagonal stabilization, and breath-synchronized neuromuscular activation, would seem to have a high degree of theoretical congruity with the three-dimensional movement demands of artistic gymnastics. However, despite this high degree of theoretical congruity, there appears to be a conspicuous lack of empirical research evaluating the performance-based consequences of spiral-based yogic movement patterns in competitive gymnasts.

To the present, there has not been an experimental investigation evaluating the effect of spiral-based yogic conditioning on core stability, explosive strength, and landing biomechanics in a competitive female artistic gymnastics population.

Therefore, there is a critical need to evaluate whether incorporating spiral-based yogic conditioning into regular training can produce measurable improvements in performance-related outcomes in competitive female artistic gymnasts.

Methods

To evaluate the effectiveness of spiral-based yogic conditioning on performance parameters in competitive female artistic gymnasts, a pre-test and post-test experimental study design was adopted.

Study Design

A single-group pre–post experimental design was conducted over eight weeks. Baseline measurements of core stability and explosive power were recorded prior to the intervention. Post-intervention assessments were performed at the end of the training period.

Participants

Thirty competitive female artistic gymnasts aged 15–22 years were recruited from gymnastics academies and collegiate sports centers through convenience sampling. All participants had a minimum of three years of structured training experience and were actively engaged in regular competitive practice.

Inclusion Criteria:

- Competitive female artistic gymnasts
- Age between 18–22 years
- Minimum 3 years of structured gymnastics training
- Training frequency ≥5 days per week
- No current musculoskeletal injury

Exclusion Criteria:

- Recent lower limb or spinal injury (within 6 months)
- History of spinal surgery
- Neurological disorders
- Participation in structured yoga training within the last 3 months

Written informed consent was obtained from all participants. Ethical clearance was obtained from the Institutional Ethics Committee.

Intervention Protocol

Participants received spiral-based yogic conditioning on a thrice-weekly basis for eight weeks, in addition to their existing gymnastics training.

Spiral-based yogic conditioning is a systematic multi-planar movement strategy that has been developed from traditional yogic exercises with a focus on rotational control, diagonal loading, and breath-synchronized neuromuscular activation. Unlike traditional yoga exercise routines, which are largely focused on flexibility and static positioning, spiral-based yogic conditioning involves controlled trunk rotation, dynamic movement transitions, and progressive stabilization challenges that simulate the multi-planar movement requirements of artistic gymnastics.

The spiral-based yogic conditioning program was focused on transverse plane and frontal plane trunk muscle activation, proximal stability, and coordinated force transfer through the kinetic chain. All exercises were conducted under direct supervision to ensure optimal positioning, breathing, and neuromuscular control. The program was conducted thrice a week for eight weeks, with each session lasting approximately 40 minutes.

Table: Week-Wise Spiral-Based Yogic Conditioning Protocol

Week	Training Focus	Key Exercises	Sets	Hold Duration	Progression Strategy
1–2	Foundational trunk activation & breath coordination	Parivrtta Utkatasana, Static spiral lunges, Basic diagonal plank	2	20–25 sec	Emphasis on alignment and controlled breathing
3–4	Rotational stabilization & endurance	Parivrtta Trikonasana, Side plank with rotation, Dynamic spiral lunges	3	25–30 sec	Increased hold time and rotational control
5–6	Dynamic diagonal loading & balance integration	Virabhadrasana III with rotation, Diagonal plank reach	3	30–35 sec	Limb integration and reduced base of support
7–8	Advanced spiral transitions & neuromuscular challenge	Flow-based spiral sequence, Controlled rotational transitions	3	35–40 sec	Increased complexity and movement speed

The spiral patterned conditioning method is intended to improve proximal stability through the stimulation of coordinated activation of the deep trunk muscles in various planes of movement. The addition of stabilization with breath control could potentially facilitate enhanced regulation of intra-abdominal pressure and anticipatory muscle activation, which are essential for effective force transfer during explosive movements. The addition of rotational control and balance exercises could also potentially facilitate enhanced neuromuscular patterning and dynamic postural stability, thus aiding in the improvement of landing stability and explosive ability in gymnasts.

Outcome Measures

1. Core Stability

Core endurance was assessed using the McGill Core Endurance Test Battery, including:

- Trunk flexor endurance
- Trunk extensor endurance
- Right and left side bridge

Time was recorded in seconds. The composite endurance score was used for analysis.

2. Explosive Power

Explosive performance was evaluated using the Vertical Jump Test. Participants performed three maximal countermovement jumps, and the best value (in centimeters) was recorded.

Statistical Analysis

Descriptive statistics were performed, and results were expressed as mean ± standard deviation. Normality of data was tested using the Shapiro-Wilk test.

Paired t-tests were employed to compare pre-test and post-test measures of core endurance and vertical jump height. The level of significance was set at $p < 0.05$. Effect size was calculated using the formula for Cohen's d.

Results

The pre-intervention assessment established baseline values for core stability and explosive performance among the competitive female artistic gymnasts. The mean McGill Core Endurance composite score at baseline was 148.6 seconds (SD = 18.4), while the mean vertical jump height was 34.8 cm (SD = 4.6). These baseline measurements reflect the trunk endurance and explosive capacity typical of trained gymnastic athletes.

Table 1: Descriptive Statistics (Pre-Test Vs Post-Test)

Outcome Measure	Pre-test Mean ± SD	Post-test Mean ± SD
McGill Core Endurance (sec)	148.6 ± 18.4	176.9 ± 20.2
Vertical Jump Height (cm)	34.8 ± 4.6	38.7 ± 4.9

As shown in Table 1, improvements were observed in both core endurance and vertical jump height following the eight-week spiral-based yogic conditioning program.

Paired t-test analysis was performed to determine whether these improvements were statistically significant.

Table 2: Within-Group Comparison (Paired T-Test Analysis)

Outcome Measure	Mean Difference	t value	p value	Effect Size (Cohen's d)
McGill Core Endurance (sec)	+28.3	9.21	<0.001	1.28
Vertical Jump Height (cm)	+3.9	8.14	<0.001	1.05

The analysis revealed a statistically significant increase in core endurance following the intervention ($t = 9.21$, $p < 0.001$), with a large effect size ($d = 1.28$), indicating substantial enhancement in trunk endurance capacity.

Similarly, vertical jump height demonstrated significant improvement post-intervention ($t = 8.14$, $p < 0.001$), with a large effect size ($d = 1.05$), reflecting meaningful gains in explosive power.

Overall, the findings indicate that the eight-week spiral-based yogic conditioning program resulted in significant improvements in both proximal trunk stability and explosive performance in competitive female artistic gymnasts.

Discussion

The present study aimed to investigate the effect of spiral-based yogic conditioning on core stability and explosive power in competitive female artistic gymnasts. The findings demonstrated statistically significant and practically meaningful improvements in both trunk endurance and vertical jump performance following the eight-week intervention.

The large increase in McGill core endurance values indicates improved proximal stability and better regulation of trunk stiffness. In artistic gymnastics, the trunk serves as the force-transmission center, allowing for efficient energy transfer from the lower limbs during take-off and deceleration during landing. Improved trunk endurance would have contributed to better neuromuscular coordination in various planes, especially in rotational and diagonal movements characteristic of gymnastic exercises. The large effect size value for core endurance indicates that the loading concept based on spirals could offer a training stimulus that goes beyond conventional conditioning exercises in the sagittal plane.

The increase in vertical jump height also supports the practical relevance of the training intervention. In gymnasts, explosive power is not only a function of lower-limb strength but also of effective proximal stabilization that prevents energy loss along the kinetic chain. With a focus on trunk activation in synchrony with breathing, rotational loading, and multi-planar stability, the yogic conditioning program based on spirals may have optimized rate of force development and neuromuscular timing. The 3.9 cm average increase in vertical jump height is a significant improvement in performance potential, especially in a trained athletic group where small improvements are hard to come by.

These results confirm the theoretical assumption that multi-planar, spiral-oriented trunk exercise is more in line with the biomechanical requirements of artistic gymnastics than linear strengthening methods. Artistic gymnastics movements per se include the generation of rotational forces, control of trunk extension, and stabilization during aerial transitions. Training programs that simulate these three-dimensional movement requirements could potentially lead to better neuromuscular adaptations.

Moreover, the incorporation of controlled breathing patterns in spiral-based movement patterns may have also contributed to the observed improvements in intra-abdominal pressure regulation and trunk stiffness modulation. Effective breathing and movement coordination is a key determinant of anticipatory trunk muscle activation, which is essential for explosive movement and force absorption. This neuromuscular coordination principle may have contributed to the observed improvements.

Notably, the improvements were attained over an eight-week period without displacing conventional gymnastics training, indicating that spiral-based yogic conditioning can be effectively incorporated into existing conditioning models. The extent of improvement observed in both core stability and explosive performance capabilities underscores the utility of integrative, yoga-inspired movement principles as performance-enhancing modalities rather than purely rehabilitative or flexibility-focused interventions.

In summary, the findings of the current study add to the emerging paradigm of integrative sports conditioning, where conventional yogic movement patterns are effectively incorporated into a modern performance science paradigm. Spiral-based yogic conditioning may be a useful adjunct training modality that can improve trunk stability and explosive performance capabilities in female artistic gymnasts.

Conclusion

The results of the current study clearly show that an eight-week yogic conditioning program based on the spiral concept was able to improve core stability and explosive strength in female artistic gymnasts. The marked improvements in trunk endurance and vertical jump performance clearly indicate that yogic movement patterns with a multi-planar and rotationally oriented concept can have a positive effect on trunk stabilization and force transmission efficiency.

The close alignment of the yogic conditioning program with the three-dimensional biomechanical requirements of artistic gymnastics appears to provide a clear performance advantage over the linear strengthening concept. The results clearly indicate the need for the integration of structured and performance-oriented yogic movement patterns into the current gymnastics conditioning framework.

Limitations

Despite the positive findings, there are some limitations that need to be acknowledged. The study was conducted using a single-group pre-post experimental design, which does not allow the attribution of performance enhancement solely to the intervention. The sample size was not very large and was restricted to female artistic gymnasts, which does not allow generalization to male athletes or other sports.

Moreover, only two outcome measures related to performance were used. Although core endurance and vertical jump height are important indicators of trunk stability and explosive power, the addition of biomechanical motion analysis or reactive strength would have given more information regarding movement changes.

Recommendations

Future studies should employ randomized controlled designs to better establish causal links between spiral-based yogic conditioning and performance improvement. A larger sample population that includes male gymnasts, elite athletes, and other rotational sports may be necessary to better establish the generalizability of this training paradigm.

Future studies should also examine the effects of spiral-based conditioning on landing mechanics, rate of force development, and sport-specific skill execution. Longitudinal studies examining performance maintenance and injury rates post-integrative spiral-based training are also suggested.

The combination of biomechanical analysis software, electromyographic analysis, and force plate analysis may offer greater insights into the neuromuscular mechanisms underlying performance improvements.

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Conflict Of Interest

The authors declare no conflict of interest

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IMPACT OF TRATAKA-BASED YOGIC EYE TRAINING ON ANTICIPATORY VISUAL PROCESSING IN COMPETITIVE BADMINTON PLAYERS: A PRE–POST EXPERIMENTAL STUDY

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Introduction

Badminton is one of the fastest racquet sports in the world. It involves quick shuttlecock movements, sudden changes in direction, and rapid visual reactions. Professional badminton players must process visual information in milliseconds. They need to predict their opponent's movements and respond accurately to visual cues while facing very tight time limits. During a smash, the shuttlecock can reach speeds of over 300 km/h.

Anticipatory visual processing is an athlete's ability to predict the path of a moving object by looking at initial visual cues. In badminton, this means observing the opponent's body stance, racket position, and shuttlecock angle before they hit the shuttlecock. Strong anticipatory visual processing helps the athlete perform planned movements, which is essential for both defense and offense in badminton. Delays in visual processing or issues with eye coordination can slow reaction time and impact an athlete's performance during a game.

The visual system is essential for performing well in badminton. The oculomotor system must operate effectively, comprising saccadic eye movements, smooth pursuit eye movements, fixation stability, and the ability to detect peripheral stimuli. Each of these components is vital for noticing the shuttlecock and grasping the surrounding environment. Problems such as delayed saccadic responses and unstable fixation can hinder the speed at which a player processes visual information. This can affect their agility and precision in badminton. While training programs typically emphasize agility, strength, and endurance, they frequently neglect the visual and neurological elements crucial for sports performance..

Recently, sports science studies have emphasized the role of vision training in improving sporting performance. Reaction time, eye-hand coordination, and peripheral awareness training programs have yielded encouraging outcomes in racquet sports. Nevertheless, the majority of vision training studies employ computerized training, light reaction equipment, or optical devices. There is a dearth of research on traditional, non-instrumented, neurocognitive approaches that could potentially improve the efficiency of oculomotor control and attentional abilities.

Trataka is a yogic technique where the focus is on an object using the eyes. This technique has been derived from Hatha Yoga practices, where the focus is on an external object, such as a candle flame, followed by internal visualization. Trataka is said to increase concentration, decrease small eye movements, and fix the attention. From a neurophysiological point of view, sustained gaze can increase the stability of fixation, control of saccadic eye movements, and brain networks associated with visual attention

Recent findings show that meditation and focused attention techniques may affect how efficiently neural processes work in the visual cortex and frontoparietal attention networks. Improved performance in sustained attention, reaction time, and perceptual accuracy has been seen after mindfulness-based interventions. However, the use of Trataka as a systematic eye movement training method in competitive sports has not been studied yet.

Because of the high visual demands of badminton, the enhancement of anticipatory visual processing skills

could offer a great performance advantage. Potentially stabilizing fixation, reducing saccadic latency, and refining visuomotor control, yogic eye training procedures based on Trataka could offer a novel complementary approach to traditional badminton training. Unlike technology-based vision training devices, Trataka is very inexpensive, easy to perform, and easily integrable into existing training regimens.

Despite its potential use in fast-paced racket sports like badminton, there is a significant lack of studies examining how yogic gaze stabilization techniques affect measurable visual performance in competitive badminton players. Most existing research focuses on agility, strength, and aerobic capacity, with very little emphasis on the neurovisual aspects of anticipatory performance.

Because of the absolutely crucial role of visual anticipation in badminton and the current interest in integrative sports conditioning paradigms, there is a clear need to investigate innovative, evidence-based approaches that synergistically integrate traditional yogic practices with modern sports neuroscience.

Therefore, in this study aims to evaluate the effect of Trataka-based yogic eye training on anticipatory visual processing in badminton players.

Research Gap

Anticipatory visual processing is one of the key factors that affects performance in fast racquet sports like badminton. The ability to quickly process information about opponents, predict the shuttle's path, and initiate pre-planned movements plays a significant role in reaction time and efficiency. However, despite this knowledge, traditional badminton training programs still focus mainly on physical conditioning, including agility, leg strength, endurance, and tactics. Neurovisual training programs have been added, but they remain relatively basic by comparison.

Recent developments in sports vision research have introduced new, technology-based methods like stroboscopic training, light reaction training, and computerized visual training programs. These methods aim to improve reaction time and hand-eye coordination. While effective, they often require specialized equipment and laboratory settings, which can be costly. This makes them harder to integrate into standard athletic training. Additionally, these methods typically focus on general reaction time improvement rather than specific skills such as fixation stability, saccadic accuracy, or anticipatory visual prediction.

Yogic practices, especially Trataka, have been traditionally linked with the following advantages: concentration, control of attention, and improved vision. Recent studies on meditation have concluded that focused attention methods can affect cortical attention networks, improve sustained attention, and decrease cognitive processing time. However, the use of Trataka as a specific eye training method in competitive sports has not been extensively investigated. Most of the research studies on yoga have been linked with flexibility, balance, stress management, or overall wellness, without any specific aim on sports-related objective visual performance parameters.

Furthermore, there is a significant lack of experimental research studies attempting to investigate the effects of yogic gaze stabilization methods on objective parameters such as visual reaction time, accuracy of anticipatory timing, or visuomotor processing speed in badminton players.

Based on available evidence, there is a lack of experimental studies evaluating the effects of Trataka-based eye training on anticipatory visual processing in competitive badminton players.

Methods

To evaluate the effectiveness of Trataka-based yogic eye training on anticipatory visual processing in competitive badminton players, a pre-test and post-test experimental study design was taken.

Study Design

A single-group pre–post experimental design was conducted over six weeks. Baseline assessments of anticipatory visual processing and reaction parameters were recorded prior to the intervention. Post-intervention measurements were obtained at the end of the training period to determine the effect of Trataka-based eye training.

Participants

Thirty competitive badminton players aged 18–25 years were recruited from university teams and professional badminton academies through convenience sampling. All participants were actively involved in structured training and competitive play.

Inclusion Criteria

- Competitive badminton players
- Age between 18–25 years
- Minimum 3 years of structured badminton training
- Training frequency ≥4 days per week
- Normal or corrected-to-normal vision

Exclusion Criteria

- History of visual impairment not corrected by lenses
- Neurological disorders affecting vision or reaction time
- Recent upper limb or lower limb injury (within 3 months)
- Participation in structured vision training or yoga-based eye exercises within the past 3 months

All participants provided written informed consent prior to the data collection. Ethical clearance was granted by the Institutional Ethics Committee

Intervention Protocol

For six weeks, participants undertook Trataka-based eye exercises five days per week along with their usual badminton training schedule

Trataka is a classical yogic gaze stabilization technique involving sustained fixation on a stationary visual target followed by internal visualization. Unlike conventional vision training methods that utilize external visual stimuli or technology-based drills, Trataka emphasizes intrinsic oculomotor control, fixation stability, attentional regulation, and reduction of involuntary ocular micro-movements.

The intervention was designed to progressively challenge fixation endurance, attentional stability, and visual concentration capacity. All sessions were supervised to ensure correct posture, gaze alignment, and adherence to breathing coordination.

Each session lasted approximately 20 minutes and consisted of:

- Centered sitting posture with neutral spine alignment
- Candle flame placed at eye level at a distance of one meter
- Sustained, unblinking gaze fixation
- Internal visualization of the flame after eye closure
- Controlled diaphragmatic breathing during practice

Progression was implemented by increasing fixation duration, reducing blink frequency, and incorporating dual-attention elements during later weeks

Table: Week-Wise Trataka-Based Yogic Eye Training Protocol

Week	Training Focus	Key Components	Sets	Fixation Duration	Progression Strategy
1–2	Foundational fixation stability	Candle flame gazing, controlled breathing, internal visualization	3	20–30 sec	Emphasis on posture alignment and minimizing blinking

3–4	Sustained gaze endurance	Extended flame fixation, Visualization accuracy, breath synchronization	4	30–40 sec	Increased fixation duration and reduced rest intervals
5	Attentional control integration	Candle fixation with peripheral awareness cueing	4	40–50 sec	Introduction of mild external distraction control
6	Advanced visual concentration challenge	Prolonged fixation + rapid internal visualization recall	5	50–60 sec	Enhancedcognitive Engagement and reduced blinking frequency

The Trataka protocol was intended to improve oculomotor efficiency by enhancing fixation stability and reducing unnecessary saccadic intrusions. Sustained gaze stabilization may facilitate improved neural efficiency within visual attentional networks, potentially contributing to faster visuomotor processing and improved anticipatory performance during shuttle tracking.

Outcome Measures

1. Choice Reaction Time

Participants responded to multiple directional visual stimuli requiring rapid decision- making. Mean reaction time (ms) was recorded.

2. Eye–Hand Coordination Test

Measured using a standardized wall toss test. Number of successful catches within 30 seconds was recorded.

Statistical Analysis

Descriptive statistics were calculated and expressed as mean ± standard deviation for both outcome measures. The normality of data distribution was assessed using the Shapiro–Wilk test prior to inferential analysis.

Paired t-tests were employed to compare pre-test and post-test values of Choice Reaction Time and Eye–Hand Coordination performance. The level of statistical significance was set at $p < 0.05$. Effect size was calculated using Cohen's d to determine the magnitude of change following the six-week Trataka-based yogic eye training intervention.

Results

The baseline assessment demonstrated comparable pre-intervention values between the experimental and control groups for both choice reaction time and eye–hand coordination performance.

Table 1: Descriptive Statistics (Pre-Test & Post-Test)

Outcome Measure	Pre-test Mean ± SD	Post-test Mean ± SD
Choice Reaction Time (ms)	412.6 ± 28.4	374.8 ± 24.6
Eye–Hand Coordination (No. of catches)	21.4 ± 3.2	26.8 ± 3.5

TABLE 2: WITHIN-GROUP COMPARISON (PAIRED T-TEST)

Outcome Measure	Mean Difference	t value	p value	Effect Size (Cohen's d)
Choice Reaction Time	-37.8 ms	6.42	<0.001	1.04
Eye–Hand Coordination	+5.4	5.87	<0.001	0.95

TABLE 3: BETWEEN-GROUP COMPARISON (INDEPENDENT T-TEST ON POST-TEST VALUES)

Outcome Measure	Mean Difference	t value	p value
Choice Reaction Time	-26.9 ms	2.87	0.008
Eye–Hand Coordination	+4.7	3.12	0.004

Interpretation:

Post-test comparison shows statistically significant superiority of the Trataka group over control group.

Discussion

This study aimed to evaluate the effect of Trataka-based yogic eye training on anticipatory visual processing in competitive badminton players. The findings demonstrated statistically significant improvements in choice reaction time and eye–hand coordination performance in the experimental group following six weeks of intervention, whereas the control group showed no significant changes. These results suggest that structured Trataka training may positively influence visuomotor processing efficiency and sport-specific coordination in badminton athletes.

The significant reduction in choice reaction time observed in the experimental group indicates enhanced decision-making speed and anticipatory processing ability. In badminton, rapid interpretation of shuttle trajectory and opponent cues is essential for timely motor execution. Trataka, through sustained gaze fixation and attentional stabilization, may reduce unnecessary saccadic intrusions and improve fixation control, thereby optimizing the efficiency of visual signal processing. Improved cortical attentional regulation and reduced visual noise could have contributed to faster stimulus discrimination and motor response selection, ultimately decreasing reaction latency.

Similarly, the improvement in eye–hand coordination performance suggests enhanced integration between visual input and upper limb motor output. Badminton requires continuous shuttle tracking, precise timing, and coordinated racket positioning. The repetitive practice of steady gaze fixation followed by internal visualization may strengthen visuospatial representation and sensorimotor synchronization. Enhanced visual concentration likely facilitated better timing precision and coordinated motor execution during the wall toss task, reflecting improved neuromuscular integration.

The lack of significant improvement in the control group indicates that routine badminton training alone may not sufficiently target intrinsic oculomotor efficiency or attentional control mechanisms. Conventional training predominantly focuses on agility drills, technical stroke refinement, and endurance conditioning, with limited emphasis on structured visual-neurological enhancement. The current findings highlight the potential value of integrating non-instrumented neurovisual training strategies into sports conditioning programs.

From a neurophysiological perspective, focused-attention practices such as Trataka may modulate activity within the visual cortex and frontoparietal attentional networks, thereby enhancing sustained attention and reducing cognitive processing delays. Improved parasympathetic regulation associated with yogic breathing may further optimize neural efficiency and response stability under performance conditions. These mechanisms collectively may explain the observed improvements in anticipatory reaction speed and coordination.

The moderate-to-large effect sizes observed in the experimental group underscore the practical significance of the intervention. In high-performance sports such as badminton, even small reductions in reaction time can translate into meaningful competitive advantages during fast rallies. Therefore, incorporating structured Trataka-based eye training may offer a cost- effective and accessible adjunct to conventional training methods.

Overall, the findings support the emerging paradigm that integrative mind–body practices can extend beyond flexibility and stress management to influence objective sport-specific performance variables. Trataka-based yogic eye training appears to be a promising modality for enhancing anticipatory visual processing and visuomotor coordination in competitive badminton players.

Conclusion

The findings of this study shows that a six-week Trataka-based yogic eye training program significantly improved choice reaction time and eye–hand coordination in competitive badminton players. The observed enhancements in anticipatory visual processing and visuomotor integration suggest that structured gaze stabilization training can positively influence sport- specific neurovisual performance. Integrating Trataka into regular badminton training may provide a simple, cost-effective, and performance-oriented strategy to optimize reaction efficiency in high-speed racket sports.

Limitations

Although the results are valuable, a few points should be considered as limitations. The number of participants was small, which could affect how well the results apply to a larger group. The intervention lasted only six weeks, and the long-term effects on retention were not assessed. Additionally, only two performance measures were tested. It would have been more informative to include other techniques, such as eye-tracking analysis or shuttle trajectory anticipation tests.

Recommendations

Future studies should employ randomized controlled trial designs with larger sample sizes to strengthen causal inference. Inclusion of objective oculomotor assessments such as saccadic latency measurement, eye-tracking technology, or sport-specific shuttle anticipation tasks is recommended. Longitudinal research examining the long-term effects of Trataka-based training on competitive performance and match outcomes would further enhance understanding of its practical applicability in badminton and other high-speed racket sports

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Conflict Of Interest

The authors declare no conflict of interest

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INTEGRATIVE MANAGEMENT OF ANOREXIA NERVOSA THROUGH YOGA AND AYURVEDA: A REVIEW

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Abstract

Anorexia Nervosa is among the most lethal psychiatric conditions worldwide, marked by persistent restriction of caloric intake, severe body image disturbance, and an intense fear of weight gain. Conventional biomedical approaches, including pharmacotherapy and cognitive behavioural therapy, yield incomplete remission in many patients, especially those with chronic or treatment-resistant presentations. This review examines the role of Yoga and Ayurveda, two traditional Indian systems with centuries of clinical application, in addressing the physical, psychological, and constitutional dimensions of Anorexia Nervosa. From an Ayurvedic perspective, the condition is conceptualised as a manifestation of Arochaka and Agnimandya arising from Vata-Pitta vitiation, depleted Rasa and Mamsa Dhatus, and disturbed Manovaha Srotas. Classical texts including the Charaka Samhita and Ashtanga Hridayam prescribe targeted dietary regimens, Rasayana herbs such as Ashwagandha and Shatavari, and Panchakarma procedures to restore digestive fire and rebuild body tissues. Yoga, particularly Pranayama, restorative Asanas, Yoga Nidra, and mindfulness-based practices, has demonstrated measurable impact on autonomic dysregulation, interoceptive awareness, and body dissatisfaction in clinical trials involving patients with eating disorders. Integration of these two systems offers a constitutional, person-centred treatment model that addresses root imbalances rather than suppressing surface symptoms. This paper presents a narrative review of classical textual sources and contemporary clinical evidence, proposing an integrative framework that may complement standard care for Anorexia Nervosa.

Keywords: Anorexia Nervosa, Ayurveda, Yoga, Arochaka, Rasayana, Integrative Medicine

1. Introduction

Anorexia Nervosa (AN) is a serious, potentially life-threatening eating disorder characterised by self-imposed food restriction, distorted body perception, and an intense preoccupation with weight and shape. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5-TR), defines AN by three core criteria: persistent restriction of caloric intake relative to requirements; an intense fear of gaining weight or becoming fat; and disturbance in the way body weight or shape is perceived (American Psychiatric Association, 2022). Globally, AN carries the highest mortality rate among psychiatric illnesses, with deaths attributable both to medical complications of starvation, cardiac arrhythmia, osteoporosis, electrolyte imbalance and to suicide (Lock & La Via, 2015).

Despite decades of research, available biomedical treatments remain limited in efficacy. Pharmacological agents approved for AN are few, and evidence for their effectiveness is weak. Cognitive Behavioural Therapy and Family-Based Treatment show better outcomes, particularly in adolescents, yet relapse rates remain high and full recovery is achieved by fewer than half of those who receive treatment (Hatch et al., 2010). This gap has turned clinical and research attention toward integrative approaches, including traditional systems of medicine.

India's two ancient health traditions Ayurveda and Yoga offer frameworks that are not reducible to symptom management. They approach illness as a disruption of constitutional balance, and recovery as restoration of homeostasis across physical, psychological, and social dimensions. For AN, where the illness is rooted as much in distorted cognition and emotional dysregulation as in nutritional depletion, this holistic orientation has genuine practical relevance. The present review draws on classical Ayurvedic texts, including the *Charaka Samhita* and *Ashtanga Hridayam*, alongside published clinical research on yoga-based interventions for eating disorders, to map an integrative framework for managing AN.

2. Ayurvedic Conceptualisation of Anorexia Nervosa

2.1 Disease Analogy: Arochaka and Agnimandya

Ayurveda does not have a direct one-to-one equivalent of AN as defined by DSM-5-TR, but two closely related clinical entities - *Arochaka* (aversion to food/taste distortion) and *Agnimandya* (diminished digestive fire) together capture the core clinical picture. Charaka in the *Sutrasthana* describes Arochaka as a condition arising from the vitiation of all three Doshas, but predominantly Vata and Pitta, leading to distorted perception of taste and an unwillingness to eat. The involvement of Manovaha Srotas - the channels governing mental function makes AN particularly congruent with the type of Arochaka driven by psychological and emotional factors.

"Aruchistu bhaved yatra sarvendriyavirodhinī |
Hṛdayasya prasādena tasyā śāntir vidhīyate ||"
(Charaka Samhita, Sutrasthana, 25/40)

Translation: "Where aversion to food opposes all sensory faculties, its pacification is achieved through the contentment of the heart (mind)." This verse is notable because it locates the origin of food aversion in the mind consistent with the psychological substrate of AN and prescribes mental contentment, not force-feeding, as the remedial approach. Charaka further specifies that the management of Arochaka begins with addressing the mental state of the patient through Satvavajaya (psychotherapy), Rasayana (rejuvenation), and appropriate dietary rehabilitation (*Charaka Samhita*, Chikitsasthana, 15).

2.2 Doshic Imbalance and Dhatu Depletion

The Ayurvedic model views AN through the lens of severe Vata aggravation manifesting as emaciation (Karshya), dryness, cold intolerance, constipation, and mental restlessness compounded by Pitta-driven obsessive thinking, perfectionism, and irritability. Both Rasa Dhatu (plasma/nutrient fluid) and Mamsa Dhatu (muscle) undergo significant depletion as the disease progresses. Ojas considered the essence of all dhatus and the substrate of immunity and vitality is profoundly depleted in moderate-to-severe AN, correlating well with the immune vulnerability and hormonal disruption seen in this condition (Lad, 2002).

Vagbhata, in the *Ashtanga Hridayam*, emphasises that Agni the digestive and metabolic fire is the root of health, and its diminishment leads to ama (undigested metabolic waste) accumulation, impaired tissue nourishment, and mental dullness. The restoration of Agni is thus a primary therapeutic goal. This is addressed through Deepana (digestive stimulant) and Pachana (ama-digestive) herbs before initiating any Brimhana (nourishing) therapy.

"Agniṃ hi sarvalokeṣu pavitram āhuḥ purātanāḥ |
Āyurvedo hy agniṃ mūlaṃ ārogyasya vadanti hi ||"
(Ashtanga Hridayam, Sutrasthana, 11/38)

Translation: "The ancients declare Agni to be the purifier in all worlds; Ayurveda declares Agni to be the root of health." This principle guides the sequential treatment logic: no nourishing therapy is administered until digestive capacity is restored, which a reasonable parallel to modern is refeeding protocols that emphasise gradual nutritional rehabilitation to avoid refeeding syndrome.

2.3 Ayurvedic Treatment Principles

Bhandari and Chandola (2011) conducted a clinical study documenting the use of Ashwagandha (*Withania somnifera*) and Shatavari (*Asparagus racemosus*) in an Ayurvedic management protocol for anorexia. Both herbs belong to the Rasayana category meaning they are rejuvenative agents that rebuild depleted tissues, enhance adaptability to stress, and restore hormonal balance. Ashwagandha demonstrated measurable improvements in body weight, appetite, and self-reported sense of wellbeing. Shatavari, a Vata-Pitta pacifier and uterine tonic, is especially indicated where the patient presents with amenorrhoea secondary to AN a common complication. Brahmi (*Bacopa monnieri*), classified as a Medhya Rasayana, targets the cognitive and emotional distortions that sustain the illness, reducing anxiety and rumination (Lad, 2002).

External therapies including Abhyanga (medicated oil massage) and Navarakizhi (rice-bundle fomentation) directly counter Vata aggravation, improve circulation to depleted tissues, and create a sense of physical comfort and safety

in the body something that is often severely compromised in AN patients. The importance of Satvavajaya chikitsa (Ayurvedic psychotherapy), which includes counselling, mantra recitation, and positive suggestion, cannot be understated in a condition where the psychiatric component drives the physical deterioration.

3. Yoga-Based Interventions in Anorexia Nervosa

3.1 Theoretical Basis

Yoga, as codified by Patanjali in the *Yoga Sutras*, provides both a philosophical framework and practical tools for addressing the body-mind interface. The second chapter of the Yoga Sutras describes Kriya Yoga consisting of Tapas (disciplined practice), Svadhyaya (self-study), and Ishvara Pranidhana (surrender to a higher principle) as the foundational approach to reducing Klesas (mental afflictions). In AN, the primary Klesas are Asmita (egoic identification with body image), Dvesha (aversion to food, weight, body), and Abhinivesha (clinging to thinness as a source of control and identity).

"Sthira sukham āsanam ||"
(Patanjala Yoga Sutras, 2.46)

Translation: "Steady and comfortable is the posture." This deceptively simple sutra has direct clinical implications. For patients with AN many of whom engage in compulsive exercise with a driven, rigid quality the yogic instruction that bodily practice should be both stable and easeful directly counters the punishing relationship with the body that the illness enforces. In clinical yoga programmes for eating disorders, this sutra is frequently cited as a philosophical touchstone for redirecting patients' relationship to movement (Cook-Cottone et al., 2013).

3.2 Evidence from Clinical Studies

The randomised controlled trial by Carei et al. (2010) was among the first to rigorously evaluate yoga in eating disorder treatment. Fifty-four adolescents and young adults with AN, Bulimia Nervosa, or Eating Disorder Not Otherwise Specified were randomised to yoga plus standard care or standard care alone. The yoga group showed significantly greater reductions in food preoccupation measured on a validated scale compared to the control group. There were no adverse events, suggesting that yoga is safe even in medically compromised patients when delivered by trained instructors in a clinical setting.

Pacanowski et al. (2017) examined yoga within a residential eating disorder programme. Thirty-seven adults with A participated in a two-arm randomised design. The yoga group attended weekly sessions during residential treatment. Significant reductions in state anxiety, eating disorder symptoms, and body dissatisfaction were observed in the yoga arm compared to controls. The authors noted that the relational quality of group yoga practice shared presence in the body without judgment was qualitatively reported by participants as a meaningful experience in a population that often experiences the body as adversarial.

Mitchell et al. (2007) evaluated yoga alongside dissonance-based intervention for women with subclinical eating disorder symptoms. While the sample was not exclusively AN, the yoga group showed significant reductions in thin-ideal internalisation and body dissatisfaction two constructs central to AN maintenance suggesting that yoga may operate upstream of established risk factors.

3.3 Mechanisms of Action

Several biological and psychological mechanisms likely underlie yoga's benefit in AN. At the autonomic level, patients with AN show documented dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, with elevated cortisol and sympathetic hyperactivation contributing to the hypermetabolic state. Pranayama particularly slow, diaphragmatic breathing patterns such as Anulom-Vilom and Bhramari activates the parasympathetic nervous system via vagal afferents, lowering cortisol and heart rate (Telles et al., 2012). This is clinically relevant because cortisol-driven catabolism worsens muscle and tissue loss in AN.

Interoception the perception of signals from within the body is substantially impaired in AN. Patients report an inability to recognise hunger signals accurately, a detachment from bodily sensations, and a distorted sense of body size. Yoga, particularly Yoga Nidra and body scan practices, has been proposed to improve interoceptive accuracy by systematically directing attention to physical sensations in a non-evaluative context (Cook-Cottone et al., 2013). Over time, this may help patients reconnect with hunger cues and develop a less adversarial body relationship.

Khalsa et al. (2009) demonstrated that yoga practice significantly reduces anxiety and mood disturbance in a population of professional musicians a finding transferable to AN given that anxiety and mood disorder frequently co-occur.

"Yuktāhāravihārasya yuktaceṣṭasya karmasu |
Yuktasvapnāvabodhasya yogo bhavati duḥkhahā ||"
(Bhagavad Gita, 6/17)

Translation: "For one who is moderate in eating, recreation, work, sleep, and wakefulness for such a person, Yoga destroys all sorrow." The Gita's instruction on moderation in eating neither excess nor restriction is strikingly applicable to AN. It acknowledges that eating behaviour is part of a broader pattern of moderation in all activities, and that imbalance in one area disturbs the others. Clinically, this connects to the observation that AN patients often display an all-or-nothing relationship not just with food, but with exercise, achievement, and control.

4. Integrative Interventions: Summary Table

Table 1 below summarises Ayurvedic and Yoga-based interventions relevant to AN management, including their proposed mechanisms and clinical applications.

Table 1: Ayurvedic and Yoga Interventions in the Management of Anorexia Nervosa

Intervention	Category	Proposed Mechanism	Clinical Application in AN	Reference
Ashwagandha (Withania somnifera)	Ayurvedic Herb	Adaptogenic; increases body weight and appetite via cortisol modulation	Underweight patients with stress-related food aversion	Bhandari & Chandola, 2011
Shatavari (Asparagus racemosus)	Ayurvedic Herb	Nourishes dhatus; tonic for Vata-Pitta imbalance; promotes anabolic activity	Emaciation, hormonal dysregulation, weakness	Bhandari & Chandola, 2011
Brahmi (Bacopa monnieri)	Ayurvedic Herb	Medhya Rasayana; reduces anxiety and obsessive cognition	Psychological component fear of weight gain, distorted body image	Lad, 2002
Triphala churna	Ayurvedic Formulation	Deepana-pachana (digestive stimulant); normalises agni	Impaired digestion, constipation, ama accumulation	Charaka Samhita, Chikitsasthana 15
Sukhasana + Pranayama (Anulom Vilom)	Yoga – Breathing	Parasympathetic activation; reduces HPA-axis hyperreactivity	Anxiety, food-related fear, hypermetabolic state	Carei et al., 2010
Shavasana (Corpse Pose)	Yoga – Relaxation	Deep rest response; reduces cortisol and sympathetic tone	Restlessness, sleep disturbance, over-exercise	Pacanowski et al., 2017
Bhujangasana (Cobra Pose)	Yoga – Asana	Stimulates digestive organs; stretches abdominal region; improves appetite	Digestive weakness, Agni mandya	Mitchell et al., 2007
Yoga Nidra (Yogic Sleep)	Yoga – Meditation	Promotes interoceptive awareness; reduces body dissatisfaction	Disturbed body image, hypervigilance about weight	Cook-Cottone et al., 2013

Intervention	Category	Proposed Mechanism	Clinical Application in AN	Reference
Surya Namaskar (Sun Salutation)	Yoga – Combined	Gradual musculoskeletal loading; improves body awareness without over-exercise risk	Supervised structured movement; prevents muscle atrophy	Carei et al., 2010
Navarakizhi / Abhyanga	Ayurvedic Therapy	External oleation; nourishes dhatus; counters Vata aggravation and emaciation	Severe underweight, skin and bone fragility	Lad, 2002

5. towards an Integrative Framework

Neither Yoga nor Ayurveda should be positioned as a replacement for medically indicated care in AN. The severity of this illness with its risk of cardiac failure, bone density loss, and death makes multidisciplinary care essential. However, the limitations of biomedical approaches alone make a compelling case for integration.

An integrated protocol might proceed in three stages. The first stage prioritises medical stabilisation correction of electrolyte imbalances, nutritional rehabilitation under dietitian supervision, and psychiatric assessment. During this phase, Ayurvedic contributions are supportive: gentle Deepana and Pachana herbs such as Triphala to restore Agni without overburdening a weakened digestive system, and Abhyanga to address Vata aggravation and improve patient comfort with their own body. Yoga during this stage is limited to restorative practices Shavasana, Yoga Nidra, and gentle Pranayama that reduce autonomic hyperactivation without imposing physical demands on a nutritionally depleted body. The second stage, once medical parameters have stabilised, incorporates Rasayana therapy. Ashwagandha and Shatavari are introduced to rebuild Dhatu (tissue) and support the HPA axis. A graduated yoga programme adding Surya Namaskar at a slow pace, body-scan meditations, and Svadhyaya journalling begins to address body image and interoceptive deficits. The relational and group dimension of yoga classes is particularly valuable here; shared embodied practice in a non-competitive, non-evaluative environment challenges the social isolation that accompanies AN (Pacanowski et al., 2017).

The third stage focuses on relapse prevention and long-term constitutional rebalancing. Ongoing Rasayana and Medhya Rasayana herbs are continued. Satvavajaya which might involve mantra practice, Trataka (concentration meditation), and structured reflection addresses residual cognitive distortions. The Bhagavad Gita's principle of *Nishkama Karma* (action without attachment to outcomes) provides a philosophical counterweight to the achievement-oriented, perfectionist cognition that underlies chronic AN.

"Aum Trayambakam yajamahe sugandhim pushtivardhanam |
Urvārukamiva bandhanān mṛtyormukṣīya māmṛtāt ||"
(Rigveda 7.59.12; Yajurveda 3.60)

Translation: "We worship the three-eyed one who is fragrant and who nourishes all beings. May he liberate us from the bondage of death as a ripened cucumber falls from the vine grant us immortality." This mantra, prescribed in Vedic medicine for life-threatening illness and extreme emaciation, has been used in clinical Ayurvedic and yoga settings to support healing at a psychological level. The imagery of liberation from bondage the body detaching naturally rather than through force holds particular resonance for AN patients who feel imprisoned by their own disorder.

6. Discussion

The evidence base for yoga in eating disorders is small but consistently directional. Each randomised trial published to date Carei et al. (2010), Pacanowski et al. (2017), Mitchell et al. (2007) shows benefit without harm. The limitation common to all three is sample size; none was adequately powered to detect effects on weight restoration, the hardest endpoint in AN research. What they do capture are the proximal psychological outcomes anxiety, body satisfaction, food preoccupation that are arguably the necessary preconditions for sustained weight recovery. In this sense, yoga's contribution might be best understood as enabling the psychological conditions under which conventional treatment can work more effectively.

The Ayurvedic literature on AN is almost entirely observational and case-based. Bhandari and Chandola (2011) represents one of the few structured clinical studies in this domain. This is not unique to Ayurveda the traditional

medicine literature on AN is generally underpowered and methodologically varied. What classical Ayurveda offers is a detailed phenomenological account of the illness that maps well onto modern clinical descriptions: the constitutional types who are most susceptible, the seasonal and psychological triggers, and the sequential logic of treatment. This phenomenological depth is worth preserving even as Ayurvedic interventions are subjected to more rigorous evaluation.

One area deserving particular attention is the intersection between Ayurvedic dietary rehabilitation and modern nutritional protocols. Ayurveda's principle of beginning with easily digestible, warm, unctuous foods thin rice gruel, milk, ghee before progressing to more complex foods closely mirrors evidence-based refeeding practice and stands in contrast to the generic high-calorie supplementation that is sometimes applied in medical settings without attention to digestive capacity. Future interdisciplinary work between Ayurvedic clinicians and dietitians could formalise this overlap.

7. Conclusion

Anorexia Nervosa remains one of the most difficult psychiatric conditions to treat. Its maintenance by interlocking biological, psychological, and social factors means that no single intervention is sufficient. Yoga and Ayurveda, when applied with clinical sensitivity and in conjunction with standard care, offer contributions that address dimensions of the illness constitutional vulnerability, digestive rehabilitation, interoceptive awareness, body image, and psychological rebalancing that biomedical approaches often leave unaddressed.

What is needed going forward is not advocacy, but research. Multi-arm trials that include Yoga, Ayurvedic herbal protocols, or both alongside standard care, with adequate sample sizes and validated outcome measures, would clarify where these traditions add the most value. Until that evidence is available, integrative practitioners are advised to apply these approaches conservatively, with medical oversight, and with attention to the specific contraindications that apply to a medically vulnerable population.

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IMPACT OF SURYA NAMASKAR PRACTICE ON NORMAL HUMAN MICROBIOTA COMPOSITION AND FUNCTIONAL ACTIVATION: A REVIEW.

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Abstract

Suryanamaskar (Sun Salutation) is a collection of twelve asanas with rhythmic breathing that can be done systematically which promotes physical and mental health.The regulated and coordinated movements of Surya Namaskar gently stimulate the abdominal organs, enhance blood circulation to the gastrointestinal tract, and promote peristaltic activity, thereby facilitating efficient digestion and smooth transit of food through the digestive system. The human gut microbiota plays a central role in metabolic regulation, immune modulation, and neuroendocrine balance. Yoga, in particular, represents an effective lifestyle intervention that may support microbiome health by reducing stress, promoting gentle physical activity, and enhancing digestive function. Simultaneously, regulated breathing and relaxation responses may lower cortisol levels and systemic inflammation, thereby fostering microbial diversity and resilience. Surya Namaskar–induced alterations in gut microbial diversity may contribute to improvements in tissue metabolism, cardio respiratory fitness, and insulin sensitivity. Notably, increased relative abundance of genera such as *Bacteroides*, *Flavobacterium*, *Staphylococcus*, *and Corynebacteriumand Parabacteroides* has been associated with metabolic adaptations observed following regular Surya Namaskar practice.Surya Namaskar is traditionally recommended to be practiced in the early morning while facing the rising sun. This routine is believed to enhance overall vitality and may contribute to improved skin health. Allowing the body to relax in *Shavasana* after practice, with natural perspiration drying on the skin, is thought to support detoxification processes and assist in the management of certain skin conditions. Suryanamaskar is considered a part of modern-day yogic practices though which every cell in the body is revitalized and regenerated. This abstract proposes that Surya Namaskar may act as a non-pharmacological strategy to modulate normal human microbiota through combined mechanical, neural, endocrine, and immunological pathways. Awareness of microbiological concepts—particularly the role of the microbiota—among the general population can shape societal perspectives and inform policy decisions. Accordingly, human health is increasingly recognized as the outcome of a complex and dynamic interaction between the microbiome and its host.

Key words: Suryanamaskar, Rhythmic breathing, Normal microbiota, Microbiome, detoxification.

Introduction

The human body hosts trillions of microorganisms collectively referred to as the human microbiota, including bacteria, fungi, viruses, and archaea residing primarily in the gastrointestinal tract, skin, oral cavity, and respiratory system. The human gut microbiome is a complex ecosystem of microorganisms that can influence our health and exercise habits. On the other hand, physical exercise can also impact our microbiome, affecting our health. (Varghese, 2024). These microbial communities contribute to digestion, immune system development, nutrient metabolism, and protection against pathogens. Disturbances in microbiota composition, known as dysbiosis, have been associated with several chronic diseases including inflammatory bowel disease, obesity, diabetes, and mental health disorders.(Li, 2024). Yoga, a holistic practice that originated in ancient India, combines physical postures (asanas), breathing techniques (pranayama), and meditation to promote physical and mental well-being. One of the most widely practiced yoga sequences is Surya Namaskar, which consists of a rhythmic series of twelve interconnected postures that activate and stimulate various physiological systems.(Patni, 2024). Recent research has increasingly explored the connection between yoga practices and the gut–brain axis, a two-way communication system that links the central nervous system with the gastrointestinal tract and its associated microbiota. Yoga is believed to influence the composition and activity of the microbiome by regulating neuroendocrine functions, enhancing digestive processes, and lowering stress-related hormones such as cortisol (Kaur, 2025). This review explores the impact of Surya Namaskar practice on the composition and functional activation of human microbiota, with particular emphasis on gut and skin microbial communities.

An Insight into Surya Namaskar

Surya Namaskar is widely practiced in modern yoga traditions, although it was not originally classified as a classical asana or a component of traditional yoga practices. Performing Surya Namaskar before beginning daily activities is

believed to energize the body and promote a sense of vitality throughout the day. The practice was first systematized and popularized by Bhawan rao Shriniwas rao Pant Pratinidhi, after which several renowned yoga masters contributed to its global recognition. Prominent figures such as Tirumalai Krishnamacharya, Swami Sivananda, and Swami Satyananda Saraswati further popularized this dynamic sequence through their teachings and institutions. Surya Namaskar consists of a well-structured series of postures performed in coordination with controlled breathing patterns, thereby integrating the benefits of both asanas and pranayama. A complete round of Surya Namaskar comprises twelve postures and twenty-four steps, performed as a symbolic salutation to the Sun while traditionally chanting the twelve names of the Sun deity. This review highlights the significance of Surya Namaskar and discusses its potential effects on the physical, psychological, and physiological aspects of human health based on existing scientific literature(Venkatesh,2022).

The fluid movements of Surya Namaskar activate the digestive organs, promoting better blood flow and stimulating peristalsis, which aids in the smooth movement of food through the digestive tract. This practice also reduces stress, a common contributor to digestive disorders. Regular practice of Surya Namaskar can alleviate issues such as constipation, indigestion, and bloating, supporting overall digestive health and enhancing vitality. Surya Namaskar provides significant benefits to several parts of the body, particularly the back, including the backbone, spinal cord, and legs. In addition, it positively influences vital organs such as the skin, stomach, intestines, liver, lungs, and heart. Regular practice of Surya Namaskar helps revitalize and regenerate body cells and tissues, thereby improving overall physiological functioning. For this reason, many experts recommend Surya Namaskar as an effective practice for maintaining a healthy lifestyle.

When performed at a faster pace, Surya Namaskar acts as a form of cardiovascular exercise by enhancing blood circulation throughout the body and improving the functioning of internal organs. This contributes to maintaining good health and reducing the risk of various diseases. The practice also enhances strength, flexibility, and vitality. Conversely, when performed slowly and with controlled breathing, Surya Namaskar promotes muscle relaxation and acts as a meditative practice. The different asanas included in Surya Namaskar help burn excess body fat, particularly in areas such as the abdomen, buttocks, and back, by stimulating fat metabolism and helping to regulate hormonal balance. In women, regular practice may help reduce menstrual irregularities and support easier childbirth. Furthermore, Surya Namaskar contributes to mental well-being by promoting relaxation, reducing stress, and helping to maintain a calm and focused mind (Kumari, 2022).

Table 1. Sequence of Surya Namaskar (Sun Salutation) showing the twelve postures along with the associated Beej mantras, solar mantras, and corresponding chakras.(Tripati, 2025**)**

Step	Asana Name	Beej Mantra	Mantra	Chakra
1	Pranamasana (Prayer Pose)	Om Hraam	Om Mitraya Namah	Anahata
2	Hasta Uttanasana (Raised Arms Pose)	Om Hreem	Om Ravaye Namah	Vishuddhi
3	Padahastasana (Hand-to-Foot Pose)	Om Hroom	Om Suryaya Namah	Swadhisthana
4	Ashwa Sanchalanasana (Equestrian Pose)	Om Hraim	Om Bhanave Namah	Ajna
5	Parvatasana (Mountain Pose)	Om Hraum	Om Khagaya Namah	Vishuddhi
6	Ashtanga Namaskara (Eight-Limbed Salutation)	Om Hrah	Om Pushne Namah	Manipura
7	Bhujangasana (Cobra Pose)	Om Hraam	Om Hiranyagarbhaya Namah	Swadhisthana
8	Parvatasana (Mountain Pose)	Om Hreem	Om Marichaye Namah	Vishuddhi
9	Ashwa Sanchalanasana (Equestrian Pose)	Om Hroom	Om Adityaya Namah	Ajna
10	Padahastasana (Hand-to-Foot Pose)	Om Hraim	Om Savitre Namah	Swadhisthana
11	Hasta Uttanasana (Raised Arms Pose)	Om Hraum	Om Arkaya Namah	Vishuddhi
12	Pranamasana (Prayer Pose)	Om Hrah	Om Bhaskaraya Namah	Anahata

Effects on Skin Microbiome

The biodiversity of skin microbiota is strongly influenced by the surrounding environmental ecosystems in which humans live. The skin is primarily inhabited by four major bacterial phyla: *Firmicutes*, *Bacteroidetes*, *Proteobacteria*, and *Actinobacteria*. Different regions of the skin provide distinct microenvironments that support specific microbial communities. Sebaceous areas are mainly dominated by *Propionibacterium* and *Staphylococcus* species, whereas moist regions commonly harbor *Corynebacterium* species along with *Staphylococcus*. In contrast,

dry areas tend to contain more diverse microbial populations, with a higher prevalence of *Proteobacteria* and members of the order *Flavobacteriales*. Among the resident microorganisms, *Staphylococcus epidermidis*, belonging to the phylum *Firmicutes*, constitutes more than 90% of the aerobic resident skin microbiota. Practice of Surya Namaskar has been reported to influence microbial diversity in the human body, which may contribute to improved tissue metabolism, enhanced cardiorespiratory fitness, and reduced insulin resistance. Studies have suggested that increases in the relative abundance of bacterial genera such as *Bacteroides, Flavobacterium,* and *Parabacteroides* may be associated with metabolic changes induced by regular Surya Namaskar practice.

Surya Namaskar consists of a sequence of twelve postures performed consecutively, involving forward and backward bending movements coordinated with deep inhalation and exhalation. These rhythmic movements stimulate various physiological systems and promote overall physical activity (Karishma, 2022)

Effects on Gut Microbiota

The abundance and diversity of the human microbiota is dependent on intrinsic and extrinsic factors. The oral cavity hosts a diverse microbial community composed of numerous bacterial genera, including *Streptococcus, Granulicatella, Gemella, Actinomyces, Corynebacterium, Rothia, Veillonella, Fusobacterium, Prevotella, Porphyromonas, Capnocytophaga, Neisseria, Haemophilus, Treponema, Eikenella, Leptotrichia, Lactobacillus, Peptostreptococcus, Staphylococcus, Eubacterium,* and *Propionibacterium*. In addition to bacteria, the oral microbiome also includes several fungal genera such as *Candida, Cladosporium, Saccharomyces, Fusarium, Aspergillus,* and *Cryptococcus*.

Various viruses associated with human diseases, including those responsible for mumps, rabies, and human papillomavirus infections, have also been detected in the oral cavity. Furthermore, protozoan species such as *Trichomonas tenax* and *Entamoeba gingivalis* are known to inhabit the oral environment, contributing to the overall diversity of the oral microbiota. The gastric microbiota is composed of several dominant bacterial phyla. In gastric juice, the predominant phyla include *Firmicutes, Actinobacteria,* and *Bacteroidetes*, whereas *Proteobacteria* and *Firmicutes* are more commonly dominant in the gastric mucosa. In addition, certain bacteria typically present in the oral cavity and duodenum, such as *Veillonella, Lactobacillus,* and *Clostridium,* may transiently colonize the stomach. Other bacterial phyla present in the gut environment include *Actinobacteria, Proteobacteria, Fusobacteria,* and *Verrucomicrobia*. Among these, the phylum *Firmicutes* is highly diverse and comprises nearly 200 different genera, including *Bacillus, Lactobacillus, Enterococcus, Clostridium,* and *Ruminococcus*. While certain members such as *Lactobacillus* are considered beneficial for human health, some *Firmicutes* species, including *Staphylococcus aureus* and *Clostridium perfringens*, are known to be pathogenic and can cause infections under specific conditions (Aggerwal, 2023). Yoga practices like Surya Namaskar improves gut health. It helps to add a fair microbiome and beneficial bacteria multiply, lower blood glucose levels. Similarly, it is evident that lifestyle or routine control the glucose level (Aturi, 2019).

Research has also indicated that physical activity done during Surya Namaskar may influence the composition of the gut microbiota as well as the concentration of its metabolic products.(Magzal, 2022) Zhang *et al*, 2025, showed differences in gut microbiota, serum metabolites and serum immune factors between healthy controls and older adults with insomnia.

Effects on Muscles

Surya Namaskar has an immediate positive effect on muscle flexibility and overall physical mobility. The alternating contraction and relaxation of abdominal muscles during the practice helps strengthen the abdominal organs and improve their functioning, particularly those associated with the digestive system. Additionally, the practice helps relieve stress and elevate mood, thereby exerting a beneficial effect on the nervous system. However, certain precautions should be considered while practicing Surya Namaskar. Individuals suffering from hernia are generally advised to avoid this practice because the postures can increase abdominal pressure. Women are also advised not to perform Surya Namaskar during menstruation due to the risk of physical strain or discomfort. Furthermore, traditional Surya Namaskar is usually contraindicated during pregnancy to prevent spinal stress, although modified versions of the practice may be recommended under supervision to support easier childbirth.(Sabbineni A,2021)

Effects on Heart

The study by Rameshwar Pal, 2024 demonstrated that the practice of Surya Namaskar led to reduced blood pressure, decreased cardiac workload, and lower myocardial oxygen consumption. It also showed improvements in body

composition, breath-holding capacity, and handgrip strength. These findings suggest that regular practice of Surya Namaskar enhances cardiovascular efficiency and physical fitness, and may help in the prevention of lifestyle-related cardiovascular diseases (Pal, 2024).

Effects on lungs

Pranayama practiced during Surya Namaskar helps in proper ventilation of the lungs, which supports efficient respiratory function. The rhythmic contraction and relaxation of the lungs during the breathing exercises strengthen the respiratory muscles and contribute to maintaining healthy lung function. Regular practice may also help reduce the risk of respiratory disorders such as bronchial asthma and other respiratory infections. Additionally, the chanting of mantras during Surya Namaskar has a positive psychological effect, promoting mental relaxation and helping to reduce stress, anxiety, and depression (Sabbineni, 2021).

Effects on endocrine glands

Surya Namaskar plays an important role in maintaining the proper functioning and balance of the endocrine glands. This regulatory effect may help in moderating the transition from childhood to adolescence in growing children, particularly in females. Puberty and the onset of menarche are crucial developmental stages that prepare the female body for reproduction. However, factors such as environmental influences and changing dietary habits have contributed to the earlier onset of puberty and menarche, sometimes occurring before the body is fully prepared for these physiological changes. Such early transitions may lead to various complications related to the menstrual cycle (Venkatesh, 2022)

Effects on Immune system

A comprehensive analysis of the studies highlight the potential of Surya Namaskar as an effective practice for enhancing immune function through multiple mechanisms. Surya Namaskar may improve immune vigilance by increasing natural killer (NK) cell activity, reducing chronic inflammation, and promoting the proliferation and activation of immune cells. In addition, the stress-reducing effects associated with the practice help create a favorable physiological environment for stronger immune responses. Although further research is required to fully understand the underlying mechanisms, Surya Namaskar appears to be a promising complementary approach for strengthening immune health. In a world facing numerous health challenges, incorporating Surya Namaskar into daily routines can be transformative. Beyond improving physical and mental well-being, regular practice may help the immune system remain resilient against various health threats. These findings emphasize the importance of adopting Surya Namaskar as a holistic practice for optimizing immune function and promoting a healthier and more resilient lifestyle.(Tadi, 2024)

Effects on Nervous system

The available evidence supports the hypothesis that **Surya Namaskar** can serve as a beneficial complementary practice for improving mental health by potentially influencing the gut microbiome and the gut–brain axis (GBA). The gut–brain axis (GBA) represents a complex bidirectional communication network that links the emotional and cognitive centers of the central nervous system with peripheral intestinal functions. This intricate system includes components such as the enteric nervous system, the vagus nerve, and the hypothalamic–pituitary–adrenal (HPA) axis, all of which are strongly influenced by the gut microbiome. Surya Namaskar, a traditional yogic practice, is increasingly being investigated as a non-pharmacological intervention that may help reduce stress and support overall The close alignment between modern neuroscientific findings and traditional holistic health perspectives highlights the importance of an integrated approach to understanding the mind–body connection(Paramjeet Kaur,2025)

Conclusion

Surya Namaskar represents a holistic yogic practice integrating physical exercise, breathing regulation, and mindfulness. Emerging research suggests that yoga practices may influence microbiota composition and function through mechanisms involving stress reduction, improved digestion, and modulation of the gut–brain axis. Preliminary studies indicate that Surya Namaskar may enhance microbial diversity, particularly in skin and gut microbiomes, thereby supporting metabolic and immune health Surya Namaskar can be practiced as a group activity within families to promote overall family health and well-being. It is particularly beneficial for individuals who wish

to engage in yogic practices but are unable to dedicate a full hour each day, as it provides significant physical and mental benefits within a relatively short period of time.

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Conflict of Interest

Authors declare no conflict of interest

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THE ATHLETE'S EDGE: ANCIENT AYURVEDIC SECRETS FOR PEAK PERFORMANCE AND RAPID RECOVERY. A LITERARY REVIEW.

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Abstract

Sports culture has been documented since antiquity in classical Indian literature such as the Ra¬mayana, Mahabharata, Dhanurveda, and Malla Purana, reflecting the long-standing tradition of physical training and martial disciplines in India. The educational, formative, promotional, competitive, recreational, and restorative aspects of athletic participation are all included in the field of sports medicine. Through its concepts of injury management, performance optimization, and preventative healthcare, Ayurveda offers a thorough framework i.e. in line with these dimensions.

The importance of Vyayama (exercise), its proper intensity, indicators of overexertion, nutrition control, sleep hygiene, mental discipline, and behavioral conduct in preserving athletic fitness are all covered in classical Ayurvedic writings. For musculoskeletal conditioning, fatigue management, pain relief, and rehabilitation, therapeutic modalities like Snehana (oleation), Swedana (sudation), Nasya, Abhyanga (oil massage), Shirodhara, Agnikarma, Upanaha Sweda, Nadi Sweda, Pinda Sweda, Patra Pinda Sweda, Taila Lepa, and Dhanyamla Dhara are described.

Under the Chikitsa Sutra, Ayurveda further categorizes injuries and describes treatment approaches for soft tissue damage and fractures. For recuperation and performance improvement, emphasis is placed on herbal groups like Brihmana (which promotes bulk), Sandhaniya (which promotes tissue union), Balya (which enhances strength), Shrama-hara (which prevents fatigue), Angamarda- prashamana (which relieves body aches), Shoola-prashamana (which is analgesic and antispasmodic), and Vedana-sthapana (which relieves pain).

Marmachikitsa is also emphasized as a unique treatment strategy for quick pain alleviation and functional recovery.In order to illustrate the applicability of Ayurvedic concepts in contemporary sports medicine, this study gathers traditional references, current research findings, and case studies pertaining to common sports injuries. A comprehensive, customized, and long-lasting approach for sports health, injury prevention, and rehabilitation is suggested by the integrative application of these therapies.

Introduction

Sports culture in India is not a modern phenomenon but a deeply rooted tradition documented since antiquity in classical texts such as the Ramayana, Mahabharata, Dhanurveda, and Malla Purana. These scriptures reflect a long-standing mastery of physical training, martial disciplines, and competitive excellence. Within this cultural ethos, Ayurveda emerges as a foundational pillar for the athlete, offering a sophisticated framework for sports medicine that encompasses educational, formative, promotional, and restorative dimensions.

Ayurveda aligns seamlessly with contemporary sports science by prioritizing injury management, performance optimization, and preventative healthcare. Classical writings provide detailed guidelines on Vyayama (exercise) intensity, nutrition, sleep hygiene, and mental discipline—collectively ensuring the athlete's longevity. By integrating therapeutic modalities like Snehana, Agnikarma, and Marmachikitsa with specialized herbal groups such as Balya (strength-promoting) and Sandhaniya (tissue-healing), Ayurveda offers a holistic, customized, and sustainable alternative to conventional sports rehabilitation.

Aim and Objectives

Aim:

To evaluate the integration of classical Ayurvedic principles and therapeutic modalities into modern sports medicine for the enhancement of athletic performance, injury prevention, and rapid rehabilitation.

Objectives:

- To explore traditional references of sports culture and physical training within classical Indian literature (Dhanurveda, Malla Purana, etc.).
- To analyze the Ayurvedic guidelines for Vyayama (exercise), including the physiological indicators of optimal exertion and the management of overexertion.
- To categorize and review Ayurvedic therapeutic interventions—such as Abhyanga, Pinda Sweda, and Dhanyamla Dhara—for musculoskeletal conditioning and fatigue management.
- To examine the efficacy of specific herbal groups (Shrama-hara, Angamarda-prashamana, and Sandhaniya, etc) in accelerating tissue union and systemic recovery.
- To investigate Marmachikitsa as a unique clinical strategy for immediate pain relief and functional restoration in sports-related injuries.
- To synthesize current research and case studies that demonstrate the applicability of Ayurvedic Chikitsa Sutras (treatment protocols) in contemporary sports health.

Review of Literature

Historical Evidence of Physical Culture in Ancient India

Physical Activities in the Ramayana Period

Ramayana describes chariot racing, horse riding, wrestling, archery, swimming, and ball games. These activities demonstrate a culture of structured physical training and martial preparation. [1]

Physical Culture in the Mahabharata Period

Mahabharata references swimming, wrestling, gymnastics, archery, and weapon training. These descriptions indicate systematic physical conditioning practices in ancient India.1

Indigenous Sports Traditions

Mallakhamb

Mallakhamb combines aerial yoga, martial arts, and gymnastics. It develops strength, flexibility, neuromuscular coordination, and core stability. Historical references appear in Manasollasa (12th century CE). [2]

Kabaddi

Kabaddi requires respiratory control, agility, muscular endurance, and mental alertness—attributes discussed in Ayurvedic exercise and psychological principles.

Kalaripayattu

Kalaripayattu emphasizes flexibility, reflexes, marma (vital point) knowledge, and injury management techniques.[3]

Sports activities mentioned in Ayurveda

In nidana (Etiology) of kshatakshina and rajyaskshama chikitsa, Acharya Charak described different sports activities like Straining bow, Carrying heavy weight, Falling or jumping from high altitude, wrestling or fighting, restraining a running bull, stallion or any other strong animal requiring control, throwing heavy stones, wooden blocks, or equipment made of stone, reciting scriptures loudly, running a long distance or walking too fast, crossing a big river by swimming, running along with horse,long and high jump.

Vyayama (Exercise) in Ayurveda

शरीरचेष्टा या चेष्टा स्थैर्यार्था बलवर्धिनी| देहव्यायामसङ्ख्याता मात्रया तां समाचरेत् || Ch. su. 7/31
Such suitable physical movement intended towards bringing stability (in body) and increase in strength is known as vyayama (physical exercise). This has to be practiced in moderation (with apt control and for proper duration).

Benefits of vyayama (exercise) and harmful effects of excess exercise

लाघवं कर्मसामर्थ्यं स्थैर्यं दुःखसहिष्णुता | दोषक्षयोऽग्निवृद्धिश्च व्यायामादुपजायते || Ch. su. 7/32
Lightness, strength to work, stability, endurance towards distress and mitigation of dosha (especially kapha), and stimulation of agni (digestive power) is caused by physical exercise.

According to Acharya Shusruta

शरीरायासजननं कर्म व्यायामसंज्ञितम् ॥
The work involving exertion of the body is known as 'vyāyāma (physical exercise). After doing it one should press the body gently all over.

Even incompatible food, cooked or uncooked, is digested without any difficulty in persons performing exercise daily.

Physical exercise is always wholesome for those who are strong and take unctuous food. That too has the most salutary effect in winter and spring.

When to stop exercise

बलस्यार्धेन कर्तव्यो व्यायामो हन्त्यतोऽन्यथा ।। हृदि स्थानस्थितो वायुर्यदा वक्त्रं प्रपद्यते ॥

In all seasons daily exercise should be performed by persons desiring their well-being by 'balärdha' (half of strength) otherwise it harms. When (prana) vāyu situated in heart comes out to mouth while performing exercise-it is the sign of the half of strength. This is equivalent to the modern threshold of aerobic fatigue.

Effect of over exercise

श्रमः क्लमः क्षयस्तृष्णा रक्तपित्तं प्रतामकः| अतिव्यायामतः कासो ज्वरश्छर्दिश्च जायते || Ch. su. 7/33

Exhaustion, fatigue, wasting (of body tissues), thirst, bleeding from different parts of the body (raktapitta), pratamaka (dyspnea with fainting), cough, fever and vomiting are caused by excessive physical exercise.
This directly corresponds to overtraining syndrome in modern sports medicine.

Schedule for giving up unwholesome practices

क्रमेणापचिता दोषाः क्रमेणोपचिता गुणाः| सन्तो यान्त्यपुनर्भावमप्रकम्प्या भवन्ति च || Ch. su. 7/38

By slowly and gradually giving up unwholesome practices and by increasing the wholesome practices in proper sequence, the unwholesome practices do not reoccur and the wholesome practices are fully adopted.

These ślokas explain that one should not begin heavy exercise or intense sports practice suddenly. Training should start with small targets and low intensity, and then gradually increase, allowing stamina and endurance to develop progressively."

Benefits of proper quantity diet

मात्रावद्ध्यशनमशितमनुपहत्य प्रकृतिं बलवर्णसुखायुषा योजयत्युपयोक्तारमवश्यमिति || Ch. su. 5/8

The food taken in right quantity certainly provides strength, complexion, happiness and longevity to the person; without disturbing the normalcy.

This verse establishes that adequate caloric and nutritional intake maintains homeostasis and provides muscle strength and stamina, which are indispensable for athletes.

Brimhana (nourishing) therapy

अदिग्धविद्धमक्लिष्टं वयस्थं सात्म्यचारिणाम् | मृगमत्स्यविहङ्गानां मांसं बृंहणमुच्यते ||

The meat of adult (mature) animals, fish, and birds which are found roaming in their suitable natural surroundings, which are healthy (or disease-free) and have not been killed by poisonous weapons and is unspoiled, is considered to be ideal for brimhana (nourishing therapy).

These ślokas state that a sportsperson should consume natural milk, indigenous (deshi) meat, and the meat of healthy animals.

Features after consuming proper quantity of food

Whether the quantity of food to be consumed is appropriate or not is determined on the basis of the capacity of the stomach and its division into three parts.

“For a sportsperson, diet is one of the most important factors in the development of strength and stamina. However, dietary principles are not described in great detail in most classical sources.”

Determination of Psychological Trait

यद्गुणं चाभीक्ष्णं पुरुषमनुवर्तते सत्त्वं तत्सत्त्वमेवोपदिशन्ति मुनयो बाहुल्यानुशयात् || Ch. su. 8/6

The sages describe the mind according to the predominance of the guna (quality or predisposition), which is predominantly and repeatedly represented in the mind of a person.

अणुत्वमथ चैकत्वं द्वौ गुणौ मनसः स्मृतौ |

Oneness and atomicity are said to be the two defining characteristics of the mind. "A healthy body and mind are equally crucial for a good athlete. Together, an invigorated body and an optimistic outlook improve performance. A strong will to succeed boosts a sportsperson's chances of success significantly. For a competent athlete, mental and physical well-being are equally crucial. Together, an invigorated body and an optimistic outlook improve performance. A sportsperson's chances of success significantly enhance when they remain resolute in their pursuit of victory.

Perception by Association of Mind and Sense Organs

मनःपुरःसराणीन्द्रियाण्यर्थग्रहणसमर्थानि भवन्ति || Ch. su. 8/7

The sense organs are capable of perceiving objects only when they are associated with the mind.

Prajnaparadha (intellectual defect) and its consequences

धीधृतिस्मृतिविभ्रष्टः कर्म यत् कुरुतेऽशुभम्| प्रज्ञापराधं तं विद्यात् सर्वदोषप्रकोपणम् || Ch. sh. 1/101

A person engages in inauspiciousdeeds that aggravate all doshas, when his dhi (capacity to understand), dhriti (governing power), and smriti (power to retain memories, or reminisce) are compromised.This is referred to as prajnaparadha, which is an intellectual error, deliberate criminal activity, or unwholesome or evil deeds.We sometimes do this during sports even though we know it hurts our performance.Sometimes, even if we are aware that there isn't much time for our tournament, we choose to ignore it and waste it.We frequently follow Pragyapradha after learning that this diet is unhealthy for us.

Benefits of sleep

निद्रायत्तं सुखं दुःखं पुष्टिः कार्श्यं बलाबलम्| वृषता क्लीबता ज्ञानमज्ञानं जीवितं न च ||Ch. su. 21/36

अकालेऽतिप्रसङ्गाच्च न च निद्रा निषेविता| सुखायुषी पराकुर्यात् कालरात्रिरिवापरा||Ch. su. 21/37 ||

Proper (and improper) sleep is essential for human happiness and unhappiness, nutrition and emaciation, strength and weakness, fertility and infertility, knowledge and ignorance, and longevity and death. Sleep deprivation and premature, excessive sleep reduce a person's longevity and pleasure.
For athletes to perform at their best and maintain attentiveness, getting enough sleep is crucial. Lack of sleep impairs performance and increases the risk of damage.

Effect of abhyanga (Oil massage) on body

According to shusruta

अभ्यङ्गो मार्दवकरः कफवातनिरोधनः ।॥ धातूनां पुष्टिजननो मृजावर्णबलप्रदः ॥ Shu. chi 24/30

Oily massage softens the body, checks kapha and vāta, promotes dhātus and provides cleanliness, complexion and strength.

न चाभिघाताभिहतं गात्रमभ्यङ्गसेविनः| विकारं भजतेऽत्यर्थं बलकर्मणि वा क्वचित् || Ch. su. 5/88 ||

The skin becomes beautiful, vata disorders are relieved, and tolerance to hardship and physical strain is enhanced. It help to drain inflammatory exudates form injuries in the early stages. 7

Adharaniya vega (Non-suppressible urges)

न वेगान् धारयेद्धीमाञ्ज्ञातान् मूत्रपुरीषयोः| न रेतसो न वातस्य न छर्द्याः क्षवथोर्न च ||

नोद्गारस्य न जृम्भाया न वेगान् क्षुत्पिपासयोः| न बाष्पस्य न निद्राया निःश्वासस्य श्रमेण च || Ch. su. 7/4

The intelligent person should not suppress the natural urges initiated by sensations of urine, defecation, sexual desires (release of semen), flatus, vomiting, sneezing, belching (eructation), yawning, hunger, thirst, tears, sleep and exertion induced dyspnea.

In sports, suppression of urges leads to:

Dehydration, Muscle cramps, Injury, Exhaustion, Performance collapse

Classification of sports injuries according to ayurvedic principles

According to Ayurveda, sports injuries are generally associated with Agantuja Vyadhi (traumatic disorders), which result from external factors such pātana (fall), pīḍana (compression), and other types of physical impact.Acute pathological disorders such as śopha (inflammation), sadyovraṇa (acute wounds), bhagna (fracture), and vrana (ulcerative lesions) are triggered by these circumstances.After a certain amount of time, if left untreated, these acute diseases can develop into chronic or Nija Vyadhi states, which are frequently typified by Vata-dominant ailments. Recurrent fractures, joint dislocations (sandhi mukta), tendon and ligament involvement (kandara gata vata), muscle diseases (māmsa gata vata), degenerative musculoskeletal issues, and Vata Vyadhi are examples of chronic symptoms. Therefore, incorporating Ayurvedic concepts—especially Panchakarma and supportive medication into sports medicine may provide a thorough, all-encompassing framework for managing injuries, recovering from them, and improving performance.

Therapeutic Effects of Various Ayurvedic Interventions

Snehana (Oleation Therapy):

Snehana enhances lubrication of joints and improves their range of motion and flexibility. It nourishes body tissues (dhatus) and facilitates the mobilization of aggravated doshas from peripheral tissues to the gastrointestinal tract. It is primarily indicated as a pūrva karma prior to Virechana karma. [4]

Swedana (Sudation Therapy):

Swedana alleviates obstruction (srotorodha), stiffness, coldness, and heaviness of the body. By inducing perspiration, it helps liquefy and mobilize morbid doshas, thereby preparing the body for purification procedures such as Virechana.

Nadi Swedana:

This localized steam therapy reduces stiffness, pain, and restricted movement in specific joints or body parts. It provides targeted sudation and enhances local circulation. [6]

Pinda Swedana:

Pinda Swedana effectively relieves joint pain associated with swelling and inflammation. It reduces muscular stiffness and improves functional mobility.[7]

Patra Pinda Swedana:

This therapy is beneficial in managing joint pain without significant swelling. It reduces stiffness and improves flexibility while exerting analgesic and anti-inflammatory effects.[8]

Nasya Karma:

Nasya strengthens the sensory organs and alleviates disorders of the head and neck region, including cough, cold, headache, facial paralysis, lockjaw, and tremors. It also nourishes cranial structures, including joints, ligaments, and tendons. [9]

Upanaha Sweda:

Upanaha reduces localized pain and inflammation. It acts as a topical analgesic and helps relieve stiffness in affected joints or muscles.[10]

Lepa:

Lepa reduces joint stiffness, edema, and inflammation. It promotes local circulation and provides symptomatic relief in musculoskeletal conditions.[11]

Taila Dhara:

Taila Dhara alleviates stiffness and pain associated with degenerative disorders of joints, bones, and muscles. It is beneficial in chronic musculoskeletal conditions.[12]

Dhanyamla Dhara:

Dhanyamla Dhara is effective in inflammatory musculoskeletal disorders, including osteoarthritis. It reduces pain, stiffness, and swelling.[13]

Agni Karma:

Agni Karma provides immediate pain relief and helps pacify aggravated Vata and Kapha doshas. It is particularly useful in chronic painful conditions. [14]

Shirodhara:

Shirodhara reduces psychological stress and is beneficial in insomnia, headache, and facial paralysis. It exerts calming and neuroprotective effects.[15]

Research papers on Injury/Condition alongwith advised panchkarma therapies

S. No.	Injury/Condition	Panchakarma Therapies	References
1.	Painful Post-Traumatic Trigeminal Neuropathy	Anu Taila Nasya, Marsha Nasya, Swedana with Churna Pinda, Shirodhara, Matra Basti	16
2.	Spinal Injury-Induced Paraplegia Involvement	Udvartana, Virechana, Yapana Basti	17
3.	Grade III Medial Meniscus Tear	Godhuma Upanaha, Sthanik Parisheka, Janu Basti	18
4.	Gridhrasi (Sciatica)	Abhyanga, Local Swedana, Ashwagandhadi Ksheera Basti, Kati Basti, Anuvasana Basti, Vyatyasa Basti	19
5.	Knee Ligament Injury	Janu Basti with Murivenna Taila	20
6.	TBL Fracture Injury Treatment	Sarvanga Upanaha, Swedana, Pinda Sweda(Fermentation), Tikta Ksheera Ghrita, Brimhana Basti	21
7.	Post-Fracture Rehabilitation	Dhanyamla Dhara, Upanaha Sweda, Shashtika Shali Pinda Sweda	22
8.	Collapse Compression Fracture	Vasa Therapy, Pushti Basti, Majja Matra Basti	23
9.	Avabahuka (Frozen Shoulder)	Snehapana (after food), Snehana, Swedana, Upanaha Sweda, Nasya	24
10.	Acute Rotator Cuff Injury	Murivenna Bandaging, Dhanyamla Dhara, Local Taila Dhara (Murivenna & Dhanwantharam Taila), Marsha Nasya, Shashtika Lepam, Yoga Basti	25
11.	Supraspinatus Tendon Tear	Upanaha Sweda, Abhyanga, Taila Pichu, Bandaging, Active Shoulder Exercises	26
12.	Chronic Rotator Cuff Injury	Pratimarsha Nasya, Pichu (Shoulder), Lepana, Local Abhyanga, Swedana, Dhanyamla Dhara, Local Taila Dhara, Pathya, Potali Sweda, Shashtika Pinda Sweda	27
13.	Tennis Elbow Management	Agnikarma	28
14.	Recurrent Shoulder Dislocation	Pichu and static excercise	29

Treatment or Chikitsa sutra (Principle of management)

Bhagna sthapana - Realignment of bone
Pida hara - Analgesic
Shotha Hara- Anti-inflammatory
Sandhana- Union of joint
Sthirikarana- Immobilization
Dhatu poshana- Nutrition [30]

Jeevaniya (Vitalisers)

जीवकर्षभकौमेदामहामेदाकाकोलीक्षीरकाकोलीमुद्गपर्णीमाषपर्ण्यौ जीवन्ती मधुकमिति
दशेमानि जीवनीयानि भवन्ति||

jívaka, rishabhaka, meda, mahameda, kakoli, kshirakakoli, mudgaparni, mashaparni, jivanti and madhuka

Brimhaniya (Strength/bulk promoting)

क्षीरिणीराजक्षवकाश्वगन्धाकाकोलीक्षीरकाकोलीवाट्यायनीभद्रौदनीभारद्वाजीपयस्यर्ष्यगन्धा
इति दशेमानि बृंहणीयानि भवन्ति ||

kshirini, rajakshavaka, ashwagandha, kakoli, kshirakakoli, vatyayani,bhadraudani, bhardwaji, payasya and rishyagandha

Sandhaniya (promoting union/binding)

मधुकमधुपर्णीपृश्निपर्ण्यम्बष्ठकीसमङ्गामोचरसधातकीलोध्रप्रियङ्गुकट्फलानीति
दशेमानि सन्धानीयानि भवन्ति ||

madhuka, madhuparni, prushniparni, ambashthaki, samanga, mocharasa, dhataki, lodhra, priyangu and katphala

Balya (tonics)

ऐन्द्र्यृषभ्यतिरसर्ष्यप्रोक्तापयस्याश्वगन्धास्थिरारोहिणीबलातिबला इति दशेमानि बल्यानि भवन्ति ||

aindri, rishabhi, atirasa, rishyaprokta, payasya, ashwagandha, sthira, rohini, bala and aatibala

Shramahara (relieving fatigue)

द्राक्षाखर्जूरप्रियालबदरदाडिमफल्गुपरूषकेक्षुयवषष्टिका इति दशेमानि श्रमहराणि भवन्ति ||

draksha, kharjura, priyala, badara, dadima, phalgu, parushaka, ikshu, yava and shashtika

Angamrdaprashamana (relieving body-ache)

विदारीगन्धापृश्निपर्णीबृहतीकण्टकारिकैरण्डकाकोलीचन्दनोशीरैलामधुकानीति
दशेमान्यङ्गमर्दप्रशमनानि भवन्ति ||

vidarigandha, prushniparni, bruhati, kantakarika, eranda, kakoli, chandana, ushira, ela and madhuka

Shula prashamana (anti-spasmodics)

पिप्पलीपिप्पलीमूलचव्यचित्रकशृङ्गवेरमरिचाजमोदाजगन्धाजाजीगण्डीराणीति
दशेमानि शूलप्रशमनानि भवन्ति ||

pippali, pippalimula, chavya, chitraka, shringavera, maricha, ajamoda, ajagandha, ajaji and gandira

Vedana sthapana (stopping sensation of pain)
शालकट्फलकदम्बपद्मकतुम्बमोचरसशिरीषवञ्जुलैलवालुकाशोका
इति दशेमानि वेदनास्थापनानि भवन्ति ॥
shala, katphala, kadamba, padmaka, tumba, mocharasa, shirisha, vanjula, elavaluka, and ashoka

Achara Rasayana: It consists of self-control, nonviolence, and the balanced use of senses. This also implies a routine that is stress-free. Ayurvedic medicine places a strong focus on getting enough sleep to prevent brain deterioration and recharge. counseling with ayurveda physicians to gain a positive outlook, self-motivation, and a correct understanding of life's purpose.

Marma Chikitsa: its primary goal is to provide immediate pain relief to the affected area. For immediate pain treatment, Kshipra and Kurpara Marma are used for shoulder discomfort, Kshipra and Kurpara Marma for leg and knee pain, and Kshipra, Kurpara, and Ani Marma for cervical pain.

Discussion

Ayurveda addresses every facet of sports and sports medicine, both directly and indirectly. It ought to be a part of an athlete's daily routine. When it comes to sports and athletic performance, Ayurveda is extremely relevant.
Overuse of synthetic supplements, including energy boosters, protein powders, and capsules, is common in modern sports, but prolonged use can have negative health effects and cause metabolic imbalance. Ayurvedic regimens, on the other hand, place an emphasis on natural, foodbased nutrition, herbal formulations, and lifestyle discipline with the goal of safely and sustainably enhancing strength (Bala), stamina (Sthairya), and endurance (Kshama). In addition to enhancing an athlete's mental and physical well-being, panchakarma speeds up the healing process from sporting injuries.

Conclusion

The "Athlete’s Edge" lies in the synergistic application of ancient wisdom and modern physical science. This review demonstrates that Ayurveda provides more than just symptomatic relief; it offers a comprehensive lifestyle and therapeutic system that addresses the root causes of physical and mental fatigue. Through the precise application of *Panchakarma* variants like *Patra Pinda Sweda* and the strategic use of *Marmachikitsa*, athletes can achieve rapid functional recovery that often surpasses the limitations of conventional physiotherapy alone.

By prioritizing *Sandhaniya* (tissue-binding) and *Balya* (strength-giving) interventions, Ayurveda ensures that recovery is not merely the absence of injury, but the restoration of peak physiological vigor. Ultimately, an integrative approach—combining traditional Ayurvedic protocols with modern diagnostic tools—presents a sustainable, customized, and superior model for sports medicine, fostering a new era of high-performance athletics rooted in time-tested natural principles.

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REIMAGINING PREVENTIVE HEALTHCARE: A SPORTS SCIENCE PERSPECTIVE ON PANCHAKARMA

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Abstract

The Ayurvedic medicine of bio-purification of the body, often incorporating five methods of treatment: Vamana (therapeutic emesis), Virechana (purgation), Basti (medicated enema), Nasya (nasal administration) and Raktamokshana (bloodletting) has been extensively established in Indian traditional medicine as a complete branch of disease prevention, cleansing and rejuvenation of the system. Panchakarma is though a thousand-year-old clinical tradition but remains very peripheral to the mainstream sports science and preventive healthcare discourse. It is a descriptive and thematic study that critically discusses the concept of Panchakarma according to the perspective of the modern sport science, regarding its theoretical parallelism with the modern concept of recovery, inflammatory regulation, neuroendocrine and musculoskeletal health. The paper gives a thesis based on classical Ayurvedic texts, new metabolomics research, and other findings of the sports medicine study, that the preparatory interventions of Panchakarma (Purvakarma) in particular, Abhyanga (medicated oil massage) and Swedana (therapeutic sudation) are quantifiably equivalent to set protocols of evidence-based recovery procedures in peer-reviewed sports science journals. The paper also explores the potential of using Shirodhara as a stress-reduction treatment, which is physiologically applicable to athletes, how Virechana and Basti can be used to regulate gut-immune axis, and the metabolomic data about the systemic changes that are induced by using Panchakarma. The paper will conclude by an offer of an integrative preventative health model whereby the Panchakarma procedures would fit within a framework of sports science and this would offer new research avenues, athlete wellness programmes, and policy with regard to physical education in the country.

Keywords: Preventive Healthcare, Panchakarma, Sports Science, Abhyanga, Shirodhara, Recovery, Ayurveda, Inflammation, Athlete Wellness, and Integrative Medicine.

Introduction

The debate on preventive healthcare on the planet has been undergoing a paradigm shift in the twenty first century. The concept of proactive wellness strategies as the key to sustainable athletic performance and long-term health is identified as gaining momentum as opposed to the traditional sports medicine, which has traditionally viewed an injury treatment approach and pharmacological intervention as the cornerstone of sustainable athletic performance and long-term health (World Health Organization, 2021). This shift has offered intellectual space within which traditional systems of medicine could be reconsidered not as ancient artefacts but as progressive knowledge systems which could perhaps co-exist with modern biomedical knowledge.

The preventive medicine- Swasthavritta has always been the opinion of the ancient Indian system of life science Ayurveda. Panchakarma is put in the centre stage in this system since it is not only a treatment procedure but a systemic guideline to the body purification process and in establishing homeostasis and body revival. The system relies on the reality that the systemic balance is upset under the build-up of the waste products (Ama) in the body and aggravated biological humours (Doshas) that predisposes the individual to disease (Sharma et al., 2007).

The question that this framework poses to the sports scientists is the following: can we extrapolate the mechanisms of Panchakarma, detoxification, anti-inflammatory tissue work, and autonomic modulation and gut health optimisation to the evidence-based constructs of sports medicine? The present paper will argue that they can and in doing so will reveal a coherent and evidence-based model of preventive sport healthcare that is in the best position to address the needs of contemporary athletes.
The theme in this paper is a thematic descriptive one, and the literature reviewed is Ayurvedic classical literature and new peer-reviewed literature on sports science, which enables the formulation of a conceptual bridge between Ayurveda and sports science. It takes into account five thematic areas, which are (1) Panchakarma as a whole-body

cleansing program; (2) Abhyanga and sports massage comparison; (3) Shirodhara and psychophysiological stress control; (4) Basti and Virechana in changing physiology; and (5) metabolomics evidence to change physiology by Panchakarma.

Methodology

The thematic descriptive research design is suitable in this paper because it occurs with the synthesis of diverse literature in the conceptual coherent theme (Braun & Clarke, 2006). A thematic research is not a data producing research but a critical analytical and organising research work of the current scholarship with a view to demonstrating patterns, congruity, and gaps in knowledge. This particularly fits in studies that aim to comprehend the overlap between traditional medical paradigms and modern scientific paradigms since the focus of the study is to clarify about structural similarities and correspondence of evidence and not necessarily test some hypotheses.

Various databases were consulted by using literature (PubMed/MEDLINE, Google Scholar and Shodhganga) and searched with the following keywords: Panchakarma and sports science, Abhyanga and athletic recovery, Shirodhara and cortisol, Ayurveda and preventive healthcare, and Panchakarma metabolomics. There was also the Charaka samhita and Sushruta Samhita books that were classical Ayurvedic books. The inclusion criteria required the studies to be peer-reviewed and published in English at the period between 2005 and 2024 and must be related to thematic categories identified. The researches that were founded on anecdotal evidence alone or which did not give transparency on methodology were omitted.

In the end of the repetitive reading and comparative analysis, five important themes were suggested, and they include purification and detoxification, tissue recovery and anti-inflammation, psychophysiological stress regulation, gastrointestinal and immune modulation, and metabolomic evidence. These are the structural themes of the findings part below.

3. Ayurvedic Model of Prevention and Panchakarma

3.1 The Five Procedures and their Preventive Intention

Panchakarma (or five actions) consists of: Vamana (therapy by emesis), Virechana (purgative therapy), Basti (enema of herbs), Nasya (nasal application of herbal preparations) and Raktamokshana (bloodletting or leech therapy). These are not only administered as a treatment of an already existing disease under the name of Ritucharya, but also in healthy individuals to clear the accumulation of Dosha, the pathogenic potential which otherwise, were it not cleared off, will crystallise into a clinical disease. This prophylaxis is consistent with the modern concept of the subclinical inflammation of a condition of low-grade systemic inflammatory activation, which is the precursor and predeterminer of numerous chronic illnesses and overtraining syndromes in the athlete (Shukla et al., 2025).

The preparation phase known as Panchakarma is referred to as Purvakarma, and it is of particular importance to sports science. It involves Snehana (internal and external oleation) and Swedana (sudation or therapeutic sweating) that is a procedure mobilisation of impurities of peripheral tissues that have been stored in the body to the digestive tract in order to be shed off. With the examples of athletes in whose case there is a repetition of musculoskeletal micro-trauma and accumulation of reactive oxygen species, the preparatory procedures create an interesting analogy with the contemporary foam-rolling, heat therapy, and myofascial release regimens which in sports medicine are a standard recommendation.

3.2 The Principle of Ama and Correlations of Sports Science

The Ayurvedic preventive theory centrally depends on the concept of Ama (biologically not metabolised residue) deposited in the channels (Srotas) and ruins the usual body functioning. Though Ama is metaphysical entity, the functional description is very close to the build-up of metabolic byproducts, including reactive oxygen species, inflammatory cytokines and lactic acid, which is a side-effect of high-intensity exercise and lack of rest (Conboy et al., 2009). Just like Panchakarma that attempts to clear the Ama and provide the body a balanced state of Dosha, the modern sports recovery science attempts to clear the metabolic waste and provide the body with a homeostatic state between the training bouts. It is the theoretical fits, as well as the figurative language, that might provide the theoretical tools, in which the concrete procedures of Panchakarma might be evaluated in terms of the quantifiable physiological results.

4. Abhyanga: The Art of Prevention Therapeutic Touch

4.1 Classical Description and Clinical Application

The most usual feature of the preparatory stage of Panchakarma, perhaps, is abhyanga which is an orderly and rhythmic use of medicated oils on the body. The Charaka Samhita states that daily Abhyanga helps to prevent fatigue and Vata, have healthier skin, stronger peripheral circulation and injury protection (P P et al., 2021). These benefits can be directly projected on the sports medicine practitioner outcomes: improved tissue recovery, reduced delayed-onset muscle soreness (DOMS) and maintenance of neuromuscular health.

4.2 The evidence is provided in the research on Sports Massage

The scientific usefulness of therapeutic massage in sporting conditions is very high and it supports the mechanistic claims of Abhyanga. A pioneering study by Crane et al. (2012) who were in a position to demonstrate that an ten minutes massage protocol performed on exercised quadriceps resulted in the significant inhibition of the NF-kB inflammatory pathway, induced mitochondrial biogenesis and reduced the expression of inflammatory cytokines at cell level. Above all, the authors have demonstrated that massage did not merely encircle the pain but it resulted in actual anti-inflammatory molecular signalling (Crane et al., 2012). This finding of this research resonates much with the Ayurvedic claim that the effects of the Abhyanga are systemic and prophylactic rather than palliative.
White, West, Caterini, Di Battista, Rhind and Wells (2020) also investigated the findings in a crossover study of healthy male athletes, who underwent a high intensity intermittent sprint protocol. The study found out that, the post-exercise massage treatment had previous re-establishment of pro-inflammatory signs, including IL-8, TNF-alpha, and MCP-1, to pre-exercise stages compared to the control group. The secondary outcome measures did not demonstrate a difference across the conditions ($p = 0.776$), but the fact that the inflammatory mediators in the massage group resolved faster ($p < 0.05$ all of them) means that the structured touch therapy can be beneficial in ensuring the faster recovery of competitive athletes (White et al., 2020).

This accelerated elimination of the inflammatory mediators, is Ayurvedically speaking, comparable to the Ayurvedic description of the action of Abhyanga on the Vyana Vayu, the sub-type of Vata that is involved in the circulation and distribution of metabolites in the body, that when stimulated by medicated oil massage, aids the body in getting rid of the metabolic residues. Another pilot study also reported that a single session of Abhyanga had statistically significant impact of heart rate and subjective stress experience ($p < 0.05$) and that prehypertensive individuals had a statistically significant change in blood pressure (Basler, 2011).

4.3 The existence of bioactive mechanisms in Sesame oil

Another factor that is not usually appreciated of the effectiveness of Abhyanga is its pharmacological value of the oils. Ayurvedic massage is most commonly recommended to use sesame oil (sesamol, sesamin, sesamolin) as these are some of the best antioxidants in the oil that penetrates the skin barrier and has topical anti-inflammatory effects. The application of the lipid-based antioxidant carrier through the massage technique is one of the primary prevention strategies that should be put under strict clinical trials within the frames of the sports science, in which the role of oxidative stress causes acute injury and chronic overtraining syndrome among the key factors.

5. Shirodhara: Neuroendocrine and Mind of the Athlete

5.1 Procedure, and Classical Procedure Rational.

Shirodhara, the inexhaustible and rhythmic pouring of warm meditated liquid or oil on the forehead, which is one of the most typical processes of Panchakarma, is neurologically significant and rich in symbols. Shirodhara, prescribed in classical in the diseases of Vata aggravation of the mind and nervous system is prescribed in anxiety, insomnia, psychological stress, and concentration disorders. Such a neuromodulatory approach should be taken seriously on the part of scientists, when it comes to athletes who are increasingly susceptible to burnout, anxiety, and psychological overload. It is postulated that the process overall stimulates the trigeminal nerve fibre by stimulating the forehead with thermo-mechanical stimulation to induce the preeminence of the parasympathetic state and regulate the hypothalamic-pituitary-adrenal (HPA) axis (Rajan et al., 2021).

5.2 HRV, Cortisol and Athletic Stress Response.

Scientific proof regarding stress control of athletes is concentrated around two central biomarkers salivary cortisol and heart rate variability (HRV). The analysis of the results of a seven-week longitudinal study of young endurance athletes presented by Mishica, Kyrolain, Hynynen, Nummela, Holmberg and Linnamo (2021) demonstrated that nocturnal HRV and salivary cortisol levels had a negative correlation ($r = -0.552$, $p = 0.01$), and the correlation was the highest at the moment when the load of the training had the greatest impact. This finding confirms the usefulness of HRV as an at-risk real-time anticipator of autonomic recovery status and sympatho-adrenal strain in athletes (Mishica et al., 2021).

Most importantly, a case study study published in the Journal of Ayurveda and Integrative Medicine has documented a case where a subject underwent a 14 days Shirodhara treatment with sesame oil where serum cortisol and DHEA levels were significantly reduced. By the conclusion of the study, the sleep-deprived, concentration-lacking, and mood-disrupted participant exhibited the changes in the Profile of Mood Score (POMS) and normalisation of the stress-related biomarkers, and the negative events were not observed (Rajan et al., 2021). The hypothetical mechanism is the alteration in the HPA axis, noradrenaline decrease, and sympatholytic activity through peripheral skin sensors and the trigeminal nerve of the head.

Shirodhara offers a non-pharmacological, highly restorative intervention in competitive athletes whose chronic loads are in a permanent burden on the HPA axis and the psychological wellbeing of which cannot be quarantined out of physical performance, which might have the capacity to do the very psychophysiological vulnerable that the mainstream sports medicine is not able to legitimately do. It is a very likely preventive intervention with regard to its clinical and theoretical reasoning that the standard Shirodhara treatments should be included in the recovery plans of the athletes, particularly when on high-volume training programmes, and just before competitions.

6. Basti and Virechana: Gut-Immune Axis Modulation In Populations Of Athletes

6.1 Gastrointestinal Health and Sports Performance

The relationship between the gastrointestinal integrity and the athletic performance is becoming rather popular in the athletic science in the past decade. The intestinal permeability provoked by exercise is the so-called leaky gut in the case of the tight junctions between the enterocytes becoming weak and the translocation of lipopolysaccharides (LPS) and other bacterial products into the systemic circulation. The resultant endotoxaemia induced by this exercise triggers an inflammatory cascade in the system, rises cytokine levels, and causes fatigue, immunosuppression, and delayed recovery. Of immediate concern is the elite sports medicine in the preventive measures of maintaining the intestinal epithelial integrity.

6.2 Ancient Mechanisms and New Correlates

The most potent of all the Panchakarma processes is referred to as the Basti, medicated enema treatment. It is for the following reason, that the property of Basti is said to be able to heal half of all diseases because it acts upon the large intestine which Ayurveda acknowledges as the location of Vata Dosha, and, thus,, as a homeostatic center of the body. A sub-type where smaller volumes of medicated oil are employed is the Matra Basti; which is particularly applied in the role of preventative or tonic treatment to healthy people and the people who are engaged in vigorous physical activity since it nourishes the intestinal mucosa, pacifies Vata and strengthens the musculoskeletal system (Dash et al., 2020).

Virechana is a form of therapeutic purgation by the use of herb preparations and also called Pitta Dosha; it is more active in the small intestine and liver. Its preventive administration is meant to clear the hepatic congestion, bile metabolism and the restoration of digestive fire (Agni). In the sports science case, hepatic efficiency is the most important in glycogen synthesis, lipid and the removal of metabolic waste products due to exercise. An Ayurvedic dietary modification with Panchakarma therapy in patients with coronary artery disease showed that lipid profiles have been significantly improved, which demonstrates that AI has a hepato-intestinal effect of Panchakarma, and this effect is measurable in metabolism (Sane et al., 2024).

Preventive use of Basti and Virechana among sportsmen is to be put in this complex context: not as a treatment of the underlying disease but as a preventive that serves to preserve the integrity of the gastrointestinal tract, immune homeostasis, and the metabolic productivity on the basis of which the athletic activity of a person is sustained. Integration of Panchakarma in the Modern Clinical Practice underlines the fact that the presence of the vitiated

Doshas even before the clinical disease occurs is likely to prevent the development of pathology during the subclinical stages, which is completely consistent with the preventive ethos of the sports science (Acharya, 2024).

7. Physiological Change After Panchakarma Evidence Through Metabolomics.

7.1 SBTI Study: A Historical wise in Panchakarma Study

The recent discoveries that have been most scientifically significant in proving the existence of a physiological effect of Panchakarma are probably those of the Self-Directed Biological Transformation Initiative (SBTI), a controlled clinical trial which was conducted at the UC San Diego and published on the Scientific Reports. The study by Peterson et al. (2016) examined the effects of a 6-day intervention based on Panchakarma-Ayurveda on plasma metabolites of 119 healthy individuals. In the case of liquid chromatography-mass spectrometry, the researchers found highly significant changes in 12 phosphatidylcholines and significant changes in 57 other metabolites including amino acids, biogenic amines, acylcarnitines, glycerophospholipids and sphingolipids in the Panchakarma group as compared to a relaxation control group (Peterson et al., 2016).

Such lipid metabolites as phosphatidylcholines have been defined to play roles in inflammatory signalling, cholesterol metabolism and cardiovascular risk. Their severe change in Panchakarma intervention of six days is breathtaking suggesting that the combination of Abhyanga, dietary modification and herbal therapy and calculated rest provokes systemic metabolic reprogramming within a few days. This fact is particularly persuasive to sports scientists: it demonstrates that Panchakarma is no longer an object of subjective experience of wellness, but a kind of intervention that acts physiologically and can produce objective and measurable biochemical outcomes.

7.2 Implications to Sports Science and Preventive Health

The metabolomic analysis provided by Peterson et al. (2016) has shown the growth of the biochemical pathways of the phospholipids synthesis, choline metabolism, HDL-mediated lipid transportation, and lipoprotein metabolism, the processes of which are closely related to the process of controlling inflammation, cell membrane integrity, and cardiometabolic well-being. The capacity of Panchakarma to control these pathways within an athlete can be a potentially effective preventive intervention in those sports people where chronic high-intensity exercise causes a persistent inflammatory burden and increased lipid turnover.

Besides that, SBTi study has shown that differentially abundant metabolites were reduced in 93 percent of the Panchakarma group of metabolites which means that there is a net clearing or normalisation of circulation metabolites. This agrees with classical Ayurvedic definition of Shodhana (purification), expulsion of accumulated pathogenic material, and provide molecular level data of a process that previously was possible only by qualitative traditional description. The findings are amenable to longitudinal metabolomic studies especially on groups of athletes to define the ability of seasonal Panchakarma-interventions to change the inflammatory as well as the metabolic burden at the conclusion of competitive training regimes.

8. A Prevention Sports Health Model To An Integrative Prevention

The reason behind this is that two parties cannot be in a competition as they complement one another.
There is also the imputation of threat of false dichotomy, the implicit opposition of Ayurveda and modern sports science as two systems, mutually exclusive, comes out as one of the most common objections to be brought up when Ayurveda and modern sports science are discussed in terms of traditional medicine. The reviewed evidence in this paper is an argument against this position. Abhyanga is not similar to sports massage; it puts it into a more advanced theoretical and philosophical context. Shirodhara does not represent an opposite to the psychological coaching, and another somatic, neurological complement to the cognitive interventions. Basti and Virechana do not substitute the diet sports nutrition, they address gastrointestinal and hepatic preconditions that determine the success or failure of the nutritional strategy.

The suggested integrative preventive model theorises Panchakarma as a seasonal, cyclical protocol of wellness as part of a larger programme of healthcare in a sports setting. Systematic detoxification, neuroendocrine replenishment, musculoskeletal preservation that is absent in the traditional recovery interventions, may be part of the organized seasonal interventions of Panchakarma that can be implemented between competition and recovery phases of the training macrocycle. The later model can conform to the recommendations of the sports science literature that multi-modal and holistic recovery should be viewed as taking into account the athlete as a biological, psychological and social being.

9. Gaps In Research And Future

Despite the theoretical and emerging empirical support, which were discussed in this paper, there are significant gaps in research that have been raised. The information on Panchakarma among athletic populations has been reduced so far to the information of the general population and case reports; there is an immediate need to come up with randomised controlled trials among sports specific cohorts. Future research priorities will be the following:

(1) Longitudinal, randomised controlled trials of the effects of pre- and post-Panchakarma biochemical profile changes on injury rates, inflammatory biomarkers, and recovery kinetics in competitive athletes;
(2) Metabolomic studies of the comparison between pre- and post-Panchakarma biochemical profile in high-performance athletes compared to different disciplines;
(3) Neuroimaging and HRV studies of the effect of Shirodhara on the autonomic activity of high-performance athletes;

To generate the evidence and ensure the effectiveness and safety of Panchakarma therapies on various health conditions, strict randomised controlled clinical trials of mass population are needed. Pre-clinical and clinical research of advanced imaging, nanotechnologies, and in silico pharmacology can identify the pharmacokinetic processes that the Panchakarma involves and can give a strong clue of how the processes can be applied in complimenting the traditional medical practice, particularly in prevention and management of chronic diseases (Acharya, 2024).

10. Conclusions

It is a descriptive thematic study that has attempted to demonstrate that Panchakarma is no longer believed to be a culturally exotic novice, but a complex internally consistent preventive healthcare system, the modalities of the latter of which are gradually coming to be justified by the biomedical research. The findings of analysis of the anti-inflammatory and autonomic effects of Abhyanga, neuroendocrine effect control of Shirodhara, gastrointestinal implication of Basti and Virechana, and the metabolomic results of the SBTI study all correlate to a significant argument of the systematic application of the Panchakarma principles of modern preventive sports healthcare. The theme of the seminar that mirrors this demand exactly is Wellness Renaissance: Reimagining Health through Yoga, Ayurveda and Sports Sciences. Real wellness renaissance will not come through simply incorporation of the old practices into the modern medicine: it will need the intellectual bravery to reconsider the theoretical foundations behind both systems and create bridging systems that will not ignore the virtues of either. The panchakarma is not an artifact to be preserved by but a system of life to be re-imagined, tried on, refined and ultimately up-scaled to suit the preventative health needs of the athletes of the twenty first century and those who aspire to their levels of wellness. The mounting international stress of lifestyle disease, the increase in the number of overtraining syndrome cases in the competitive sport combined with the rising demand of non-pharmacological health management is one of the precipitating factors that has led to the Revival of the Panchakarma in the sport science. A path to the journey is outlined in the following research agenda presented in this paper.

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STRESS MANAGEMENT AND MENTAL RESILIENCE IN YOUNG ATHLETES THROUGH YOGA AND PRANAYAMA: A NEUROPHYSIOLOGICAL AND PSYCHOSOCIAL ANALYSIS

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Abstract

Young athletes experience considerable psychological stress due to competitive pressures, demanding training schedules, injury risks, and high expectations for performance. These factors can negatively affect mental health, emotional regulation, and athletic performance. Yoga, which integrates asana (physical postures), pranayama (breathing techniques), and meditation, has emerged as a promising complementary strategy for enhancing stress management and mental resilience among athletes. This paper provides a thematic review of the neurophysiological and psychosocial mechanisms through which yoga and pranayama contribute to improved stress regulation and psychological well-being in young athletes. Existing research indicates that yogic practices promote parasympathetic nervous system dominance, improve heart rate variability (HRV), reduce cortisol levels, and regulate the hypothalamic–pituitary–adrenal (HPA) axis. Additionally, yoga practices enhance mindfulness, emotional regulation, coping strategies, and psychological flexibility while reducing anxiety and perceived stress. Evidence from experimental studies and clinical trials demonstrates that pranayama techniques such as Anulom-Vilom, Bhramari, and Kapalabhati significantly influence autonomic balance and improve mental resilience. The findings suggest that integrating yoga and pranayama into sports training programs can support both mental health and athletic performance. However, further sport-specific longitudinal studies are required to determine optimal intervention protocols and long-term outcomes.

Keywords: Yoga, Pranayama, Stress Management, Mental Resilience, Young Athletes, Mindfulness, Neurophysiology.

Introduction

Participation in competitive sports exposes young athletes to a variety of psychological and physiological stressors. These stressors arise from demanding training schedules, pressure to achieve high performance, fear of injuries, academic responsibilities, and social expectations from coaches, peers, and family members. While a moderate level of stress can enhance motivation and performance, excessive or prolonged stress can negatively affect athletes' mental and physical well-being. Research has shown that competitive athletes often experience high levels of performance anxiety, emotional instability, and mental fatigue due to the continuous pressure to excel (Malik, 2025). In many cases, young athletes struggle to balance athletic commitments with academic and social demands, which can further intensify stress levels and reduce overall life satisfaction.

Stress in athletes is not only psychological but also involves complex physiological responses within the body. When an individual experiences stress, the body activates the hypothalamic–pituitary–adrenal (HPA) axis, a central component of the neuroendocrine system responsible for regulating stress responses. Activation of the HPA axis leads to the secretion of stress hormones such as cortisol and adrenaline, which prepare the body for a "fight or flight" response. Although this response is beneficial in short-term situations, chronic activation of the stress system can disrupt physiological balance and negatively affect cognitive functioning, emotional regulation, immune responses, and recovery from physical exertion (Wadikar, 2019). Persistent elevation of stress hormones can also impair concentration, reduce motivation, and increase the risk of burnout among athletes.

In recent years, sports science has increasingly emphasized the importance of psychological resilience and mental well-being alongside physical conditioning. Athletes who possess strong coping mechanisms and emotional regulation skills are better able to manage competitive pressures and maintain consistent performance. Consequently, researchers and sports psychologists have begun exploring holistic and non-pharmacological approaches to stress management that support both mental and physical health. Among these approaches, yoga has emerged as a widely studied and effective practice for improving psychological balance and reducing stress-related symptoms.

Yoga is an ancient mind–body discipline that originated in India thousands of years ago. It integrates physical postures (asanas), controlled breathing techniques (pranayama), meditation, and mindfulness practices to promote harmony between the body and mind. Unlike conventional exercise programs that primarily focus on physical fitness, yoga emphasizes the integration of physiological, psychological, and emotional aspects of health. Scientific research indicates that yoga can regulate the autonomic nervous system, enhance parasympathetic activity, and reduce stress hormone levels, thereby improving overall physiological stability (Rao, 2021). Through these mechanisms, yoga promotes relaxation, emotional stability, and improved mental clarity.

Several studies have demonstrated that regular yoga practice can significantly reduce stress, anxiety, and depression while improving emotional resilience and self-regulation (K & Selvalakshmi, 2025); (Nanthakumar, 2021). Practices such as pranayama and meditation help regulate breathing patterns and activate relaxation responses in the body, leading to improved autonomic nervous system balance and enhanced capacity to cope with stressful situations (Dayal,2023). Additionally, yoga-based interventions have been associated with improved mood, increased focus, and better cognitive functioning, which are crucial factors for athletic performance and recovery.

For young athletes, incorporating yoga into training routines may provide both psychological and physiological benefits. Yoga-based practices can enhance flexibility, improve breathing efficiency, and promote mental calmness, all of which contribute to improved sports performance and reduced injury risk (Saini, 2025). Furthermore, yoga encourages mindfulness and body awareness, enabling athletes to better understand their physical limits and emotional responses during competition.

This paper aims to analyse the influence of yoga and pranayama on neurophysiological mechanisms and psychosocial factors related to stress management and resilience among young athletes. By examining the existing scientific literature, the study seeks to understand how yogic practices can modulate stress responses, enhance psychological resilience, and support the overall well-being and performance of young athletes.

Stress and Psychological Challenges in Young Athletes

Young athletes encounter unique psychological demands that differentiate them from non-athletic populations. Competitive environments require constant performance evaluation, which may increase anxiety, self-doubt, and fear of failure. Research shows that athletes often struggle with sleep disturbances, emotional instability, and stress associated with competition schedules and training intensity (Saraswati et al., 2024)

Moreover, injuries represent a major psychological stressor. Athletes experiencing injury may develop feelings of frustration, depression, or loss of identity. The inability to participate in training and competition may further intensify stress levels and negatively affect mental health.

If not properly managed, chronic stress can lead to burnout syndrome, characterized by emotional exhaustion, reduced motivation, and decreased performance. Therefore, effective stress management strategies are essential to sustain long-term athletic development.

Yoga-based interventions have been increasingly proposed as holistic approaches to address both physiological and psychological components of stress.

Neurophysiological Mechanisms of Yoga and Pranayama

Autonomic Nervous System Regulation

The autonomic nervous system (ANS) plays a crucial role in regulating the body's physiological responses to stress through its two main branches: the sympathetic and parasympathetic nervous systems. When a person experiences stress, the sympathetic nervous system becomes activated, triggering the "fight-or-flight" response. This response leads to increased heart rate, elevated blood pressure, and the release of stress hormones such as cortisol. While this reaction is essential for short-term survival, prolonged sympathetic activation can negatively affect physical and mental health. Yogic practices, particularly pranayama (controlled breathing techniques), help restore balance in the autonomic nervous system by enhancing parasympathetic activity, which is responsible for relaxation and recovery. Slow and controlled breathing during pranayama can reduce metabolic activity, lower heart rate, and promote a calm physiological state (Jerath et al., 2016). Research on Nadi Shuddhi Pranayama shows that even short-term practice significantly increases heart rate variability (HRV), indicating improved autonomic balance and greater parasympathetic dominance (Chakraborty et al., 2025). Regular pranayama practice has also been associated with

increased parasympathetic tone and reduced sympathetic activity, supporting better cardiovascular and stress regulation (Veerabhadrappa et al., 2011). Overall, these findings suggest that yoga-based breathing techniques can effectively modulate autonomic function and promote physiological relaxation

Top of Form

Bottom of Form

Reduction of Cortisol and HPA Axis Activity

Chronic psychological stress activates the hypothalamic–pituitary–adrenal (HPA) axis, resulting in prolonged secretion of cortisol, the body's primary stress hormone. When cortisol levels remain elevated for extended periods, they can negatively affect immune functioning, cognitive performance, and emotional stability. Such physiological changes may also impair recovery and increase vulnerability to fatigue and burnout, particularly among athletes exposed to continuous competitive pressure. Research suggests that regular yoga and meditation practices can help regulate the HPA axis and lower cortisol production. Studies have shown that individuals who consistently practice yoga demonstrate significant reductions in cortisol levels along with improvements in heart rate variability (HRV), which reflects better autonomic nervous system balance (Kavitha et al., 2024). By moderating cortisol secretion, yoga supports physiological recovery processes and promotes a more stable internal environment. As a result, athletes may experience improved sleep quality, enhanced emotional regulation, and greater resilience to stress, ultimately supporting both mental well-being and optimal athletic performance.

Brain Activity and Neurotransmitter Regulation3

Neurophysiological studies suggest that yoga influences brain wave patterns and neurotransmitter activity. Practices involving meditation and breathing exercises increase alpha brain wave activity, which is associated with relaxation and mental clarity.

Additionally, yoga has been shown to increase gamma-aminobutyric acid (GABA) levels in the brain. GABA plays a key role in reducing anxiety and regulating emotional responses. Increased GABA activity reduces amygdala activation, thereby decreasing stress and emotional reactivity (Santra, 2022)

These neurophysiological effects contribute to improved focus, emotional stability, and cognitive performance among athletes.

Psychosocial Benefits of Yoga for Young Athletes

Reduction of Stress and Anxiety

Yoga interventions have been shown to significantly reduce perceived stress and anxiety among athletes. A randomized controlled trial involving recreational athletes found that a one-month yoga program led to notable reductions in stress levels and improvements in psychological flexibility (Saraswati et al., 2025). Through practices such as controlled breathing, relaxation, and mindful movement, yoga helps calm the mind and regulate emotional responses. As stress decreases, athletes are better able to maintain emotional balance, focus, and confidence during both training sessions and competitive situations

Enhancement of Mindfulness and Emotional Regulation

Mindfulness refers to the ability to maintain awareness of present experiences without judgment. Yoga practices often incorporate mindful breathing and meditation, which improve attentional control and emotional awareness. Studies indicate that pranayama and meditation significantly improve well-being and mindfulness levels among young adults (Kushwaha et al., 2024)

Enhanced mindfulness helps athletes manage emotional responses during competition and maintain concentration under pressure.

Improvement of Sleep and Recovery

Regular yoga practice can significantly improve sleep quality among athletes by reducing stress, anxiety, and psychological rigidity. Studies indicate that relaxation techniques and controlled breathing used in yoga help calm the nervous system and promote deeper, more restorative sleep (Saraswati et al., 2024). Improved sleep plays a crucial role in physical recovery, muscle repair, and hormonal balance. It also enhances cognitive functioning, emotional regulation, and concentration, ultimately supporting better athletic performance and overall well-being in young athletes.

Development of Psychological Resilience

Mental resilience refers to an individual's ability to adapt positively to stress, adversity, and competitive pressure. Yoga supports the development of resilience by improving emotional regulation, increasing self-awareness, and strengthening coping strategies. Regular yoga practice helps athletes remain calm and mentally balanced in challenging situations. Athletes who practice yoga often report higher self-confidence, better concentration, and improved emotional control during competitions. These psychological benefits enhance decision-making, reduce performance anxiety, and support consistent performance, ultimately contributing to long-term athletic development and success.

Role of Specific Pranayama Techniques

Several pranayama techniques are particularly effective in stress management:

Anulom-Vilom Pranayama (Alternate Nostril Breathing)

Anulom-vilom is a traditional yogic breathing practice that involves inhaling through one nostril and exhaling through the other in an alternating pattern. The practitioner sits in a comfortable posture, closes the right nostril with the thumb, inhales slowly through the left nostril, then closes the left nostril with the ring finger and exhales through the right. The process is then reversed and repeated for several cycles.

This technique helps regulate the autonomic nervous system by balancing sympathetic (stress-related) and parasympathetic (relaxation-related) responses. Slow, rhythmic breathing improves oxygen supply to the brain, reduces mental stress, and enhances concentration. Regular practice also promotes emotional stability, relaxation, and overall mental well-being by calming neural activity and improving respiratory efficiency.

Bhramari Pranayama (Humming Bee Breathing)

Bhranari pranayama is a calming yogic breathing technique in which a person produces a gentle humming sound during exhalation, similar to the buzzing of a bee. To practice, sit comfortably with eyes closed and the spine straight. Inhale slowly through the nose, then exhale while making a soft humming sound with the mouth closed. Often, the ears are lightly closed with the fingers to deepen internal awareness of the vibration.

The humming vibration stimulates the vagus nerve, which activates the parasympathetic nervous system and promotes relaxation. This practice helps reduce stress, anxiety, and mental agitation. The sound vibrations also improve concentration, calm the mind, and enhance emotional balance, making it effective for relaxation and mental clarity.

Kapalabhati Pranayama (Skull-Shining Breathing) is a dynamic yogic breathing technique characterized by rapid, forceful exhalations followed by passive inhalations. The practitioner sits comfortably with a straight spine and exhales forcefully through the nose by contracting the abdominal muscles, while inhalation occurs automatically. This process is repeated rhythmically for several rounds. The technique enhances respiratory efficiency by strengthening the diaphragm and improving ventilation, which helps increase oxygen supply and remove carbon dioxide from the body. It also stimulates the nervous system, promoting mental alertness and concentration. Studies show that Kapalabhati and other pranayama practices influence cardiovascular and autonomic functions, affecting heart rate variability and blood pressure regulation, thereby contributing to overall physiological balance and health (Kumaresan et al., 2023); (Viswanathan et al., 2020); (Mohan et al., 2017)

Integration of Yoga into Athletic Training

Integrating **Yoga** into athletic training programs can significantly enhance both physical and psychological performance. Yoga combines stretching, breathing techniques, and mindfulness, which complement traditional sports training. Regular practice improves **flexibility, balance, and joint mobility**, helping athletes perform movements more efficiently and reducing the risk of muscle strains and sports injuries.

Studies show that athletes who include yoga in their routines experience significant improvements in flexibility and balance, which are essential for optimal sports performance.

Yoga also enhances **breathing efficiency and oxygen utilization**, which can support endurance and stamina during intense physical activity. Additionally, its mindfulness and relaxation techniques improve **concentration, emotional stability, and stress management**, helping athletes remain focused during competition.

Experts recommend yoga sessions of **20–40 minutes, three to five times per week**, as a practical complement to conventional training. Furthermore, yoga can be valuable in **rehabilitation programs**, as it promotes gentle mobility, reduces stress, and helps injured athletes stay mentally engaged during recovery while maintaining overall well-being.

Limitations and Future Research

Although current research supports the role of yoga in stress management and psychological well-being, several limitations remain. Many studies rely on relatively small sample sizes and short intervention periods, which restrict the generalizability of their findings. Additionally, limited research has focused specifically on elite or sport-specific athlete populations. Another challenge is the wide variation in yoga protocols, including differences in duration, intensity, and techniques, making it difficult to establish standardized training programs.

Future research should therefore emphasize longitudinal studies that examine the long-term psychological and physiological effects of yoga practice. Researchers should also develop sport-specific yoga protocols tailored to athletes' needs. Furthermore, neuroimaging studies and large randomized controlled trials are necessary to better understand the mechanisms and effectiveness of yoga interventions

Conclusion

Young athletes frequently experience substantial psychological pressure due to rigorous training schedules, high performance expectations, and competitive environments. These demands can contribute to anxiety, mental fatigue, emotional imbalance, and decreased motivation, which may negatively affect both performance and overall well-being. In this context, **yoga and pranayama** have emerged as effective holistic practices that support mental health and resilience. These practices combine physical postures, controlled breathing, and mindfulness techniques that influence both physiological and psychological mechanisms involved in stress regulation.

Scientific studies indicate that regular yoga practice can positively influence the **autonomic nervous system**, which plays a crucial role in regulating the body's stress response. Yoga and breathing exercises help improve **heart rate variability (HRV)**, an important indicator of cardiovascular health and autonomic balance. Higher HRV reflects stronger parasympathetic activity, which promotes relaxation and faster recovery after physical exertion. Research has shown that yoga-based recovery strategies can enhance physiological recovery and reduce stress among athletes (Petviset et al., 2025). Furthermore, yoga interventions have been found to lower stress and anxiety levels while improving sleep quality, mindfulness, and emotional stability in athletes (Saraswati et al., 2024).

From a psychological perspective, yoga fosters **mindfulness, emotional regulation, and resilience**, which are essential qualities for athletes performing under pressure. Regular yoga practice encourages greater self-awareness and mental focus, enabling athletes to manage competitive stress more effectively. Empirical studies demonstrate that yoga training can significantly reduce **competitive anxiety** and improve self-confidence and mental stability among athletes (Rathod & Sawalia, 2024). Additionally, qualitative research suggests that athletes who practice yoga report enhanced concentration, improved emotional balance, and better overall psychological well-being (Bhaip & Kharade, 2025).

Therefore, integrating yoga into athletic training programs can play an important role in promoting mental well-being, improving recovery, and enhancing overall athletic performance. With further scientific research and the

development of standardized training protocols, yoga has the potential to become a valuable component of modern **sports science and athlete development programs**.

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INCLUSIVITY OF YOGA FOR SPECIAL POPULATIONS: MEDICAL EVIDENCE, POLICY GAPS, FUNDING CHALLENGES, AND DEVELOPMENTAL IMPLICATIONS

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Abstract

Yoga has emerged as a globally recognized complementary health intervention with evidence supporting its use in chronic disease management, neurological rehabilitation, mental health, and neurodevelopmental conditions. Biomedical research indexed in PubMed/NCBI demonstrates measurable therapeutic benefits. Despite institutional promotion through frameworks such as India's National Education Policy (NEP) 2020, Khelo India, and strategic directives from NITI Aayog, structured inclusion of special populations—including persons with disabilities, neurodiverse individuals, and those with chronic illness—remains inadequate. Comparative analysis of international integration in countries such as the United States, Japan, the United Kingdom, Australia, and Canada reveals partial but fragmented inclusion. This paper synthesizes medical evidence, critically evaluates policy and funding gaps, examines certification inconsistencies and implementation barriers, and analyzes how dedicated funding and inclusive policy reforms can enhance individual development and national progress.

Keywords: Inclusive Yoga; Adaptive Yoga; Special Population; Disability Policy; Rehabilitation; Public Health; Research Funding; National Development

Introduction

Yoga integrates physical postures (asanas), breathing techniques (pranayama), and meditation to promote holistic well-being. Since the declaration of the International Day of Yoga by the United Nations in 2014, yoga has gained global institutional visibility (Woodyard, 2011).

Although traditionally perceived as universally accessible, operational inclusion remains uneven, particularly for *special populations*. According to India's **Ministry of Social Justice and Empowerment**, special populations include individuals with physical, sensory, intellectual, and mental health impairments—such as locomotor, visual, hearing, speech, mental illness, and multiple disabilities—who require targeted support to participate fully in health, education, employment, and social activities (Department of Empowerment of Persons with Disabilities, 2021).

The **World Health Organization (WHO)** emphasizes that disability results from the interaction between impairment and environmental or social barriers and advocates for equitable access to health services, rehabilitation, assistive technologies, and social participation for all persons with disabilities (WHO, 2022).
These definitions establish the scope and objectives for inclusive health interventions, including yoga, aimed at improving both functional independence and social integration.

Includes following key points

- Scientific evidence supporting yoga's benefits for special populations.
- Policy frameworks and systemic barriers.
- Funding and certification deficiencies.
- Ground-level implementation challenges.
- Developmental implications of inclusive reform at individual and national levels.

Medical Evidence Supporting Yoga for Special Populations

Chronic Disease Management

Systematic reviews demonstrate that yoga can improve cardiovascular health, reduce hypertension, support glycemic control in diabetes, and improve overall quality of life in individuals with chronic conditions (Ross & Thomas, 2010; Cramer et al., 2014). Yoga enhances autonomic regulation and reduces inflammatory biomarkers.

Neurological and Neurodevelopmental Conditions

Yoga improves balance, coordination, and motor function in individuals with Parkinson's disease and other neurological disorders (Kwok et al., 2016). In children with autism spectrum disorder and intellectual disability, adaptive yoga interventions show positive effects on emotional regulation, attention, and motor coordination (Kenny, 2015).

Mental Health Outcomes

Meta-analyses confirm yoga's efficacy in reducing anxiety, depression, and stress biomarkers. Yoga's influence on gamma-aminobutyric acid (GABA) levels may support mood regulation and autonomic balance (Hofmann et al., 2010; Streeter et al., 2012).

Policy Framework Analysis

India: Education and Sports Policy

NEP 2020 promotes holistic development and incorporates yoga in curricula but lacks adaptive curriculum frameworks, mandatory disability-specific teacher training, and monitoring indicators for inclusion (Government of India, 2020). Khelo India supports para-athlete development, yet yoga is not formally classified within adaptive sport categories such as the Paralympic Games.

NITI Aayog and Policy Implementation Gaps

While NITI Aayog emphasizes inclusive growth and sustainable development, its directives for integrating yoga with health, education, and disability welfare are limited in scope. The policy framework lacks:

- A structured plan linking yoga programs to state-level disability inclusion initiatives.
- Dedicated funding allocations for research and implementation of adaptive yoga.
- Collaboration mechanisms between AYUSH, health ministries, and disability rehabilitation departments.
- Monitoring and evaluation guidelines for inclusive program effectiveness.

As a result, special populations remain indirectly underserved, and innovative adaptive yoga initiatives struggle to scale beyond pilot projects. Cross-state variations further exacerbate inequity, leaving ground-level beneficiaries without systematic access.

International Integration

In the United States, adaptive yoga is integrated in rehabilitation hospitals, veterans' mental health programs, and special education environments, though certification standards are decentralized (Khalsa et al., 2016). Japan incorporates yoga in geriatric and community wellness programs but lacks formal disability-specific policy. The UK, Australia, and Canada show partial institutional adoption, though national regulatory frameworks for adaptive yoga are absent.

Funding Gaps and Research Prioritization

Adaptive yoga research is underfunded compared to biomedical interventions. Disability-focused studies often rely on limited, short-term grants without long-term funding streams, restricting evidence generation and policy translation. The lack of a dedicated funding mechanism for special population research significantly hampers the expansion of adaptive yoga practices nationwide.

Certification and Specialized Teacher Deficits

Global yoga certification systems lack standardized adaptive modules. Key issues include:

- Absence of internationally recognized adaptive yoga credentials.
- Limited clinical and safety training for instructors handling diverse disabilities.
- Variability in teaching methods and adaptation protocols.
- Minimal regulatory oversight for quality control.

Consequently, individuals with disabilities face inconsistent instruction quality, raising safety risks and limiting participation. Establishing certified adaptive yoga instructors is critical to both therapeutic outcomes and large-scale program sustainability.

International Day of Yoga: Symbolic vs. Structural Inclusion

While the International Day of Yoga promotes visibility for special populations, inclusion is largely ceremonial. Most events:

- Highlight participation of persons with disabilities only during single-day programs.
- Lack follow-up adaptive yoga classes or year-round community programs.
- Do not include measurable evaluation of participant outcomes.

Structural inclusion requires systemic policies embedding adaptive yoga into schools, rehabilitation centers, and public health programs, beyond symbolic celebrations.

Ground-Level Implementation Barriers

Operational challenges include limited accessible infrastructure, shortage of trained instructors, economic barriers, and minimal outreach to special education institutions. These systemic gaps indirectly exclude special populations from meaningful participation, demonstrating that visibility without infrastructure is insufficient for equity.

Developmental Implications of Inclusive Policy Reform

Individual Development

With dedicated funding and adaptive policy frameworks, individuals could experience:

- Enhanced physical independence
- Improved emotional and cognitive resilience
- Greater self-efficacy and social inclusion
- Better employability
- Reduced long-term healthcare dependency

National Development

Inclusive yoga policies could:

1. Reduce public healthcare expenditure via preventive health.
2. Increase workforce participation among persons with disabilities.
3. Strengthen human capital.
4. Foster inclusive economic growth and social equity.

Investment in adaptive yoga aligns with Sustainable Development Goals (SDGs).

Discussion

Yoga demonstrates substantial therapeutic benefits, yet systemic barriers policy fragmentation, inconsistent funding, lack of certified instructors, and weak ground-level implementation limit inclusive access.
Specifically:

- **NITI Aayog policy gaps** hinder integration of adaptive yoga into mainstream health and education programs.
- **Certification deficiencies** compromise safety, scalability, and program quality.
- **Symbolic inclusion** during International Day of Yoga events cannot replace structured, year-round programs.
- **Funding constraints** restrict large-scale research and evidence-based policy-making.

International case studies highlight partial integration but underscore the need for standardized adaptive certification, cross-sectoral collaboration, and long-term funding. Comprehensive reform can simultaneously enhance therapeutic outcomes, social inclusion, and national development

Conclusion

Yoga offers therapeutic and rehabilitative potential for special populations. But due to systematic weak ground level implementation and lacking behind at the ground level the special population and Without coordinated funding, adaptive policies, standardized certification, and effective implementation, equitable access remains limited. Strategic reforms can transform yoga into a truly inclusive public health intervention, promoting both individual

empowerment and national development and the integration of all through the yoga and create a nation inclusive and equitable for all the developing nations are adopting yoga at a mass level and include in their policies yoga and yogic practices must be includes as per the needs of special population at ground level with special certified trained instructors for of special population and their specific needs and yoga is a scientific medical based practices for benefits of physical and mental health and wellbeing to pre and post rehabilitation and for social inclusion participation, and the cognitive self efficacy and emotional resilience through yoga practices.

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INCLUSION OF 'YAMA' AND 'NIYAMA' FOR CHARACTER EDUCATION IN SENIOR SECONDARY CURRICULUM

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Abstract

This research paper examines yogic principles as a basis for character education in the senior secondary curriculum. It draws the roots from classical Indian philosophical ideas, focusing on the ethical framework found in the Yoga Sutras of Patanjali and the Bhagavad Gita. The study looks at how yogic values can address modern issues like moral decline, emotional imbalance, and value fragmentation among adolescents. It takes a qualitative thematic approach, analysing key yogic concepts such as Yama (ethical restraints), Niyama (personal observances), self-discipline, mindfulness, and inner awareness. These principles are organised into broader character dimensions, including integrity, empathy, responsibility, resilience, and self-regulation. The analysis connects these dimensions to the developmental needs of senior secondary students, and shows the importance of yogic ethics in promoting overall development – i.e., cognitive, emotional, social, and moral. Instead of viewing yoga solely as a physical practice, the study presents it as a valuable ethical and psychological framework that can strengthen character development in formal education. The paper points out the teaching implications of including yogic principles in classroom instructions, co-curricular activities, and reflective learning practices. By offering clear conceptual standards, the study adds to discussions on value-based curriculum and presents a culturally grounded yet universally relevant approach to character education. The findings indicate that yogic principles provide a solid and lasting foundation for nurturing ethically responsible and emotionally balanced young citizens.

Keywords: Yogic Philosophy, Character Education, Yama and Niyama

Introduction

Education is a process that helps students develop moral principles and character in addition to imparting knowledge. Concerns concerning the deterioration of moral principles and responsible conduct among young people have been voiced by educators and legislators worldwide in recent decades. Teenagers are experiencing moral perplexity and emotional stress due to societal expectations, competitive academic contexts, and rapid technology innovation (Lickona, 1991). As a result, there is a growing emphasis on the necessity of incorporating good character education into school curricula. Traditional knowledge systems provide important insights into moral education and ethical growth in the Indian environment. A fundamental component of Indian philosophy, yogic philosophy offers a thorough framework for self-realisation, ethical behaviour, and self-discipline. Yama and Niyama, which are outlined in the ancient book Yoga Sutras by Patanjali, are two of the fundamental tenets of yoga. These tenets set forth moral standards and individual behaviours that support moral and psychological growth.

Niyama emphasises internal discipline and personal observances, while Yama stands for social ethics or moral constraints. When combined, they lay the groundwork for positive interactions with both oneself and other people. Patanjali describes five Yamas—Ahimsa (non-violence), Satya (truthfulness), Asteya (non-stealing), Brahmacharya (self-control), and Aparigraha (non-possessiveness). Similarly, the five Niyamas include Shaucha (purity), Santosha (contentment), Tapas (discipline), Svadhyaya (self-study), and Ishvara Pranidhana (surrender to a higher consciousness) (Patanjali, trans. Bryant, 2009). These moral precepts can be used as universal rules for social harmony and personal development in addition to being restricted to spiritual practice. When used in educational settings, they can support students' development of virtues including integrity, empathy, accountability, and self-control. a crucial phase of human development is represented by senior secondary schooling. At this level, students are going through major social, emotional, and psychological changes. In order to create responsible citizens, it is crucial to build solid moral foundations throughout this phase. However, character development is frequently overlooked in favour of academic success in the contemporary curriculum.
As a result, including yogic ethical principles in the senior secondary curriculum could be a successful strategy for teaching values. The current study looks at how incorporating Yama and Niyama can support students' overall development and character education.

Theoretical Foundations: Yoga, Mindfulness, and Character

Core character domains like integrity, responsibility, empathy, and self-regulation that are stressed in school-based character programs across contexts align well with yogic principles (Yama, Niyama, self-discipline, inner awareness) (Sinha & Kumari, 2021; Birhan et al., 2021; Zurqoni et al., 2018; Hanafiah et al., 2024; Rajpoot et al., 2025). According to a theoretical concept of "yoga in education" based on aṣṭāṅga yoga, systematic practice directly supports character and social-emotional learning by fostering physiological well-being, cognitive efficacy, emotional regulation, and desirable personality qualities (Sinha & Kumari, 2021).
Similar to yogic ethics, parallel traditions (such as Al bāṭiniyyah values, Islamic and indigenous character frameworks) emphasize sincerity, humility, ethical discipline, and spiritual intention as drivers of holistic personality formation (Ninoersy & Isnayanti, 2025; Hanafiah et al., 2024; Garg, 2024).

Empirical Evidence: Resilience, Self-Regulation, and Well-Being

Studies conducted at the school and university levels regularly link yoga and mindfulness to improved resilience, self-control, and overall well-being:
Resilience, self-compassion, and mindfulness are powerful indicators of improved academic achievement and decreased procrastination among undergraduates (Egan et al., 2021). Middle school curricula that incorporate mindful yoga greatly enhance long-term and global self-regulation, which is a crucial foundation for moral behaviour and impulse control (Bergen-Cico et al., 2015). While lowering stress and anxiety, including mindfulness in K–12 instruction improves attention, emotional control, social skills, and self-esteem (Meiklejohn et al., 2012). Within a self-regulatory (SART) framework, yoga practitioners demonstrate increased interoceptive awareness, decentring, and emotion regulation, elucidating the ways in which yoga modifies character-related qualities (Tolbaños-Roche & Menon, 2021). Adolescents who practice yoga develop more emotional maturity, empathy, and intrinsic drive, highlighting the benefits of yoga as a character and mental health intervention (Rajpoot et al., 2025).

Character Education Needs in Senior-Secondary Contexts

Caring, honesty, emotional intelligence, responsibility, and respect are key value clusters that are frequently overlooked or disjointed in the current curriculum, according to research on character education in schools (Birhan et al., 2021; Zurqoni et al., 2018; Alvi et al., 2020). According to studies (Dewi et al., 2025; Zurqoni et al., 2018; Ninoersy & Isnayanti, 2025; Hermino & Arifin, 2020; Garg, 2024), contextualization to local culture and wisdom, including indigenous or religious ethical traditions, is necessary for effective character education. Instead of using discrete classes, whole school approaches that incorporate role modelling, habituation, positive discipline, and community involvement (Dewi et al., 2025; Zurqoni et al., 2018; Hanafiah et al., 2024; Hermino & Arifin, 2020). systematic solutions using culturally grounded pedagogies and revitalised moral leadership to address issues of the digital era, such as online ethics, teacher identity erosion, and value fragmentation (Dewi et al., 2025; Zurqoni et al., 2018; Hanafiah et al., 2024). With no practical guidance for fostering virtues in everyday school life, secondary curriculum in many systems still places a higher priority on exam content than on structured ethical and moral formation (Birhan et al., 2021; Alvi et al., 2020).

Mapping Yogic Ethics to Adolescent Developmental Needs, Character Dimensions and Yogic Constructs:

Table 01: Alignment of Yogic Constructs with Character Outcomes

Character dimension (school focus)	Yogic / mindfulness construct	Empirical & theoretical links	Citations
Integrity, honesty, responsibility	Yama (non-harming, truth, non-stealing), dharmic duty	Yoga-in-education models tie Yama and duty to ethical conduct and prosocial attitudes	(Sinha & Kumari, 2021; Bergen-Cico et al., 2015; Tolbaños-Roche & Menon, 2021; Rajpoot et al., 2025)
Self-regulation, impulse control	Niyama (tapas, svādhyāya), mindful awareness	Mindful yoga boosts long-term self-regulation; mindfulness relates to academic resilience and reduced stress	(Egan et al., 2021; Meiklejohn et al., 2012; Bergen-Cico et al., 2015; Tolbaños-Roche & Menon, 2021; Mitchell, 2020)
Empathy, caring, compassion	Ahimsā, compassion practice, relational mindfulness	Yoga and mindfulness enhance empathy, relational compassion, prosocial behaviour	(Meiklejohn et al., 2012; Bergen-Cico et al., 2015; Tolbaños-Roche & Menon, 2021; Rajpoot et al., 2025)

Resilience and coping	Mindfulness, yogic self-regulation, resilience skills	Mindfulness training strengthens student and teacher resilience; resilience courses are welcomed in demanding curricula	(Egan et al., 2021; Meiklejohn et al., 2012; Nair et al., 2023; Kowitarttawatee & Limphaibool, 2022; Mitchell, 2020)
Purpose, meaning, spiritual well-being	Niyama-based spiritual well-being (contentment, self-introspection, surrender)	Validated Niyama-based scales show structured dimensions of spiritual well-being linked to discipline, gratitude, and higher purpose	(Sinha & Kumari, 2021; Garg, 2024)

Implementation in Formal Education:

Curriculum and Policy Alignment

According to Sinha and Kumari (2021), Yusuf et al. (2025), and Hanafiah et al. (2024), India's National Education Policy 2020 and similar policy directions emphasise holistic, value-based education and specifically acknowledge yoga as a means of fostering citizenship and physical, mental, social, and spiritual development. However, reviews of secondary curricula's moral and ethical content show a lack of systematic instruction in ethical action and a lack of depth, indicating space for yogic frameworks to operationalise stated goals (Yusuf et al., 2025; Birhan et al., 2021; Alvi et al., 2020).

Pedagogical Strategies

- There is evidence to support the integration of yogic ideas through: • Curriculum infusion: Self-regulation is improved without compromising content time when brief mindful yoga and reflection exercises are incorporated into academic topics (such as language arts) (Meiklejohn et al., 2012; Bergen-Cico et al., 2015).

- Dedicated modules: Resilience and mindfulness courses are highly regarded, boost awareness, and encourage self-directed application in demanding programs (such as medicine or nursing) (Nair et al., 2023; Mitchell, 2020).

- Teacher training: By improving wellbeing, classroom management, and supportive connections, mindfulness training for educators strengthens their position as moral role models (Meiklejohn et al., 2012; Kowitarttawatee & Limphaibool, 2022).

- **Contextual character programs**: Patanjali and the Gita should be used similarly in Indian contexts because local wisdom-based character initiatives (such as "Ing Ngarsa Sung Tuladha," community norm systems) demonstrate that value internalisation deepens when ethical principles resonate with cultural narratives (Dewi et al., 2025; Zurqoni et al., 2018; Ninoersy & Isnayanti, 2025; Hermino & Arifin, 2020).

Results Timeline and Evolving Evidence

Since the early 2010s, there has been a substantial increase in research on yoga, mindfulness, and character education in school settings. The introduction of mindfulness techniques in schools and their potential to assist children's emotional and behavioural development were the main topics of early research. The study by Patricia Meiklejohn and colleagues (2012), which looked at the use of mindfulness programs in K–12 education and emphasised their potential to increase students' attention, emotional regulation, and well-being, is one of the seminal studies in this field. The conceptual foundation for incorporating contemplative practices into educational settings was established during this time.

Research on the connection between academic functioning, self-regulation, and mindfulness grew between 2010 and 2016. Studies started looking at how mindful yoga programs could improve students' psychological resilience and behavioural control around this time. For example, Tara Bergen-Cico and associates (2015) investigated a mindful yoga intervention intended to enhance students' self-regulation and stress management. This research showed that integrating physical exercises like yoga with mindfulness could promote emotional and cognitive growth.

The literature progressively embraced multidisciplinary and comprehensive viewpoints between 2017 and 2021. Researchers started relating yoga and mindfulness to more general topics, including sustainability, psychological processes, and academic achievement. Christine Wamsler (2017), for instance, investigated how mindfulness exercises might enhance sustainability education by encouraging consciousness and responsible conduct. Simultaneously, research like that conducted by Megan Egan (2021) and Sinha Kumari (2021) looked at the connection between yoga, mindfulness, and academic success in higher education. The application of the S-ART framework (Self-Awareness, Self-Regulation, and Self-Transcendence), which explains how contemplative practices affect cognitive and emotional processes, was another significant contribution made during this time, according to research by Tolbaños-Roche and Vishal Menon (2021).

Research has recently broadened its focus to encompass regulatory frameworks, spiritual aspects of education, and the difficulties of character development in the digital era, especially between 2022 and 2025. Numerous studies have looked into how educational reforms and holistic learning techniques can be supported by yoga-based value systems. For instance, Yusuf's research from 2025 explores the consequences of incorporating yoga practices into frameworks for educational policy that are influenced by the National Education Policy of 2020. Other research, like Garg (2024), has made an effort to create assessment instruments based on Niyama and other yogic ethical concepts. Furthermore, researchers like Dewi (2025), Ninoersy (2025), and Rajpoot (2025) have studied how character education can be modified to address modern issues, including digital culture, social media influence, and changing youth value systems.

Overall, research on mindfulness in schools has clearly moved from early exploratory studies to more extensive frameworks that incorporate educational policy, psychological mechanisms, and yogic philosophy. Yoga and mindfulness are widely seen in modern scholarship as culturally embedded systems that can support students' comprehensive character development, emotional resilience, and ethical awareness in addition to being wellness practices.

Conclusions

Research from a variety of settings supports the idea that yogic principles and mindfulness-based practices can significantly improve teenagers' resilience, self-regulation, empathy, and ethical orientation, directly advancing the goals of character education. Together, theoretical models based on Ashtanga yoga, empirical results from mindfulness and mindful-yoga interventions, and policy frameworks such as NEP 2020 show that treating yoga as an ethical-psychological system rather than just a physical activity provides a solid, culturally grounded, and transferable basis for senior-secondary character curricula.

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EFFECTIVENESS OF YOGA ON PHYSICAL STATUS AND DIFFERENTIATION ABILITY AMONG JUNIOR BOYS FOOTBALL PLAYERS IN RELATION TO PLAYING POSITION.

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Abstract

Football necessitates a combination of physical conditioning and neuromuscular coordination, with a specific emphasis on differentiation ability—the skill to achieve precision and fine-tuning in body movements essential for technical maneuvers like dribbling, ball control, and shooting. This study investigates the effect of a structured yoga training intervention aimed at enhancing physical fitness and coordination among footballers (of different playing positions) of Gorakhpur.

An experiment was conducted involving junior male football players. The researcher implemented a 12-week yoga program featuring specific asanas (postures), pranayama (breathing techniques), and dharana (concentration exercises). The impact of yoga was assessed in relation to physical fitness parameters such as flexibility, balance, and core strength, alongside differentiation ability evaluated through standardized coordination tests. The analysis revealed performance differences tailored to the unique demands of each playing position.

Findings indicated that yoga training enhances physical fitness among junior players, particularly in flexibility and dynamic balance. Improvements in differentiation ability were substantial, enabling players to perform complex motor tasks with increased accuracy. Specifically, midfielders and attackers demonstrated the most pronounced advancements in ball-handling skills, while goalkeepers showed significant gains in reaction time and spatial awareness. Yoga's role in strengthening the "muscle-mind" connection resulted in an efficient energy expenditure during competitive matches.

The study concludes that yoga serves as an effective intervention for bolstering the physical and coordinative capabilities of junior football players. By enhancing differentiation ability, yoga improves technical performance on the field. It is suggested that football training centers incorporate position-specific yoga training modules to maximize young athletes' development and minimize injury risks through enhanced bodily awareness.

Keywords: Yoga, Differentiation Ability, Junior Boys, Physical Status, Playing position.

Introduction

The word "Yoga" originates from the Sanskrit root yuj, meaning to yoke or unite. The earliest mentions are found in the Rig Veda, the oldest of the Hindu scriptures. Initially, yoga wasn't about physical fitness; it was a ritualistic and meditative practice aimed at transcending the ego. During the Upanishadic period, the focus shifted toward internalizing these rituals, exploring the connection between the individual soul (Atman) and the universal reality (Brahman)

Yoga Sutras by Patanjali. He defined Yoga as "Chitta Vritti Nirodha"—the cessation of the fluctuations of the mind. Patanjali outlined the Eight Limbs of Yoga (Ashtanga). Interestingly, Asana (physical posture) was only one of the eight limbs, and it primarily referred to a steady seated position for meditation. For the ancient yogi, the body only needed to be healthy enough to sit still for hours.

The Ancient Foundations (c. 1500 BCE – 500 BCE) The word "Yoga" originates from the Sanskrit root yuj, meaning to yoke or unite. The earliest mentions are found in the Rig Veda, the oldest of the Hindu scriptures. Initially, yoga wasn't about physical fitness; it was a ritualistic and meditative practice aimed at transcending the ego. During the Upanishadic period, the focus shifted toward internalizing these rituals, exploring the connection between the individual soul (Atman) and the universal reality (Brahman).

The Classical Period and Patanjali (2nd Century BC) the most significant historical milestone is the compilation of the Yoga Sutras by Patanjali. He defined Yoga as "Chitta Vritti Nirodha"—the cessation of the fluctuations of the mind. Patanjali outlined the Eight Limbs of Yoga (Ashtanga). Interestingly, Asana (physical posture) was only one of the eight limbs, and it primarily referred to a steady seated position for meditation. For the ancient yogi, the body only needed to be healthy enough to sit still for hours.

The Rise of Hatha Yoga (9th – 18th Century CE)
As time progressed, practitioners realized that the "mind" could not be mastered if the "vessel" (the body) was weak or full of disease. This led to the development of Hatha Yoga. Texts like the Hatha Yoga Pradipika introduced complex physical postures, cleansing techniques, and breath retention. This era marked the shift toward using the body as a tool for spiritual liberation.

The Modern Transition (19th Century –Present) In the late 19th and early 20th centuries, Yoga underwent a "renaissance." Teachers like T. Krishnamacharya (often called the father of modern yoga) began blending traditional Hatha Yoga with gymnastics and wrestling exercises to create a more dynamic physical practice. His students—B.K.S. Iyengar and Pattabhi Jois—brought these styles to the West.

By the 2000s, the medical and athletic communities began validating what yogis knew for millennia. Today, football clubs like Liverpool FC, Manchester City, and Real Madrid employ full-time yoga instructors. It is no longer viewed as a "mystical" practice but as a biomechanical necessity for career longevity.As time progressed, practitioners realized that the "mind" could not be mastered if the "vessel" (the body) was weak or full of disease. This led to the development of Hatha Yoga. Texts like the Hatha Yoga Pradipika introduced complex physical postures, cleansing techniques, and breath retention. This era marked the shift toward using the body as a tool for spiritual liberation.

Football is a dynamic sport that demands a high level of physical fitness, technical proficiency, and neuromuscular coordination. In modern football, players are not only required to possess strength and endurance but also the ability to precisely regulate body movements during complex technical actions. One of the most important coordinative abilities in football is **differentiation ability**, which refers to the capability of controlling muscle force, speed, and movement direction with high accuracy.

This ability plays a crucial role in performing technical football skills such as dribbling, ball control, passing, and shooting. Players with well-developed differentiation ability can execute movements with better precision and efficiency during match situations.

The age group of **14–19 years** is considered a critical developmental stage for young athletes. During this period, significant growth occurs in both the musculoskeletal and nervous systems. As a result, this stage provides an excellent opportunity to enhance motor abilities and sports skills through structured and scientific training programs.

Despite improvements in traditional football training programs, many academies still focus primarily on cardiovascular endurance, muscular strength, and basic ball skills. However, research in sports science suggests that **coordinative abilities**, especially differentiation ability, play a vital role in technical performance and game efficiency.

Differentiation ability enables athletes to regulate muscular effort with high precision, which is essential for accurate passing, controlled dribbling, and precise shooting in football. Conventional repetitive drills often fail to develop the complex neural pathways required for such fine motor control.

Therefore, modern sports training increasingly incorporates **mind-body interventions** to improve both physical and neuromuscular functions. Among these approaches, **yoga training** has emerged as a valuable complementary training method.

Yoga integrates **asanas (postures), pranayama (breathing techniques), and dharana (concentration practices)**. These practices contribute not only to physical flexibility but also to improved neuromuscular coordination, body awareness, and mental focus. Regular yoga practice enhances the connection between the muscles and the nervous system, leading to more efficient movement control and energy utilization during sports performance.
Considering these potential benefits, the present study investigates the effectiveness of a structured 12-week yoga training program on the physical fitness and differentiation ability of junior male football players in Gorakhpur

district. Additionally, the study examines whether the impact of yoga training differs according to playing positions such as goalkeepers, defenders, midfielders, and attackers.

Methodology

The present research was conducted using an **experimental research design** to examine the effect of a structured yoga training program on the physical status and differentiation ability of junior male football players. A **pre-test and post-test design** was adopted in order to evaluate the effectiveness of the training intervention. Physical fitness parameters and coordinative abilities were measured before the implementation of the yoga training program and again after its completion.

Participants

The subjects for this study consisted of **50 junior boys football players aged between 14 and 19 years** from various football academies and training centers in Gorakhpur district, Uttar Pradesh.
Participants were selected using a **purposive sampling method**. Based on their primary playing roles, the players were categorized into four groups:

- Goalkeepers
- Defenders
- Midfielders
- Attackers

All participants were informed about the objectives and procedures of the study, and their consent was obtained prior to data collection. Only players who were actively involved in regular football training and free from major injuries were included in the study.

Training Yoga Programme

A 12-week structured yoga training program was implemented for the participants alongside their regular football training sessions.
The yoga sessions were conducted **five days per week**, with each session lasting approximately **60 minutes**. The training program consisted of three main components:

1. Asanas (Yoga Postures)

The asana component focused on improving flexibility, balance, and muscular stability. The following postures were included:

- varikshasana
- chakrasana
- uttan-padasana
- tadasana
- suryanamaskar

These postures were selected to enhance hip mobility, hamstring flexibility, lower-limb strength, and core stability.

2. Pranayama (Breathing Techniques)

Pranayama exercises were incorporated to improve respiratory efficiency, oxygen intake, and mental relaxation. The breathing techniques included:

- Nadi Shoshana Pranayama
- Kapalbhati
- Bhastrika Pranayama
- Ujaii pranayama
- Kapalbharti pranayama

Regular practice of these techniques was intended to enhance lung capacity and improve fatigue resistance during prolonged physical activity.

Physical Fitness Tests

1. Flexibility Test

Flexibility was assessed using the Sit and Reach Test, which measures the flexibility of the hamstrings and lower back muscles.

2. Balance Test

Balance ability was evaluated using the **Stork Stand Test**, where participants maintain balance on one foot for as long as possible.

3. Explosive Power Test

Lower-body explosive strength was measured using the **Sargent Jump Test**, which determines the maximum vertical jump height.

4. Endurance Test

Endurance capacity was assessed using the **Yo-Yo Endurance Test**, commonly used in football to measure aerobic endurance and recovery ability.
In this test, players run repeatedly between two markers placed **20 meters apart**, following audio signals that progressively increase in speed. The test continues until the player fails to reach the marker within the required time. The level achieved indicates the player's endurance capacity.

Differentiation Ability Test

Differentiation ability was measured using the **Peter Hirtz Test Battery**, specifically the Backward Medicine Ball Throw Test**.**
In this test, the participant stands facing away from the target area and throws a medicine ball backward over the head. Points are awarded based on where the ball lands within designated target circles.
The purpose of this test is to evaluate the player's ability to control muscular force and movement accuracy.

Statistical Analysis

The collected data were analyzed using appropriate statistical techniques.
Paired t-Test a **paired t-test** was used to determine the significance of differences between pre-test and post-test scores.

Ancova

Analysis of Covariance (ANCOVA) was applied to compare differences among players of different playing positions while controlling for pre-test scores.
The level of significance was set at **0.05 and 0.01**.

Statistical Formulas Explained

To analyze the effectiveness of Yoga or physical training across these 50 players, two primary formulas are used:
1. The Mean (x)
The average score for a specific position. It represents the "typical" fitness level.

$$(\dot{\bar{x}}) = \sum(x) / n$$

- **$(\bar{x})$**: Sum of all players' scores in that position.
- **(n)**: Total number of players in that position group

2. Standard Deviation (σ / SD)
Measures the spread of data. A **low SD** means the players have similar fitness levels; a **high SD** means there is a large gap between the fittest and least fit players.

$$\sigma = \sum\sqrt{(x - \bar{x})^2}/n$$

- **(x)**: Individual player's score.
- **{$\bar{x}$}**: The group means.
- **(n)**: Number of players.

Results

Physical Fitness Improvement "Improvement in Physical Fitness Variables after Yoga Training among Junior Football Players

Pre-Test vs Post-Test table -01

Test	Pre test	Post test
Flexibility	18.4 cm	23.1 cm
Balance	30.5 sec	37.2sec
Explosive Power	42.3 m	48.9m
Endurance	20.2 minutes	19.6 minutes

Table-02 (Goalkeeper, Defender, Midfielder, Attacker)

Position	Flexibility (c.m)	Balance(sec.)	Power (m)	Endurance (minutes)
Goalkeeper	23.1	35.2	2.60	18.20
Defender	24.0	36.8	2.80	19.10
Midfielder	26.3	38.7	3.30	18.10
Attacker	25.7	37.9	3.50	18.50

Especially

Significant improvement in flexibility and balance

Notable increase in differentiation ability the greatest improvement was observed among midfielders and attackers The table 03 indicates that all groups demonstrated improvement in physical fitness following the yoga training program.

Playing Position	Pre-Test Mean	Post-Test Mean	Mean Difference	t-value	Significance
Goalkeeper	18.4	23.1	4.7	3.42	Significant
Defender	19.1	24.0	4.9	3.56	Significant
Midfielder	20.2	26.3	6.1	4.11	Significant
Attacker	19.8	25.7	5.9	3.98	Significant

The greatest improvement was observed among **midfielders and attackers**.

Conclusion

The findings of the present study indicate that the 12-week yoga training program had a significant positive effect on the physical fitness and differentiation ability of junior football players.

Key findings include:

1. Yoga training significantly improved flexibility and balance among players.
2. Differentiation ability improved, leading to enhanced technical performance.
3. The greatest improvement was observed among midfielders and attackers.

4. Goalkeepers demonstrated improvements in reaction time and spatial awareness.
5. Yoga practice enhanced energy efficiency, concentration, and mental stability during performance.

Based on these findings, it is recommended that football academies and training centers incorporate structured yoga modules into their regular training programs**.** Such integration can support the overall physical and coordinative development of young football players and may also help in reducing injury risk.

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YOGA NIDRA FOR PERFORMANCE ENHANCEMENT AND MENTAL FOCUS AMONG ATHLETES: A REVIEW STUDY

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Abstract

A structured psychophysiological relaxation approach with roots in ancient Indian philosophy, yoga Nidra has garnered a lot of scholarly interest due to its possible benefits for mental conditioning and athletic performance. Evidence from peer-reviewed research on the effects of yoga Nidra on athletes' cognitive function, focus, anxiety control, and recuperation across a range of sports disciplines was compiled in this review study between 2006 and 2024. Using databases including PubMed, Google Scholar, ResearchGate, SPORT Discus, and Scopus, a thorough literature search was carried out using keywords such as 'Yoga Nidra', 'athletic performance', 'mental focus', 'sports psychology', 'theta brainwaves', and 'psychophysiological relaxation'. Research that presented mixed-methods or quantitative findings about mental or physical performance metrics in athletes or physically active populations was accepted. The review found consistent evidence that Yoga Nidra improves working memory and attentional control, promotes the recovery of the parasympathetic nervous system, boosts theta-wave activity linked to profound creative cognition, and considerably lowers anxiety during competitive states. These advantages seem to be mediated by neurophysiological pathways that include the autonomic nervous system balance, cortisol control, and the hypothalamic-pituitary-adrenal (HPA) axis. The methodical application of breath awareness, body scan rotation of consciousness, and Sankalp (resolute intention) in yoga Nidra is consistent with modern neuropsychological frameworks of mindful performance. Although more extensive randomised controlled studies with sport-specific populations are still required, the analysis concluded that Yoga Nidra is a scientifically validated, reasonably priced mental training supplement for athletes and coaches seeking comprehensive performance optimisation.

Keywords: Yoga Nidra, Sports psychology, mental focus, athletic performance, psychophysiological recovery.

Introduction

In today's competitive sports environment, the difference between greatness and mediocrity is often found in mental performance rather than just physical conditioning. The ability of an athlete to control arousal, sustain motivation over a competitive season, recover quickly between efforts, and maintain attentional focus under duress are all examples of psychological skills that are just as trainable as physical prowess or aerobic endurance. While Western sports psychology has long supported mindfulness based stress reduction, cognitive behavioural techniques, and imagery rehearsal, an increasing number of scholars and practitioners are looking to traditional Indian contemplative technologies, especially Yoga Nidra, as potentially potent additions to the toolkit of mental conditioning.

Yoga Nidra, which literally means to 'yogic sleep,' is a systematic guided meditation technique that induces a hypnagogic state that falls somewhere between wakefulness and sleep. The approach is founded on Tantric methods that may be found in writings such as the Shiva Swarodaya, the Yoga Tattva Upanishad, and the Mandukya Upanishad. In the 1970s, Swami Satyananda Saraswati of the Bihar School of Yoga established it in its present pedagogical form. Visualisation, paired opposites (pairs of sensations and sentiments), physical relaxation, breath awareness, rotating consciousness across the body(Nyasa), and planting a personal resolve(Sankalp) are the fundamental phases that practitioners of Yoga Nidra go through. The practitioner maintains a thread of consciousness throughout, unlike active meditation, which totally abandons voluntary bodily effort.

From a neuroscientific perspective, this hypnagogic threshold state is associated with the emergence of theta brainwave activity (4 - 8 Hz) alongside residual alpha waves, creating neurodynamic conditions conducive to deep learning, memory consolidation, and heightened receptivity to positive suggestion. These characteristics bear direct relevance to athletic mental training, where absorption of technical information, rehearsal of motor imagery, and reprogramming of performance-related beliefs are central objectives.

The application of Yoga Nidra in athletic contexts is still a relatively new but significant field of study, preliminary findings indicate that consistent practice may lessen anxiety prior to competition, enhance sleep quality, improve

attentional control, speed up physiological recovery, and strengthen the athlete's sense of focused intent. This chapter conducts a systematic review of the literature to critically examine the mechanisms and results of Yoga Nidra practice, particularly in relation to per

"Yogashchittavrittinirodhah"

(Yoga is the cessation of the fluctuations of the mind.) PYS, 1.2

The philosophical basis of Yoga Nidra practice is encapsulated in this fundamental adage from Patanjali's Yoga Sutras: the intentional stilling of mental activity as a route to elevated realms of clarity and performance.For athletes whose performance is frequently destabilised by rumination, fear of failure, and uncontrolled arousal, the cultivation of mental steadiness is directly applicable.

Philosophical and Historical Foundations

Yoga Nidra's intellectual roots can be found in Indian philosophy's classical and post classical eras. The four states of consciousness Jagrat (waking), Svapna (dreaming), Sushupti (deep sleep), and Turiya (pure awareness) are described in the Mandukya Upanishad. This provides the metaphysical foundation for Yoga Nidra's unique approach to consciousness. One of the eight limbs of Ashtanga yoga described by Patanjali, pratyahara (sensory withdrawal), is developed through Yoga Nidra's deliberate navigation of the transitional corridor between jagrat and svapna states.

Philosophical parallels to athletic performance can also be found in the Bhagavad Gita, especially in its explanation of nishkama karma (activity without regard to results) and the idea of Sthit Pragya (one of steadfast wisdom who is unfazed by outside whims). Elite sport's psychological goals are based on these principles: discriminative intelligence, non-attachment to outcomes, and composure under duress.

"Yogastah kuru karmani sangam tyaktva dhananjaya,
Siddhyasiddhyoh samo bhutva samatvam yoga uchyate." BG 2.48

(Be steadfast in yoga, O Arjuna. Perform your duty, abandoning attachment to success or failure. Such equanimity is called yoga.)

According to the Tantric tradition, sleep like experiences are places of increased spiritual and psychological potency, especially the Nidra Tantra found in the Shaiva Agamic corpus. By combining these customs into a methodical, repeatable teaching framework, Swami Satyananda Saraswati made the practice accessible outside of monastic environments. His 1976 book Yoga Nidra, which has been translated into many languages and used in therapeutic, educational, and athletic settings all around the world, continues to be the cornerstone pedagogical guide for modern practice.

The classical Yoga Nidra structure has been modified in recent years by Richard Miller's Integrative Restoration (iRest) protocol into a secular, trauma sensitive format used in stress management and rehabilitation programs for US military veterans. This shows that the technique maintains its psychophysiological effectiveness even when removed from its overtly religious context.

Methodology

Search Strategy

For this review, electronic database searches for peer-reviewed papers were carried out across PubMed, Google Scholar, ResearchGate, SPORTDiscus, PsycINFO, and the Cochrane Library. 'Yoga Nidra,' 'yogic sleep,' 'psychic sleep,' 'NSDR'(Non-Sleep Deep Rest), 'train anxiety yoga,' 'athlete mental performance,' 'theta brainwave sports,' 'hypnagogic state athletic,' 'pranayama and attention,' 'mindfulness sport performance,' and 'relaxation response athletes' were among the search terms used. The search was expanded and narrowed using boolean operators (AND, OR).

Inclusion and Exclusion Criteria

Studies were considered if they (a) used Yoga Nidra or a clearly comparable structured psychophysiological relaxation as a major or primary intervention; (b) reported quantifiable results concerning cognitive function, mental performance, anxiety, recovery, or sport related physiological markers; (c) were published in English in reputable edited academic volumes or peer-reviewed journals; and (d) included human participants who were at least 15 years old. Studies that (a) used the phrase 'Yoga Nidra' without providing a sufficient explanation of the protocol, (b) only

addressed clinical psychiatric populations without any connection to athletics, or (c) were conference abstracts without a complete published manuscript available were not included.

Quality Assessment

The Physiotherapy Evidence Database (PEDro) scale for controlled trials and a modified Newcastle Ottawa Scale for observational and cohort studies were used to assess the methodological quality. The weight given to each individual finding in the synthesis was determined using study quality ratings.

Table 1: Summary of Selected Studies on Yoga Nidra and Athletic/Cognitive Performance

S.No.	Author(s) & Year	Study Design	Sample / Participants	Intervention / Duration	Key Findings
1	Kamakhya Kumar (2006)	RCT	40 athletes (male)	Yoga Nidra, 6 weeks	Reduced pre-competition anxiety; improved focused attention
2	Rani & Rao (2011)	Pre-post experimental	60 college students	Yoga Nidra, 30 days	Enhanced memory, concentration, and academic performance
3	Deepak et al. (2014)	EEG study (quasi-exp.)	25 healthy adults	iRest Yoga Nidra, 8 weeks	Significant theta-wave increase; enhanced executive function
4	Pandi-Perumal et al. (2021)	Narrative review	Multiple populations	Various YN protocols	Neurophysiological modulation of stress-recovery balance in athletes
5	Stankovic (2011)	Controlled trial	PTSD veterans (n=41)	iRest protocol, 10 sessions	Reduced PTSD symptoms; improved emotional regulation & focus
6	Moszeik et al. (2020)	RCT	59 stressed adults	Short YN, 4 weeks	Reduced stress, improved sleep quality and mental clarity
7	Ferreira-Vorkapic et al. (2018)	Systematic review	12 studies reviewed	Yoga-based mind-body	Consistent improvements in attention, mood, and cognitive flexibility
8	Bhardwaj & Singh (2016)	Pre-post control	30 athletes (shooters)	Yoga Nidra + pranayama, 8 wks	Improved psychomotor speed, eye-hand coordination and calm
9	Hase et al. (2021)	Pilot RCT	28 elite footballers	YN relaxation, 6 weeks	Better recovery metrics, reduced cortisol, improved sleep onset
10	Sharma et al. (2013)	Controlled study	45 medical students	Yoga Nidra, 30 sessions	Decreased anxiety, depression; heightened situational awareness

Note. RCT = Randomised Controlled Trial; YN = Yoga Nidra; PTSD = Post-Traumatic Stress Disorder; EEG = Electroencephalography.

Neurophysiological Mechanisms

Brainwave Modulation

The induction and prolonged maintenance of theta brainwave activity (4-8 Hz) is one of Yoga Nidra's most well researched neurophysiological effects. Beta waves (13-30 Hz) make up the majority of the EEG signature during typical waking conditions and are linked to alertness, analytical thinking, and active cognition. EEG investigations consistently record a shift from beta to alpha (8-12 Hz) and then into theta activity as Yoga Nidra moves through its organised phases, reflecting the hypnagogic corridor that occurs naturally prior to sleep onset. Importantly, unlike

unconscious sleep, theta dominant states are characterised by the maintenance of conscious consciousness by expert practitioners.

Because theta activity has been linked to long term potentiation (LTP) in the hippocampus, a neurobiological process that supports procedural memory consolidation and motor learning, it is especially important for athletes. According to Csikszentmihalyi (1990), elite athletes who practice Yoga Nidra may benefit from an accelerated consolidation of technique practiced during training, and the resulting reduction in cortical noise (reflected in decreased beta activity) may facilitate the quiet, absorbed attentional state that flow researchers describe as a hallmark of peak performance.

Autonomic Nervous System Regulation

The autonomic nerve system (ANS) must be quickly and context sensitively modulated for athletic performance. The parasympathetic branch regulates the rest and digest mechanisms necessary for recuperation during sleep and in between training sessions, while the sympathetic branch controls the fight or flight response that mobilises energy during competition. Overtraining syndrome, poor sleep, elevated baseline anxiety, and decreased heart rate variability (HRV), a commonly used biomarker of autonomic recovery capacity, are frequently symptoms of chronic training stress and competitive pressure that tip the autonomic balance toward sympathetic dominance.
Reductions in resting heart rate, improvements in HRV, decreased skin conductance, and decreased salivary cortisol concentrations are all signs that yoga Nidra practice regularly triggers parasympathetic activation. Vagal tone, the functional measure of parasympathetic activity, is stimulated by the technique's guided breath modulation and structured physiological relaxation, giving athletes a dependable, easily accessible way to speed up recovery after exercise and prime the nervous system for sound sleep.

HPA Axis and Cortisol

The body's endocrine stress response is controlled by the hypothalamic-pituitary-adrenal (HPA) axis, which culminates in the adrenal cortex secreting cortisol. Chronically high cortisol has negative effects on immune function, sleep architecture, testosterone availability, and hippocampus neurogenesis, all of which have an adverse effect on mental focus and athletic performance. Acute, phasic cortisol release is adaptive and even required for performance. Yoga Nidra has been shown to significantly lower salivary and urine cortisol levels in stressed populations, with effect sizes that are equivalent to those of other well-recognized mindfulness and relaxation techniques.

"Shanto danto uparatas titiksuh,
Samadhitah shraddhaavan yah sa bhakta me priyah." BG – 12.19,20
(He who is tranquil, self-controlled, unattached, and endowed with steadfast faith
such a one is dear to me.)

Yoga Nidra and Cognitive Performance in Athletes

Attention and Concentration

One of the most prized cognitive abilities in sports is the ability to focus attention selectively and continuously. Athletes must use their attentional resources wisely and efficiently when monitoring a fast moving ball, maintaining focus throughout prolonged endurance events, or controlling tactical awareness on a team field. Thirty days of structured Yoga Nidra practice significantly improved attention task scores compared to control groups, according to research by Rani and Rao (2011). The greatest gains were seen in populations with high pre intervention trait anxiety, which is exactly the profile typical of competitive athletes during peak season.

According to neuroimaging evidence, consistent practice fosters increased prefrontal inhibitory control over limbic arousal circuitry and improves functional connectivity within the default mode network (DMN). This neurodynamic profile is congruent with what applied psychologists refer to as "attentional robustness," which is the ability of elite athletes to maintain composure under pressure and technical focus in the face of adverse emotional cues.

Working Memory and Decision Making

Tactical sports performance depends on working memory, the cognitive workspace that momentarily stores and processes information needed for quick decision making. Working memory capacity is used extensively by judokas anticipating throw sequences, climbers route reading while fatigued, and midfielders calculating passing alternatives. Given that theta, gamma coupling in frontoparietal networks is a known neurophysiological foundation

of working memory maintenance, Yoga Nidra's augmentation of theta oscillatory activity offers a mechanistic explanation for its beneficial effect on working memory.

Anxiety and Arousal Regulation

In sports, competitive anxiety includes both physical arousal and cognitive concern is a common performance inhibitor. According to the Individualised Zones of Optimal Functioning (IZOF) paradigm, every athlete has a unique optimal arousal band where performance is maximised, departures from this band hinder performance. When anxiety surpasses their normal range, Yoga Nidra offers athletes a dependable method for lowering arousal. Following a six-week Yoga Nidra session, Kamakhya Kumar's (2006) controlled study with male athletes showed significant improvements in self-confidence, somatic anxiety, and cognitive anxiety scores on the Competitive State Anxiety Inventory-2 (CSAI-2).The mechanism involves both autonomic calming (via vagal activation) and cognitive reappraisal (facilitated by the Sankalp and visualisation components of the practice), producing a dual pathway intervention that addresses both the physiological and psychological dimensions of competitive anxiety simultaneously.

The Role of Sankalpa in Performance

The sankalpa, a brief, powerful, personally significant resolution or goal inserted into the subconscious mind during the hyper receptive hypnagogic state, is a key component of the Yoga Nidra technique. Derived from the Sanskrit roots 'Sam' (complete, integrated) and 'kalpa' (vow, commitment), the sankalpa is a neurolinguistic seed that is sown when neuroplastic processes are heightened and habitual barriers in the mind are loosened. From the standpoint of sports psychology, the sankalpa functions through a process that avoids the critical, analytical overlay of the fully awake mind, yet it shares structural and functional similarities with self-affirmation theory, motivational self-talk, and goal setting.

"Sankalpa hi manasah shuddhi nimittam"
(A firm resolve is the very means of purifying the mind.)
Yoga Tattva Upanishad

According to case study literature, athletes who consistently incorporate performance related Sankalps such as unwavering confidence, technical precision under pressure, or post-injury recovery resolve into their Yoga Nidra practice report faster changes in their performance self-concept, fewer tendencies to avoid performance, and increased dedication to process goals). Theta state enhancement of synaptic reinforcement and long term potentiation improves the brain encoding of the Sankalp's content, according to the neurobiological justification.

Yoga Nidra and Physical Recovery

Yoga Nidra is important to sports performance as training is physical recuperation. Burnout, injury, and overtraining syndrome are all caused by inadequate recovery. Elevated nocturnal cortisol, decreased glycogen resynthesis, impaired human growth hormone (HGH) release, and systemic inflammation are biochemical indicators of inadequate recovery. Many of these channels are simultaneously addressed by yoga Nidra. The 'rest and digest' environment that promotes protein synthesis and glycogen replenishment is activated by its steady induction of parasympathetic dominance. According to research athletes who participated in a six-week Yoga Nidra relaxation program showed markedly better recovery metrics, lower cortisol levels the following day, and a quicker sleep onset latency than an active control group that passively stretched.

Notable similarities exist between Yoga Nidra and Non Sleep Deep Rest (NSDR), a technique made prominent in neuroscience communication by Huberman (2021). Although NSDR is a secular, neuroscience labelled offshoot, its mechanical profile which involves guided body scan relaxation to produce hypnagogic rest without sleep is generally consistent with Yoga Nidra. This analogy highlights how what the ancient yogic tradition had empirically developed centuries earlier had cross-cultural scientific value.

Practical Protocols for Athletes

It is necessary to pay attention to practicality, duration, frequency, and individualisation when translating Yoga Nidra from the contemplative tradition into applied sports science. Research has repeatedly demonstrated significant results from practice frequencies of three to five sessions per week over a minimum of four to eight weeks, with standard clinical and research protocols ranging from 20 to 45 minutes per session. During post training recovery

windows, pre competition preparation, or rest day mental conditioning, athletes with rigorous training loads and limited time can benefit from modified protocols that focus on body scan, breath awareness, and Sankalp stages and last 15 to 20 minutes.

In adult populations, portable audio guided sessions conducted through mobile applications (particularly those based on Sadananda's original scripts or Miller's iRest framework) have shown similar effectiveness to in person delivery, significantly increasing the intervention's usefulness in professional sports settings. When incorporating Yoga Nidra, coaches and sport psychologists should make sure that athletes get its nonreligious use, explicitly present the practice as a neurological recovery and mental performance tool, and track both objective performance measurements and subjective wellbeing indicators.

Limitations and Future Directions

Despite an increasing body of research, a number of restrictions prevent conclusive findings of Yoga Nidra's effectiveness for athletes. First, statistical power and the generalisability of results across various sport disciplines and competitive levels are limited by the majority of current studies' use of very small sample sizes and brief intervention periods. Second, the operationalisation of Yoga Nidra term that encompasses protocols of varying structure, duration, and teacher quality varies significantly across research, making systematic comparison difficult. Third, a significant gap in the body of evidence is the lack of large scale randomised controlled trials with samples of elite athletes, blinded outcome assessors, and long term follow up.

Future research should focus on the following areas: (a) sport-specific RCTs with sufficient sample sizes and validated outcome measures; (b) neuroimaging studies looking at structural and functional brain changes linked to long-term Yoga Nidra practice in athletes; (c) examining the best dose response relationships; (d) comparing Yoga Nidra to well-known psychological interventions like MBSR, ACT, or hypnotherapy; and (e) longitudinal studies looking at the retention of performance benefits aft

Conclusion:

Yoga Nidra is a scientifically sound and practically feasible mental performance solution for athletes, according to this review strong, multi-level evidence. Regular Yoga Nidra practice lowers competitive anxiety, improves working memory and attentional control, supports autonomic recovery, controls stress hormones, and helps internalise performance-oriented intentions through the Sankalp mechanism, according to a growing body of research in neurophysiology, psychology, and applied sport science. Strong neurobiological mechanisms, such as theta brainwave amplification, vagal tone rise, HPA axis modulation, and default mode network regulation, support these advantages.

Yoga Nidra gives athletes something that traditional performance psychology has historically underemphasised a direct, structured interface with the deeper layers of the mind where habitual patterns, fears, and performance identities are encoded and can be systematically transformed. This is rooted in a philosophical tradition that conceptualised mental excellence as both the prerequisite and the result of disciplined inner development. The sport of the self is ultimately the highest type of sport, as Patanjali noted over two millennia ago, and one of its most exquisite training techniques is yoga Nidra.

"Tat tvam asi"
(That thou art a recognition of the deepest unity of consciousness.)
Chandogya Upanishad, 6.8.7

In conclusion, this ancient Upanishadic statement that individual awareness and universal awareness are one and the same carries a subtle but profound message for athletes. The athlete who attains true integration of body, mind, and awareness does not just perform they embody performance itself. Yoga Nidra is a method for achieving that totality as a science and practice.

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"PSYCHOPHYSIOLOGICAL EFFECTS OF YOGA IN PREMENSTRUAL SYNDROME: CLINICAL EVIDENCE AND INTEGRATIVE INSIGHTS"

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Abstract

Background: A considerable percentage of women of reproductive age suffer from premenstrual syndrome (PMS), which causes a range of behavioral, psychological, and physical symptoms during the luteal phase of the menstrual cycle. Research into complementary therapies is prompted by the fact that conventional medications frequently offer little alleviation and may have negative side effects. By modifying the neuroendocrine, autonomic, and stress-response systems, yoga, a mind-body practice that includes physical postures (asanas), breathing techniques (pranayama), and meditation, has demonstrated potential in reducing PMS symptoms.

Purpose: The purpose of this study is to compile data from clinical trials, systematic reviews, and randomized controlled studies that examine the impact of yoga therapies on psychological well-being, stress levels, quality of life, and PMS symptoms.

Methods: Using keywords like premenstrual syndrome, PMS, yoga, randomized trial, and systematic review, relevant literature was found by searching PubMed, Scopus, Google Scholar, DOAJ, and clinical journals.

Results: When compared to controls, yoga therapies significantly improve quality of life and reduce emotional, behavioral, and certain physical symptoms of PMS, according to systematic reviews and meta-analyses. Following systematic yoga programs (8-10 weeks), women with PMS report lower levels of stress, anxiety, cortisol, and symptom severity, according to several randomized controlled trials. Yoga groups have also been shown to offer special neuropsychological advantages, such as a decrease in negative attention bias. Improvements were consistently seen across a range of demographics and yoga styles.

Conclusion: Yoga seems to be a holistic, safe, and affordable way to help women's health in general and PMS symptoms in particular. In order to standardize intervention procedures and clarify underlying physiological mechanisms, more high-quality trials are encouraged. These results support the use of yoga into PMS therapy techniques.

Keywords: Premenstrual Syndrome (PMS), Yoga Therapy, Psychophysiological Regulation, Non-Pharmacological Intervention, Women's Reproductive Health

Introduction

The luteal phase of the menstrual cycle is when premenstrual syndrome (PMS), a well-known gynaecological disorder that affects women during their reproductive years, manifests as a range of emotional, physical, and behavioural symptoms (Yonkers et al., 2008). According to Freeman (2017), these symptoms normally start one to two weeks prior to menstruation and go away after menstrual bleeding starts.

Abdominal pain, exhaustion, irritability, mood swings, headaches, anxiety, depression, and trouble focusing are common signs of PMS (Halbreich et al., 2003). According to Bertone-Johnson et al. (2015), these symptoms can seriously impair women's everyday activities, interpersonal interactions, and performance in school or the workplace.

According to epidemiological research, between 20 and 40 percent of women have moderate to severe PMS symptoms, which have a detrimental impact on their quality of life (Rosen & Moghadam, 2019). Hormonal changes, neuroendocrine processes, and psychosocial variables combine in the complicated etiology of PMS (Freeman, 2017). Neurotransmitter systems including serotonin and gamma-aminobutyric acid (GABA), which are involved in mood regulation and emotional stability, may be impacted by hormonal changes during the menstrual cycle, especially differences in estrogen and progesterone levels (Yonkers et al., 2008). Premenstrual psychological symptoms like irritability, anxiety, and depression may be exacerbated by these neurobiological alterations (Halbreich et al., 2003).

Pharmacological treatments such analgesics, hormonal therapy, and antidepressants are frequently used in conventional PMS management procedures (Steiner et al., 2006). These methods may reduce symptoms, but they may also have adverse effects and fail to address the underlying lifestyle or psychosocial causes causing the illness (Daley, 2009).

As a result, complementary and alternative therapies that prioritize mind-body integration and holistic health have drawn more attention (Sarris et al., 2013). Among these methods, yoga has drawn a lot of interest as a non-pharmacological treatment that can enhance both psychological and physical health results (Khalsa, 2015).

Yoga is an age-old discipline that combines breathing exercises (pranayama), physical postures (asanas), and meditation techniques to support mental and physiological equilibrium (Iyengar, 2005). Yoga helps lower stress, normalize the autonomic nervous system, and increase emotional control, according to research (Khalsa, 2015). According to recent research, yoga may help women with PMS experience less symptoms and a higher quality of life (Ryu et al., 2024; Singh et al., 2023). Eight-week-long structured yoga programs have been linked to gains in psychological well-being and decreases in perceived stress (Aydın et al., 2024).

Additionally, attentional bias and emotional control mechanisms are two cognitive and emotional processes that yoga therapies may affect (Li et al., 2024). These psychophysiological effects imply that yoga may be a useful supplemental treatment for PMS-affected women.

Thus, the goal of this review is to compile the available data on the psychophysiological effects of yoga treatments in the treatment of premenstrual syndrome.

Rationale of the Study

Many women of reproductive age suffer from premenstrual syndrome (PMS), which is linked to a number of behavioural, psychological, and physical symptoms that can have a detrimental effect on day-to-day functioning. Despite the availability of pharmaceutical treatments, there is growing interest in safer complementary therapies because these treatments may not offer much relief and may have unintended side effects. Yoga is a mind-body practice that incorporates physical postures, breathing exercises, and meditation. It has been proven to have potential for enhancing psychological well-being, lowering stress levels, and easing PMS symptoms. To better understand the function of yoga as a non-pharmacological method for the management of PMS, it is required to gather and synthesize the existing research data, which are dispersed throughout many clinical trials and reviews.

Objectives

1. To review and synthesize existing research on the effectiveness of yoga in managing premenstrual syndrome (PMS).
2. To examine the impact of yoga interventions on psychological well-being, stress levels, and quality of life in women with PMS.
3. To highlight the potential of yoga as a non-pharmacological and integrative approach for PMS management.

Methodology

The current study examined the psychophysiological effects of yoga in the treatment of premenstrual syndrome using a narrative literature review methodology.

Data Sources

Relevant studies were identified from electronic databases including:

1. PubMed

2. Scopus
3. Google Scholar
4. Directory of Open Access Journals (DOAJ)

Search Strategy

The following keywords were used in the literature search:
Premenstrual Syndrome (PMS), Yoga Therapy, Psychophysiological Regulation, Non-Pharmacological Intervention, Women's Reproductive Health

Inclusion Criteria

Studies were included if they:
1. Investigated yoga as an intervention
2. Focused on outcomes related to PMS symptoms
3. Included clinical trials, randomized controlled trials, or systematic reviews
4. Were published in peer-reviewed journals

Based on these criteria, 12 key studies were selected for detailed analysis.

Exclusion Criteria
1. Studies not related to premenstrual syndrome (PMS).
2. Studies that did not include yoga or yogic practices as an intervention.
3. Duplicate publications or repeated reports of the same study.
4. Conference abstracts or articles without full-text availability.
5. Studies not published in the English language.

Evidence from Existing Literature

The effectiveness of yoga treatments in treating PMS symptoms has been the subject of numerous studies. Randomized controlled trials, clinical trials, and systematic reviews are some of these investigations.
Yoga may considerably lessen the intensity of PMS symptoms and enhance general psychological well-being, according to systematic reviews (Gupta et al., 2023; Sharma & Verma, 2023). In a similar vein, narrative reviews have emphasized the possible advantages of yoga practices in lowering PMS-related emotional and physical symptoms (Khan et al., 2023).

Yoga therapies have been shown in randomized controlled trials to enhance quality of life and lower perceived stress in women with PMS (Aydın et al., 2024). According to comparative research, yoga may be more beneficial for enhancing psychological well-being than some types of physical activity (Singh et al., 2023).

Regular yoga practice may improve emotional regulation during the premenstrual phase by influencing cognitive processes like attentional bias, according to experimental research (Li et al., 2024).

Positive results, such as decreased menstruation discomfort and psychological distress after yoga practice, have also been shown in intervention studies with adolescent populations (Sahu & Mishra, 2022).

Summary of Key Studies on Yoga Interventions for PMS

Author	Study Design	Participants	Intervention	Duration	Main Findings
Khan et al., 2023	Narrative review	Multiple studies	Yogic practices	---	Improvement in PMS symptoms
Ryu et al., 2024	Systematic review	RCTs	Yoga therapy	Various	Reduced PMS severity
Gupta et al., 2023	Meta-analysis	Multiple RCTs	Yoga therapy	Various	Significant symptom reduction
Sharma & Verma, 2023	Systematic review	35 studies	Yoga interventions	Various	Reduced physical and emotional symptoms
Aydın et al., 2024	Randomized controlled trial	Adult women	Yoga program	8-10 weeks	Improved QoL

Singh et al., 2023	RCT	Women with PMS	Yoga vs relaxation	8 weeks	Improved psychological wellbeing
Singh et al., 2023	Comparative RCT	Women	Yoga vs aerobic exercise	8 weeks	Yoga more effective
Kumari & Patel, 2023	Controlled trial	Adult women	Yoga therapy	8 weeks	Reduced PMS symptoms
Kumari & Sharma, 2023	RCT	Women	Yogic practices	8 weeks	Improved sleep
Williams et al., 2022	Randomized clinical trial	Women	Yoga practice	8 weeks	Reduced PMS severity
Sahu & Mishra, 2022	Intervention study	Adolescents	Yoga	6 weeks	Reduced menstrual discomfort
Li et al., 2024	Experimental study	Women	Yoga training	8 weeks	Reduced attentional bias

Results

Premenstrual syndrome (PMS) can be effectively managed with yoga therapies, according to the results of the chosen research. Yoga activities were consistently linked to improvements in both physical and psychological symptoms of PMS across the evaluated literature, including randomized controlled trials, intervention studies, and systematic reviews. Regular yoga practice has been shown to significantly reduce common symptoms like anxiety, weariness, irritability, mood swings, and abdominal discomfort.

Numerous evaluated randomized controlled trials showed that structured yoga programs spanning roughly six to ten weeks increased psychological well-being, decreased perceived stress, and improved quality of life for PMS-affected women. Yoga therapies were found to be more successful in lowering the severity of PMS symptoms in comparative trials than several other types of physical activity or relaxation approaches. Furthermore, yoga-based therapies significantly reduced total PMS scores and improved emotional and behavioral outcomes, according to systematic reviews and meta-analyses.

Additionally, yoga has been shown in several experimental investigations to have cognitive benefits, such as better attention management and less negative attentional bias during the premenstrual phase. The results also imply that yoga may affect physiological processes linked to stress management, such as autonomic nervous system modulation and a decrease in stress-related hormone reactions. Overall, the data from the included investigations points to yoga's advantageous function as a supplemental strategy for lessening PMS symptoms and enhancing women's general wellbeing.

Discussion

According to the data examined in this study, yoga therapies may considerably reduce PMS-related psychological and physical symptoms. Numerous psychophysiological processes could account for these advantages.
One way is through autonomic nervous system modulation; yoga lowers sympathetic activity and increases parasympathetic activation, which lowers stress levels (Khalsa, 2015).

The hypothalamic-pituitary-adrenal (HPA) axis, which is essential for controlling stress, may also be impacted by yoga. Numerous research looking at mind-body therapies have revealed lower cortisol levels after yoga practice (Sarris et al., 2013).

Additionally, yoga may enhance the balance of neurotransmitters, especially the GABA and serotonin systems, which are linked to emotional stability and mood control (Yonkers et al., 2008).

Yoga's physical elements, including stretching and controlled breathing, may enhance circulation, muscle relaxation, and flexibility in addition to its psychological advantages. These benefits may help lessen physical symptoms like weariness and abdominal pain (Daley, 2009).

These results imply that yoga can offer a thorough method of treating PMS by addressing its psychological and physiological components.

Conclusion

Premenstrual syndrome is still a serious health issue that affects women's physical and mental health all over the world. The review's conclusions suggest that yoga therapies could be a useful adjunctive treatment for PMS symptoms.

Yoga provides a comprehensive and approachable way to enhance women's reproductive health through processes like stress reduction, autonomic modulation, and increased emotional balance.

Large-scale randomized controlled trials, standardized yoga practices, and long-term follow-up studies should be the main emphasis of future research in order to improve the body of evidence and get a deeper understanding of the biological processes that underlie the therapeutic benefits of yoga.

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Conflict of interest

None.

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RELATIONSHIP BETWEEN CHAKRAS AND PANCHAKOSHA IN HUMAN PHYSIOLOGICAL AND PSYCHOLOGICAL FUNCTIONING: A THEMATIC ANALYSIS

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Abstract

The present thematic paper examines the interrelationship between the chakra system and the Panchakosha model as a comprehensive framework for understanding human physiological and psychological functioning. Rooted in classical Indian philosophical literature, particularly the Taittiriya Upanishad and tantric texts such as the Shat-Chakra-Nirupana, these two models describe the human being as a multilayered integration of body, energy, mind, intellect, and consciousness. The Panchakosha doctrine conceptualizes five concentric sheaths—Annamaya (physical), Pranamaya (vital), Manomaya (mental-emotional), Vijnanamaya (intellectual), and Anandamaya (bliss)—while the chakra system identifies subtle psychospiritual energy centers aligned along the spinal axis that regulate the flow of prana and mediate psycho-physiological processes.

This paper synthesizes classical textual interpretations with contemporary scholarly research in yoga psychology, psychoneuroendocrinology, and integrative medicine. Through thematic analysis, it proposes that chakras function as regulatory interfaces across the koshas, facilitating dynamic interaction between physiological systems and psychological states. Lower chakras are examined in relation to physical stability and autonomic regulation, middle chakras in relation to affective balance and relational processing, and higher chakras in relation to cognitive integration and transcendent awareness.

Emerging empirical findings from yoga-based interventions suggest measurable effects on stress modulation, emotional regulation, and neuroendocrine balance, offering preliminary support for the integrative relevance of this framework. Although metaphysical in origin, the chakra–Panchakosha model provides a structured, holistic paradigm for understanding mind–body unity and offers promising implications for future interdisciplinary research in health sciences and psychology.

Keywords: Chakras, Panchakosha, Physiological functioning, Psychological functioning, Yoga psychology, Mind–body integration

Introduction

Human functioning has traditionally been examined through biological and psychological lenses, often treating body and mind as distinct domains. However, classical Indian philosophical traditions present a more integrative understanding of human existence. Within the Vedic and yogic corpus, the human being is conceptualized as a multilayered entity in which physical structure, vital energy, mental processes, cognition, and transcendental awareness coexist in dynamic interaction. Two foundational models expressing this holistic vision are the Panchakosha doctrine and the chakra system.

The Panchakosha framework, articulated in the Taittiriya Upanishad, describes five sheaths (koshas) that encase the self: Annamaya (physical body), Pranamaya (vital energy), Manomaya (mind and emotions), Vijnanamaya (intellect and discernment), and Anandamaya (bliss or spiritual awareness). These sheaths are not separate compartments but interdependent dimensions of human functioning. Disturbance in one sheath is understood to influence others, reflecting a systemic view of health and well-being.Complementing this model, tantric and yogic texts such as the Shat-Chakra-Nirupana describe seven principal chakras aligned along the spinal column. Later synthesized in works like The Serpent Power, chakras are portrayed as subtle centers regulating the flow of prana and coordinating psychophysiological processes.

While traditionally expressed in symbolic language, contemporary scholarship increasingly attempts to interpret these concepts within modern scientific frameworks. This paper aims to thematically analyze the relationship between chakras and the Panchakosha model, exploring their integrated role in physiological regulation and

psychological development. By synthesizing classical sources with contemporary research, the study seeks to articulate a coherent theoretical model that bridges traditional wisdom and emerging scientific inquiry.

Literature Review

Classical Foundations

The Panchakosha doctrine originates in the Taittiriya Upanishad (circa 6th century BCE), where the human being is described as enveloped by successive layers of embodiment. The koshas represent progressive refinement from gross physical matter to subtle consciousness.The chakra system is elaborated in tantric literature, notably the Shat-Chakra-Nirupana (16th century), which describes six primary chakras and Sahasrara as the transcendental center. In the early 20th century, Arthur Avalon translated and interpreted these concepts in The Serpent Power, introducing them to Western scholarship.

Contemporary Interpretations

Modern researchers such as Judith (2004) and Motoyama (1981) interpret chakras as psychospiritual regulatory centers possibly corresponding to nerve plexuses and endocrine glands. Brown and Gerbarg (2005) demonstrate that yogic breathing techniques influence autonomic and neuroendocrine functioning.Neuroscientific studies on meditation (Tang, Hölzel, & Posner, 2015) show structural and functional brain changes associated with attention and emotional regulation, indirectly supporting integrative frameworks resembling kosha–chakra models. While empirical validation of chakras remains limited, psychophysiological research increasingly supports the interconnectedness of body, breath, and mental states.

Theoretical Framework

This paper proposes that chakras operate primarily within the Pranamaya Kosha but influence all koshas through energetic mediation.

11. **Lower Chakras (Muladhara, Svadhisthana, Manipura):** Regulate survival, metabolic processes, and autonomic stability—linked to Annamaya and Pranamaya koshas.
12. **Middle Chakra (Anahata):** Integrates emotional regulation—bridging Pranamaya and Manomaya koshas.
13. **Higher Chakras (Vishuddha, Ajna, Sahasrara):** Associated with cognition, self-awareness, and transcendence—aligned with Vijnanamaya and Anandamaya koshas.

This layered integration suggests a hierarchical yet interdependent system of psychophysiological regulation.

Physiological Dimensions

Autonomic Regulation

Yogic practices targeting breath and subtle awareness influence vagal tone and stress response systems (Brown & Gerbarg, 2005). These physiological changes may reflect harmonization within the Pranamaya Kosha mediated by chakra-focused practices.

Neuroendocrine Correlates

Associations between chakras and endocrine glands (e.g., adrenal, thyroid, pineal) suggest symbolic parallels with hormonal regulation. While not empirically confirmed as literal structures, chakra symbolism aligns conceptually with regulatory biological hubs.

Somatic Integration

The kosha model implies that bodily health (Annamaya) is inseparable from energetic balance (Pranamaya) and emotional stability (Manomaya). Contemporary psychosomatic medicine echoes this interdependence.

Psychological Dimensions

Emotional Regulation

Manomaya Kosha corresponds to affective processes. Practices centered on Anahata (heart center) are associated with compassion, relational balance, and reduced anxiety.

Cognitive Clarity

Vijnanamaya Kosha aligns with executive functioning and discernment. Meditation practices engaging Ajna correlate with improved attentional control and metacognition (Tang et al., 2015).

Transpersonal Development

Anandamaya Kosha represents experiential well-being and unity consciousness. Advanced meditative states associated with Sahasrara are described as producing sustained positive affect and existential meaning.

Discussion

The thematic integration of chakras and Panchakosha offers a multidimensional model of human functioning that transcends reductionist paradigms. Rather than isolating physiology from psychology, this framework conceptualizes health as dynamic coherence across multiple layers of existence.Although chakras originate in metaphysical traditions, contemporary research in integrative medicine, neuroscience, and psychophysiology provides converging evidence that breath regulation, meditative awareness, and embodied practices significantly influence both biological and psychological processes. The chakra–kosha model may therefore function as a conceptual bridge linking subjective experience with measurable physiological regulation.

Further empirical operationalization is required to establish standardized methodologies for studying chakra–kosha correlations. Interdisciplinary research integrating neuroimaging, hormonal assays, and psychometric assessment may deepen scientific understanding of this holistic paradigm.

Conclusion

The relationship between chakras and the Panchakosha model presents a coherent and profound framework for understanding the unity of physiological and psychological functioning. By conceptualizing the human being as an integrated system of interconnected sheaths regulated through energetic centers, this model challenges fragmented views of health and offers a systemic perspective grounded in classical wisdom.

In an era increasingly recognizing the importance of mind–body integration, the chakra–Panchakosha paradigm provides both theoretical depth and practical relevance. While further empirical investigation is necessary, its integrative structure offers meaningful directions for research in yoga psychology, integrative health sciences, and holistic education.

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SMALL BOUTS, BIG IMPACT: EXERCISE SNACKING AS A MODERN STRATEGY FOR LIFESTYLE AND HEALTH MANAGEMENT

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Abstract

Exercise snacking, which consists of a short period of exercise lasting between a few seconds to a few minutes spaced through the day has become a promising form of alternative exercise, in lieu of the standard exercise programs. This new method of exercising deals with barriers that stop many people like time limitations, lack of motivation and accessibility which hinder many people to comply with the required physical activity. This paper presents a detailed discussion of the physiological processes, health advantages, practical use and evidence base underlying the exercise snacking as a plausible intervention in metabolic, heart, muscle-related and general wellness. Based on new studies, this review illustrates that repeated short exercise sessions can yield considerable health benefits on par with regular moderate-vigorous exercise and thus is an affordable and convenient alternative to enhance health in a wide range of populations, such as office workers, the elderly, and people with chronic illnesses.

Keywords: exercise snacking, physical activity, metabolic health, cardiovascular fitness, sedentary behavior, lifestyle intervention

Introduction

Physical inactivity is among the fourth most common risk factors of global mortality rate, and it causes the world to lose around 3.2 million lives each year (World Health Organization, 2020). Although most people have heard about the benefits of exercise, only 28% of Americans achieve the status of doing moderate-intensity aerobic exercises 150 minutes a week (Centers for Disease Control and Prevention, 2022). Lack of time has been mentioned as the most popularly used reason against exercising by 42% of adults in industrialized countries (Trost et al., 2002). This gap between what people know and what they should do has led to researchers exploring other physical activity paradigms that are in line with the current lifestyle limitations.

Snacking has also become a time-efficient form of exercise since it has been described as short, discontinuous periods of physical activity incorporated throughout the day (Francois et al., 2014). The exercise snacks do not need special time blocks as compared to traditional exercise prescriptions that demand specific time blocks, like the acts of climbing stairs when traveling between meetings or doing bodyweight exercises during television commercials. The term snacking is a purposeful allusion to the fact that small positional meals are frequent, instead of big, consolidated ones, which redefines physical activity as a process that can be accrued bit by bit instead of taking significant amounts of time (Islam et al., 2022).

Exercise snacking has its theoretical basis on two principles. To begin with, the dose-response curve between physical exercise and health outcomes does not seem to be a volume-dependent but a bout-dependent variable, i.e., the amount of exercise performed per day has a stronger influence on outcomes than the distribution of that activity (Jakicic et al., 2019). Second, the metabolic advantages of breaks in extended sitting sessions with short bursts of activity are unique to activity volume and especially to glycemic control and cardiovascular performance (Dempsey et al., 2016). The implication of these principles is that exercise snacking might provide significant health benefits, and avoid the major obstacle to exercise adherence.

In the context of this paper, the research on exercise snacking is reviewed, investigating the physiological processes, empirical data within the field of health, approaches to its practical implementation, possible limitations, and the perspectives of this new paradigm of lifestyle medicine.

Defining Exercise Snacking: Parameters and Protocols

There is no generally established definition of exercise snacking, although the majority of studies operationalize it as the activity bouts with a 3-10-minute duration that are done intermittently during the day and are not defined by a specific format, equipment, or committed time as the regular exercise sessions are (Beltran-Carrillo et al., 2021). The popular exercise snacking plans are stair climbing exercises, bodyweight resistance exercises, fast walking, or vigorous ambulatory exercises built into the day-to-day routines.

The research protocols differ in a significant degree in both intensity, duration, and frequency. Certain ones are the investigation of maximal-effort "vigorous intermittent lifestyle physical activity" that lasts between 4-10 seconds and repeated several times daily (Stamatakis et al., 2019), others are the moderate-intensity bouts lasting between 1-10 minutes repeated 3-6 times daily (Gibala et al., 2019). This heterogeneity is indicative of the exploratory nature of the discipline as well as the deliberate flexibility of the methodology to meet various populations and situations. In order to distinguish between exercise snacking and conventional interval training, there are key attributes that distinguish the two.

Exercise snacks are conducted in normal clothes without special training equipment and can be performed in the same environment as other activities instead of substituting them, and also focus on practical convenience, rather than on optimal training regimes (Islam et al., 2022). Such an incidental, opportunistic character sets exercise snacking against structured exercise and may have a beneficial impact on long-term exercise adherence by eliminating psychological and logistical obstacles.

Physiological Mechanisms and Acute Responses

The physiological explanation of exercise snacking comes with several mechanistic pathways, in which short activity bouts have metabolic, cardiovascular, and musculoskeletal health impacts.

Metabolic Responses and Glycemic Control

Postprandial spikes of glucose are also a significant risk factor of cardiovascular disease as well as metabolic dysfunction especially in people with prediabetes or type 2 diabetes (Ceriello & Colagiuri, 2008). Postprandial hyperglycemia can be effectively reduced using brief activity bouts that are administered after meals by various mechanisms, such as stimulating glucose uptake with the contracting skeletal muscle, improving insulin sensitivity, and slowing gastric emptying (Dempsey et al., 2016).

The studies indicate that even short (1-3 minutes of walking) activity (after every 30-minute) lowers postprandial glucose and insulin levels by 20-30 percent relative to sitting (Bailey and Locke, 2015). These effects are independent of total energy consumption and would imply that the time-varying distribution of activities has distinctive metabolic benefits in addition to caloric balance. This effect of glucose-lowering seems dose-dependent, with greater frequency of interruption and intensity leading to greater glycemic effects, although even light-intensity exercise yields quantifiable benefits (Dempsey et al., 2016).

Cardiovascular Adaptations

The acute cardiovascular responses to brief, high-intensity activity bouts are similar to those of traditional exercise, which are increased heart rate, increased cardiac output, and increased vascular shear stress (Stamatakis et al., 2019). Consistent exposure to these acute stimuli facilitates positive cardiovascular changes such as enhanced endothelial performance, decreased arterial stiffness and endowed autonomic control.

Research comparing vigorous stair climbing snacks that take a total of less than 3 minutes of daily exercise shows changes in cardiorespiratory fitness the same as those associated with moderate-intensity continuous training conditions that demand significantly more valuable time investment (Jenkins et al., 2019). These results indicate that intensity can partially offset volume to stimulate cardiovascular adaptations in favor of the effectiveness of short-term vigorous exercise snacks to improve aerobic capacity.

Musculoskeletal Responses

Exercise snacks that involve resistance training, e.g. body weight squats, push-ups or chair stands, are enough to load the muscles to induce muscular changes. Resistance exercise in brief bouts triggers the same patterns of muscle

fiber recruitment and signal transduction that are triggered by the standard resistance training, albeit the extent and duration of activation may vary (Burd et al., 2012).

Studies have shown that several shorter periods of resistance exercise administered daily can elicit similar or better anabolic effects when volume is matched with single longer sessions (Areta et al., 2013). Such a temporal distribution can maximize the synthesis of muscle proteins by cycling mechanistic target of rapamycin (mTOR) signaling pathway that has a refractory period after each stimulus.

Evidence Base: Health Outcomes Across Domains

Cardiometabolic Health

Various randomized controlled trials prove that exercise snacking interventions have a beneficial effect on cardiometabolic health markers among different populations. Islam et al. (2022) conducted a systematic review which has found 19 studies investigating brief bouts of activities less than 10 minutes; 84 percent of these studies have reported significant improvements in at least one of the cardiometabolic outcomes, including glucose control, blood pressure, lipid profiles, or cardiovascular fitness.

One of the best-researched modalities of exercise snacking is stair climbing. Jenkins et al. (2019) proved that 3 bouts of 20 seconds of stair climbing, administered three times a day, over six weeks, enhanced cardiorespiratory fitness by five percent among young adults, which was just as effective as similar six-week moderate-intensity continuous training. Likewise, a study by Allison et al. (2017) demonstrated that the intensive and short stair climbing sessions less than 10 minutes in duration per week increased insulin sensitivity and aerobic capacity in sedentary people.

The postprandial activity snacks have particularly strong glycemic effects among people with type 2 diabetes or pre diabetes. Dempsey et al. (2016) determined that brief walking breaks every 30 minutes lowering 24 hours glucose level by 9-percent and postprandial glucose excursion in type 2 diabetes by 26 percent in adults and lasted through the number of days. Such results indicate that snacking exercise can be an effective addition or alternative to medication-based glucose control to the right patients.

Musculoskeletal Fitness

Snacking protocols of resistance based exercise have been shown to be effective in enhancing muscular strength and endurance. A clinical trial by Colenso-Semple et al. (2023) focused on the impact of doing 15 bodyweight squats every hour during the time when one is awake over a period of eight weeks, which amounts to about 200 squats per day in the form of 13-14 bouts. The results showed a great improvement in lower-body strength and muscular endurance among the participants that matched the results of traditional resistance training programs where participants were required three sessions in the gym lasting 45-60 minutes a day.

The benefit of exercise snacking that is distributed could be due to improved neuromuscular learning, a smaller fatigue buildup when exercising in individual bouts, and an increased number of exercises that stimulate anabolic signaling pathways (Areta et al., 2013). Also, delayed-onset muscle soreness (also referred to as delayed-onset pain) that is usually related to traditional resistance training will not occur and this might positively affect adherence and functional capacity throughout the intervention phase.

Mental Health and Cognitive Function

There is an emerging body of evidence indicating that exercise snacking has the same psychological and cognitive effects as extended exercise rates. Short activity sessions elevate the mood, lower anxiety, and promote mental processes by various processes, such as augmented cerebral blood flow, neurotransmitter release, and stress hormone regulation (Edwards and Loprinzi, 2019).

According to the research conducted by Edwards and Loprinzi (2019), one 10-minute moderate-intensity walk had a beneficial effect on executive performance and memory up to two hours after the activity, with no superiority of 30 minutes of continuous exercise. The quick development and comparatively long-term nature of the cognitive improvements implies that exercise snacks taken at the right time may help to maximize cognitive performance when faced with cognitively demanding activities or conferences.

Moreover, the fact that the barrier to entry and exit is low in relation to exercise snacking can have a psychological benefit by establishing self-efficacy and anxiety related to exercise. The ability to accomplish short-term activity objectives during the day is a form of repeated positive reinforcement that may establish a virtuous cycle that reinforces behavioral persistence over the long term (Beltran-Carrillo et al., 2021).

Implementation Strategies and Practical Considerations

Context-Specific Applications

The key to successful snacking exercises is to determine the right contexts, cues and activities that can fit individual routine, preferences and settings. Workplace environments have a certain potential because office employees spend 70-85% of workdays sitting down, and often complain of shortage of time at work as a reason not to exercise (Parry and Straker, 2013).

Exercise snacking workplace interventions could involve using the stairs in building transitions, or standing or walking conferences, body weights exercises in breaks, or vigorous commuting sessions (Munir et al., 2018). Exercise snacking is adopted and maintained with environmental alterations, including centrally-located stairs, standing desks, and organizational culture in support of brief activity breaks.

The opportunities that exist at home are a bit different, as there are snacks of exercise during TV watching, household chores that are done at easier levels, active games with children, or they are combined with other everyday activities such as brushing their teeth or making coffee (Islam et al., 2022). The strategies of implementation intentions, that is, specifying when, where, and how exercise snacks should be done, are more effective in increasing adherence as they establish the associations between cues and behaviors.

Technology and Behavioral Support

Exercise snacking can be facilitated using wearable activity gadgets, smartphone applications, and environmental cues to remind, provide feedback, and socially reinforce exercise snacking. Immediate interventions such as providing activity cues at specific points throughout the day or after spending certain time being sedentary are proven to be effective at boosting accumulating activities on a daily basis (Bond et al., 2014).

Achievement badges, streaks, or social competitions, which constitute gamification elements, capitalize on the power of intrinsic motivation and social comparison to increase adherence to exercise snacking protocols. Technology based interventions should however be supportive and yet self-regulated to prevent overbearing surveillance and control which may be counterproductive in fostering an internal drive towards exercise (Teixeira et al., 2012).

Addressing Barriers and Facilitators

Although exercise snacking has some theoretical benefits, the implementation of exercise snacking has a set of barriers such as concerns of social acceptability, environmental limitations, awareness deficiency, and competing demands. It is noted that many of them complain about feeling uncomfortable when they exercise in their working or open areas because of sweating, because of their looks or because they feel socially inappropriate (Beltran-Carrillo et al., 2021).

These barriers are multilevel and need to be addressed with the help of multi-level interventions that will include individual knowledge and skills, social norms and support, organizational policies and practices, and environmental design. The behavior can be normalized through the endorsement and leadership modeling of exercise snacking in organizations that will make the behavior seem normal and less risky to others. Misconceptions can be reduced by educational campaigns that exercise snacks do not involve special clothes, facilities, or even time investment.

Limitations and Future Research Directions

There are a number of significant limitations governing present knowledge regarding the exercise snacking efficiency and application. The current studies mainly focus on the short-term interventions, which increase the number of weeks to months; therefore, they lack evidence on the long-term adherence, long-term positive health effects, or even their habituation consequences. The years of longitudinal studies on the maintenance of exercise snacking require further research to determine its validity as a long-term intervention. Serious difficulties in

synthesis and dose-response characterization are caused by heterogeneity in exercise snacking protocols, populations, and outcome measures.

The systematic exploration of optimal intensity, duration, frequency, and timing parameters in particular health outcome and population would allow more accurate prescription advice. Also, the comparative effectiveness study that directly compares exercise snacking versus the conventional exercise prescriptions in non-experimental conditions is required to determine clinical and population health recommendations. It is still not fully understood how the mechanisms of the apparent dose equivalence between brief, distributed activity and longer, consolidated bouts occur. Additional research on molecular signaling responses, timecourses of adaptation, and possible synergistic interactions of acute bout properties and patterns of distribution would optimize exercise snacking programs.

Lastly, the implementation research looking at how to disseminate exercise snacking in a scalable way, in an equitable manner, and reach the broadest possible population is necessary to transform the exercise snacking research concept into a readily available population health intervention. Gaining insight into those populations that might be most benefited by exercise snacking in comparison to the traditional practice of exercise, and in what situations will allow individualized prescription of physical activity with maximizing personal and population health impact.

Conclusions

Exercise snacking is a paradigm shift in the promotion of physical activity, which considers movement as a lifestyle element, which is opportunistic and integrative, but not a specific behavior time-consuming activity necessitating a separate session. New data indicate that short, cumulative activity sessions have significant health outcomes, both cardiometabolic, musculoskeletal and psychological, and in many cases as much so as more rigorous exercise prescriptions that take significantly more time. The practical benefits of exercise snacking, little time investment, absence of specialized equipment and facilities, ability to fit easily into existing habits, and lack of barriers to entry, make it potentially scalable to the challenge of physical inactivity among the population. Exercise snacking is a more convenient substitute to traditional forms of exercise that cannot be used by time-constrained individuals who cannot or do not want to exercise, which can potentially prevent chronic disease and improve quality of life. Nevertheless, it does not mean that exercise snacking has to be used to replace the old-fashioned structured exercise among all the people and in all the cases. Instead, it is one of the many tools in a complete physical activity promotion toolkit, which is suitable in specific population, context, and objectives. The most appropriate promotion of physical activity may be provided by personalized strategies that can consist of exercise snacking, conventional exercise, incidental lifestyle activity, or their combinations and can depend on the preferences, ability, and conditions of a particular person. Since contemporary living conditions are more and more requiring a time-saving health promotion method, exercise snacking represents a pragmatically viable, scientifically credible approach to building health-protective exercise. Further studies to refine protocols, clarify mechanisms, prove their long-term relevance, and come up with scalable implementation methods will tell whether exercise snacking is as transformative a public health intervention of the 21st century as it promises to be.

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THE KITCHEN LAB: EVALUATING THE EFFICACY OF ANCIENT INDIAN SUPERFOODS ON ATHLETIC RECOVERY AND PERFORMANCE LONGEVITY IN INDIAN ATHLETES

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Abstract

In the realm of elite athletics, the efficiency of the recovery window serves as the ultimate benchmark for competitive durability. National-level sprinters frequently encounter performance stagnation due to physiological burdens such as glycogen depletion, myofibrillar degradation, and chronic cortisol elevation. This paper proposes the **"Kitchen Lab"** protocol, a scientific framework aimed at validating ancient Indian superfoods—**Ashwagandha** (*Withania somnifera*), **Amla** (*Phyllanthus emblica*), and **Sattu** (Roasted Gram Flour)—as high-performance ergogenic aids. The study employs a multi-dimensional analysis of how these indigenous interventions modulate athletic output. Data for this thematic paper were synthesized through a comprehensive review of literature spanning from 2000 to 2026, utilizing primary scholarly databases including PubMed/MEDLINE, ScienceDirect, Google Scholar, and the AYUSH Research Portal**. Ashwagandha** is examined for its adaptogenic capacity to down-regulate serum cortisol and stabilize the hypothalamic-pituitary-adrenal (HPA) axis. **Amla,** rich in bioavailable Vitamin C and polyphenols, is evaluated for its efficacy in mitigating oxidative stress and accelerating the resolution of Delayed Onset Muscle Soreness (DOMS). Additionally, **Sattu** is analyzed as a low-glycemic, nutrient-dense carbohydrate source for sustained energy release and efficient glycogen re-synthesis. Preliminary assessments suggest that the "Kitchen Lab" methodology can refine recovery timelines by **20–25%**. This research supports a transition toward culturally integrated, evidence-backed sports nutrition, endorsed by the Ministry of AYUSH, providing a clean, anti-doping compliant alternative to synthetic supplements.

Keywords: Withania somnifera, Phyllanthus emblica, Sattu, Ergogenic Aids, Cortisol Modulation, HPA Axis, Glycogen Re-synthesis, Sports Nutrition.

1. Introduction

The modern landscape of elite sports is increasingly turning toward plant-based, sustainable alternatives to synthetic supplements to avoid inadvertent doping and long-term health risks **(Ayaz et al., 2024; O'Connor et al., 2022).** "The Kitchen Lab" framework bridges ancient Ayurvedic wisdom with contemporary exercise physiology, focusing on three core pillars: hormonal balance, oxidative protection, and metabolic fuelling.

For Indian athletes, particularly those in high-intensity disciplines like sprinting, the reliance on imported synthetic supplements often ignores the bio-availability and gut-microbiome compatibility of indigenous foods. This paper synthesizes data from 2000 to 2026 to argue that the Indian pantry functions as a sophisticated laboratory for ergogenic optimization. Recent investigations also highlight the growing importance of functional foods and adaptogenic herbs in sports nutrition, with studies demonstrating that Ashwagandha supplementation can significantly enhance muscle strength, recovery, and stress resilience among athletes **(Wankhede et al., 2015; Lopresti et al., 2019).**

2. Ashwagandha: The Neuro-Endocrine Adaptogen

Withania somnifera (Ashwagandha) is classified as a primary adaptogen—a substance that increases non-specific resistance to physical and emotional stressors **(Kostrakiewicz-Gierałt, 2022).**

2.1 Modulation of the HPA Axis and Serum Cortisol

The Hypothalamic-Pituitary-Adrenal (HPA) axis is activated by intense physical exercise, which is a significant stressor. Elevated serum cortisol, which is catabolic to muscle tissue and immune system suppressive, is a result of chronic activity.

Standardized Ashwagandha root extracts dramatically lower blood cortisol levels by 22–30%, according to recent meta-analyses **(Guo & Rezaei, 2024).** Ashwagandha reduces the perceived stress response by altering $GABA_A$ receptors in the brain, enabling the athlete to sustain an anabolic state even during periods of intense exercise. This

is especially important for sprinters, whose success depends on high-velocity neuronal activity and explosive power, both of which are compromised by long-term stress **(López-Samanes et al., 2023).**

3. Amla: The Phytochemical Defense System

Phyllanthus emblica (Amla) serves as a potent antioxidant intervention. Its high concentration of Vitamin C—ranging between 400 and 500 mg per 100 ml—is significantly higher than that of most citrus fruits **(Sinha et al., 2021).**

3.1 Oxidative Stress and Redox Signalling

During high-intensity sprinting, the sudden surge in oxygen consumption leads to the production of **Reactive Oxygen Species (ROS).** While some ROS is necessary for signalling, an excess leads to myofibrillar micro-trauma and **Delayed Onset Muscle Soreness (DOMS).** Amla's unique **"tanninoid"** complex (including emblicanin A and B) remains stable even after processing. Research indicates that Amla enhances the expression of endogenous antioxidants like Superoxide Dismutase (SOD) and Glutathione Peroxidase (GPx) **(Ayaz et al., 2024; Tilahun et al., 2022).**

4. Sattu: The Indigenous Glycemic Anchor

Sattu (roasted gram flour) is a traditional Indian functional food with a high bioavailability and low **glycemic index (Tamang et al., 2016).**

4.1 Sustained Glycogen Re-synthesis

The main reason for a reduction in performance in sprinters is the depletion of muscle glycogen. Sattu's high fiber content and roasted starch structure allow for a prolonged release of glucose **(Singh et al., 2024).** Sattu guarantees a steady blood-glucose curve, in contrast to maltodextrin-based recovery drinks that result in an insulin rise followed by a collapse.

5. Preliminary Findings: The 20-25% Recovery Optimization

The "Kitchen Lab" protocol, synthesized from longitudinal data (2000–2026), demonstrates a measurable shift in recovery biomarkers. The following results provide the evidentiary basis for the 20-25% optimization claim:

5.1 Ashwagandha for Hormonal and Neural Recovery

Cortisol Suppression: When compared to placebo groups, a clinical evaluation of standardized root extract usage (600 mg/day) revealed a 27.9% decrease in serum cortisol **(Guo & Rezaei, 2024).** This is directly related to the inhibition of the stress-induced hyperactivity of the HPA axis.

Muscular Strength Gains: During resistance training, athletes who used ashwagandha showed a noticeably greater increase in muscle strength. Bench press and leg extension exercises showed improvements that were almost 1.5–1.7 times greater than those of the control groups **(López-Samanes et al., 2023).**

5.2 DOMS Resolution and Antioxidant Capacity (Amla)

Oxidative Defense: Supplementing with amla dramatically raises blood levels of glutathione and superoxide dismutase (SOD), which lowers lipid peroxidation markers by about 20% **(Tilahun et al., 2022; Sinha et al., 2021).**

Inflammatory Modulation: By blocking the pro-inflammatory cytokines that follow myofibrillar micro-trauma, the high polyphenol content promotes a 25% quicker recovery of muscular soreness (DOMS) **(Ayaz et al., 2024; Michel P. et al., 2024)**

5.3 Glycemic and Metabolic Efficiency (Sattu)

Sustained Energy Release: Due to more stable blood glucose control, Sattu's low glycemic index (GI) causes a 12–15% increase in time-to-exhaustion during endurance trials when compared to straightforward carbohydrate therapies **(Singh et al., 2024; Tamang et al., 2016).** Glycogen Re-synthesis: Compared to isolated carbohydrate

sources, post-exercise protein-carbohydrate co-ingestion through Sattu promotes a 20% more effective glycogen replacement rate **(Singh et al., 2024).**

6. Institutional Revival: Integration, Regulation, and Safety

The revival of ancient superfoods in the diets of elite athletes requires more than just advocacy; it necessitates a structured institutional framework to ensure safety, efficacy, and legal compliance.

6.1 The Role of the Ministry of AYUSH

The Ministry of **AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homoeopathy)** plays a pivotal role in transitioning these foods from "traditional remedies" to "standardized ergogenic aids."

- **Standardization of Bioactives:** By implementing strict Pharmacopoeial standards, AYUSH ensures that superfoods like Ashwagandha contain consistent levels of withanolides, preventing the efficacy fluctuations seen in raw market samples **(Sharma et al., 2019).**
- **The "Ayur-Logistics" Framework:** AYUSH can lead the "Farm-to-Field" initiative, ensuring that crops are grown in heavy-metal-free soil, which is a critical concern for medical boards overseeing athlete health.

6.2 Medical Boards and Anti-Doping Compliance

Fear of "inadvertent doping"—the presence of prohibited drugs as a result of cross-contamination—is the main obstacle to adopting traditional superfoods. Why NADA/WADA Synergy: "Certified for Sport" seals for native superfoods must be established by national medical boards working with the National Anti-Doping Agency (NADA). This entails checking low-quality herbal mixes for banned stimulants or anabolic substances.

Pharmacovigilance: By tracking long-term physiological effects, a medical board-led registry for athletes utilizing these aids can provide the clinical information required to categorize them as "Safe Ergogenic Aids" **(Guo & Rezaei, 2024).**

6.3 Implementation in Athletic Diets

Specialized sports nutritionists with training in Ayurvedic pharmacology must lead revival.
1. Periodization: To treat acute oxidative stress, amla is given priority during competitive periods, whereas ashwagandha should be administered during high-volume "loading" phases.
2. Bioavailability Protocols: Sattu should be consumed with certain carriers (such as buttermilk or jaggery) to facilitate the best possible absorption of glucose and electrolytes during rehydration **(Tamang et al., 2016).**

7. Conclusion

The "Kitchen Lab" protocol is an evidence-based, culturally grounded paradigm change. Athletes can enhance recovery times by 20–25% by utilizing the combined effects of Sattu's metabolic efficiency, Amla's oxidative protection, and Ashwagandha's hormonal regulation.

This strategy maximizes physiological potential while maintaining the integrity of elite sports in a sustainable, anti-doping compliant manner.

Ashwagandha, Amla, and Sattu can be promoted to the position of gold-standard recovery aids under the cooperative supervision of national medical boards and the Ministry of AYUSH. India can provide its athletes with a long-lasting, domestic advantage on the international scene by guaranteeing anti-doping compliance and biochemical standardization.

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THE RESILIENCE OF THE INDIAN KNOWLEDGE SYSTEM (IKS) IN SPORTS (18TH–21ST CENTURY)

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Abstract

The Indian Knowledge System (IKS) in the realm of physical culture and sports traces its evolution from ancient comprehensive practices to its modern global resurgence. Traditionally, Indian sports were embedded in a psycho-spiritual context where the body (Ksetra) was seen as a medium for achieving "Dharma". This framework, guided by the tenets of Dhanurveda, Yoga, and Ayurveda, emphasized internal mastery and the equilibrium of Gunas rather than just external competition.

The narrative transitions in the 18th and 19th centuries, highlighting the systematic decline of native sports during British colonial rule. The introduction of Western "gentlemanly" sports like Cricket and Hockey, along with the adoption of British-style education, side-lined traditional activities such as "Kushti" and "Mallakhamba", branding them as outdated. This "civilizing mission" shifted Indian athletic goals towards Olympic-recognized formats, a trend that reached its zenith in the 20th century with India's dominance in Field Hockey and the eventual cultural supremacy of Cricket after the 1983 World Cup.

However, the 21st century signifies a "Glocal" revival. Through the perspective of the National Education Policy (NEP) 2020 and the commercial triumph of the "Pro Kabaddi League", the paper demonstrates how traditional Indian sports have been redefined for a global audience. Additionally, it underscores a modern "Hybridization" model where ancient IKS—particularly "Pranayama" for breath control and Ayurvedic recovery methods—is being incorporated into the high-performance routines of elite contemporary athletes. Ultimately, the paper contends that the progression of Indian sports is not a tale of replacement, but of integration, where ancient wisdom offers the cognitive and physiological advantage in today's competitive arena.

Keywords: Indian Knowledge System (IKS), Kalarippayattu, Colonialism, Pro Kabaddi League, Yoga-Sports Synthesis, Ayurgenomics.

1. Introduction

To understand this evolution, this paper aims to trace the historical continuum of indigenous physical culture. It will examine how traditional sports navigated the systemic disruptions of British colonialism and the deliberate institutional marginalization of native practices. Furthermore, it explores the 21st-century 'Glocal' revival, highlighting how ancient frameworks—such as Pranayama for breath control and Ayurvedic recovery methods—are being hybridized with modern sports science to meet the demands of contemporary elite athletics. The discourse surrounding the Indian Knowledge System (IKS) within the domain of physical culture necessitates a departure from Western paradigms of mere athletic competition. Historically, the evolution of IKS in sports spans from ancient, comprehensive, and philosophically grounded practices to its current global resurgence. At its core, traditional Indian physical culture was inextricably embedded in a psycho-spiritual context. Within this epistemological framework, the human body—conceptualized as the Ksetra (the field or medium)—was not merely a mechanical vessel for sport, but an essential instrument for the realization of Dharma (righteous duty). This intrinsic link between cognitive motivation, spiritual duty, and physical execution underscores a holistic approach to human performance. Ultimately, the trajectory of Indian sports is not a narrative of cultural erasure, but one of integration, wherein ancient wisdom continues to provide profound cognitive and physiological advantages in contemporary competitive arenas.

2. Indigenous Sports of India and the Indian Knowledge System: Preserving Tradition and Promoting Professionalism

To comprehend the traditional sporting landscape of India, one must examine the foundational pillars of the IKS: Dhanurveda, Yoga, and Ayurveda. Unlike modern athletic frameworks that prioritize external competition and quantifiable metrics, this ancient system emphasized internal mastery and the delicate equilibrium of the Gunas (fundamental attributes of nature) Traditionally, Indian sports were embedded in a psycho-spiritual context where the body (Ksetra) was seen as a medium for achieving "Dharma". Ayurveda, which collectively emphasized internal mastery and the equilibrium of the Gunas, rather than merely prioritizing external competition. The pursuit of athletic

excellence was thus intrinsically linked to spiritual duty and self-actualization, fostering a profound mind-body synthesis.

A. Mallakhamb

Mallakhamb serves as a quintessential embodiment of the Yoga-sports synthesis. Mallakhamb stands as a premier biomechanical manifestation of the Indian Knowledge System. Originating as a conditioning apparatus for wrestlers, it evolved into a sophisticated discipline requiring immense neuromuscular coordination, spatial orientation, and core stability. It perfectly exemplifies the application of yogic principles in a dynamic athletic context. However, with the advent of colonial educational structures, traditional activities such as "Mallakhamba" and "Kushti" were actively side-lined and unjustly branded as outdated.

Etymologically derived from the words Malla (wrestler) and Khamb (pole), it originated as a highly specialized conditioning apparatus for combatants. The earliest literary traces of Mallakhamb are found in the Manasollasa, a 12th-century text compiled by the Chalukya king Someshvara III, which detailed the physical conditioning required for elite warriors. However, the discipline experienced its most significant revival and codification in the early 19th century under the Maratha Empire. Balambhatta Dada Deodhar, the physical instructor to Peshwa Baji Rao II, systematically developed Mallakhamb as a core training methodology to enhance the grip, agility, and core stability of wrestlers. During this era, participation was deeply rooted in the psycho-spiritual context of the IKS, where the body (Ksetra) was utilized as a medium for achieving Dharma. The drive to practice was fueled almost entirely by high levels of intrinsic motivation—the internal desire for physical mastery and the equilibrium of the Gunas.

However, during the 18th and 19th centuries, the introduction of British-style education and Western sports systematically side-lined traditional activities such as "Mallakhamba" and "Kushti," unjustly branding them as outdated. This colonial intervention severely disrupted the institutional support for the sport, pushing it to the margins of India's athletic landscape.

The Mallakhamb Federation of India (MFI): The survival and modern resurgence of this discipline are heavily attributed to dedicated institutionalization efforts in the late 20th century. The formation of the Mallakhamb Federation of India (MFI) in 1981 marked a critical turning point. The MFI undertook the monumental task of standardizing a largely uncodified traditional art into a structured, competitive sport. The federation classified the sport into three primary competitive formats: Pole Mallakhamb (traditionally for men), Rope Mallakhamb (traditionally for women), and Hanging Mallakhamb.

Today, Mallakhamb is experiencing a remarkable "Glocal" revival, reflecting the broader resurgence of traditional Indian sports. Its popularity has surged at the grassroots and national levels, bolstered by its prominent inclusion in major state-sponsored events like the Khelo India Youth Games and the National Games of India. This institutional backing has provided modern athletes with viable professional pathways.

Furthermore, its popularity is no longer confined to the Indian subcontinent. The establishment of the Vishwa Mallakhamb Federation (VMF) has catalysed its international footprint. The successful hosting of the first-ever Mallakhamb World Championship in Mumbai in 2019, which saw participation from over 15 countries, unequivocally demonstrates that traditional Indian sports can be redefined for a global audience.

B. Sitholiya (Lagori)

While highly codified disciplines like Mallakhamb demanded specialized martial environments, community-level games such as Sitholiya (widely standardized and recognized today as Lagori or Pitthu) served as the foundational bedrock of grassroots physical literacy in the Indian Knowledge System (IKS). These indigenous games functioned as vital pedagogical tools outside of formal martial institutions, cultivating communal harmony and individual physiological readiness. Played with a stack of seven flat stones and a rubber ball, the game divides participants into two distinct roles: the "Seekers" (who aim to rebuild the stone stack) and the "Hitters" (who defend the stack by targeting the Seekers with the ball).

Today, the critical transition of Sitholiya from an unstructured traditional pastime into a codified, professional sport is primarily spearheaded by the Amateur Lagori Federation of India (ALFI). Recognizing that this indigenous knowledge was slowly disappearing from mainstream competitive platforms, ALFI has systematically structured the game to ensure its survival in the modern era. Guided by leadership figures such as President Sandeep Gurav, Technical Director Bharat P. Gurav, and Founder Member Tushar V. M. Jadhav, the federation has implemented a robust organizational framework.

National and Global Recognition: ALFI's efforts have successfully propelled Lagori onto the national stage, notably resulting in its inclusion as a demonstration sport in the 37th National Games in Goa in 2023. Furthermore, the federation recognizes the sport's extensive global footprint, noting its variations in over 30 countries under names such as Haft Sang in Iran, Teelo in Canada, and Pitho in Pakistan.

Ultimately, by institutionalizing Lagori, ALFI has successfully introduced modern extrinsic motivators—such as formalized rankings and national championships—while consciously working to preserve the intrinsic cognitive and physical benefits of this ancient Indian sport.

C. Kabaddi & Kho-Kho

The origins of both Kabaddi and Kho-Kho are deeply embedded in India's martial and cultural history, functioning as foundational tools for physical literacy and tactical combat readiness. The trajectory of Kabaddi and Kho-Kho illustrates the dynamic capacity of indigenous sports to transition from traditional practices to highly professionalized spectacles. The 21st century has witnessed a remarkable "Glocal" (global-local) revival of these sports, most notably driven by the commercial triumph of the Pro Kabaddi League. This phenomenon demonstrates how traditional Indian sports have been successfully redefined and packaged for a global audience. By adopting modern professional structures, these sports preserve their indigenous biomechanical identities while integrating seamlessly into the contemporary sports economy.

While disciplines like Mallakhamb focused on individual, gravity-dependent mastery, indigenous team sports such as Kabaddi and Kho-Kho demonstrate the application of the Indian Knowledge System (IKS) within high-intensity, intermittent tactical environments. These sports historically served as community-driven physical practices that fostered communal bonding, but they have since evolved into highly structured, professionalized athletic spectacles.

Kabaddi: Rooted in prehistoric India, Kabaddi was originally developed to enhance the defensive and offensive reflexes necessary for multi-opponent combat. The core mechanic of a single "raider" penetrating enemy territory is historically linked to the tactical manoeuvres described in ancient epics, such as navigating the Chakravyuha (a complex military formation). The sport innately demanded the respiratory control, agility, and mental toughness required to survive behind enemy lines. A raider must continuously chant ("can't"), testing respiratory endurance in a manner that mirrors functional Pranayama. Simultaneously, the raider must execute rapid, individual decision-making to anticipate traps and tag defenders. Conversely, the defending team must rely on a highly sophisticated collective decision-making process. Defenders (operating in coordinated chains) must communicate non-verbally, synchronize their biomechanical movements, and execute precise tackles under intense physiological distress.

Kho-Kho: Originating in the state of Maharashtra, Kho-Kho is one of the oldest traditional tag games in the subcontinent. Early iterations of the game were played on chariots (known as Rathera), requiring immense spatial awareness and timing. Over centuries, it was adapted into an intense, terrestrial pursuit game that cultivated explosive cardiovascular endurance and sequential tactical planning. The sport requires rapid spatial evaluation in a confined linear arena. The continuous chasing and evading require players to perform sequential decision-making, executing explosive acceleration and sudden deceleration.

In their traditional contexts, these sports were embedded in a psycho-spiritual framework where the body was seen as a medium for achieving "Dharma". Participation was driven by high levels of intrinsic motivation—the internal pursuit of physical excellence and communal duty—which effectively insulated practitioners from amotivation.

During the British colonial period, these native sports faced systematic decline as Western sports were actively prioritized. The survival of Kabaddi and Kho-Kho relied on intense grassroots resilience and, eventually, rigorous institutionalization in the 20th century.
The Amateur Kabaddi Federation of India (AKFI), established in 1973, and the Kho-Kho Federation of India (KKFI), established in 1955, were instrumental in standardizing these sports. These federations transitioned the games from rural mud courts to standardized synthetic mats. By codifying rules, establishing strict time limits, and introducing weight categories, they created a level playing field. This structural formalization successfully introduced structured extrinsic motivators (such as state championships, national rankings, and Asian Games inclusion) while preserving the sports' foundational biomechanics.

The 21st century signifies a profound "Glocal" (global and local) revival for traditional Indian sports. This is most spectacularly demonstrated by the commercial triumph of franchise-based leagues, specifically the Pro Kabaddi League (PKL) and the recently established Ultimate Kho -Kho (UKK) league.

These platforms have successfully redefined traditional Indian sports for a modern, global audience. By adopting international broadcasting standards, sophisticated sports science camps, and lucrative player contracts, these leagues have fundamentally altered the motivational landscape of the athletes. Modern players now operate in an environment dominated by intense extrinsic motivators. For elite athletes competing in these hyper-professionalized leagues, balancing these external pressures with their foundational intrinsic love for the game is vital for sustaining peak performance, maintaining mental toughness, and preventing burnout during gruelling competitive seasons.

Ultimately, the evolution of Kabaddi and Kho-Kho proves that indigenous biomechanical practices are highly adaptable. They successfully bridge the ancient IKS focus on internal mastery with the complex cognitive demands and extrinsic pressures of the modern global sports economy.

3. Emergence of Foreign Sports and Decline of Traditional Indian Sports

The narrative of Indian physical culture experienced a critical disruption in the 18th and 19th centuries, characterized by the systematic decline of native sports under British colonial rule. The imposition of a colonial "civilizing mission" deliberately shifted the athletic aspirations and motivations of the Indian populace towards Olympic-recognized formats. This ideological shift fundamentally altered the motivation for physical exertion from the internal mastery of the IKS to the external, measurable validation of the Western sporting paradigm.

This era saw the introduction and institutional backing of Western "gentlemanly" sports, specifically Cricket and Hockey, which were heavily patronized through the adoption of British-style education. Consequently, indigenous disciplines were structurally marginalized and branded as outdated. This trend of marginalization and Western adoption reached its zenith in the 20th century. It was concretized by India's absolute dominance in Field Hockey on the Olympic stage, and later solidified by the eventual cultural supremacy of Cricket following the 1983 World Cup. As state funding and national identity became inextricably tied to these foreign sports, the psycho-spiritual frameworks of the traditional IKS were further obscured.

The narrative of the Indian sporting landscape underwent a drastic and deliberate transformation during the 18th and 19th centuries, highlighting the systematic decline of native sports during British colonial rule. The imposition of a foreign physical culture was not merely an organic cultural exchange, but rather a calculated sociological apparatus utilized by the colonial administration.

4. The Resilience of the Indian Knowledge System in Sports (18th- 21st Century)

Despite the systemic colonial disruptions spanning the 18th to 20th centuries, the 21st century has catalysed a profound resurgence of the IKS. This modern era underscores a sophisticated "Hybridization" model, wherein ancient IKS methodologies are systematically incorporated into the high-performance regimens of elite contemporary athletes. Specifically, practices such as "Pranayama" are actively utilized for advanced breath and physiological control, while Ayurvedic recovery methods provide scientifically grounded recuperation strategies. Furthermore, institutional frameworks, notably the National Education Policy (NEP) 2020, are playing a crucial role in formally recognizing and supporting this "Glocal" revival from a pedagogical standpoint.

Despite centuries of systemic marginalization, the Indian Knowledge System has demonstrated profound resilience. Rather than facing total obsolescence, the 21st century has catalysed a structural and scientific renaissance of these ancient methodologies.
This contemporary era is characterized by a "Glocal" revival, prominently supported through the perspective of the National Education Policy (NEP) 2020, which advocates for the pedagogical reintegration of native physical culture. More significantly within the realm of elite athletics, the survival of the IKS is evident in a modern "Hybridization" model. In this model, ancient IKS practices are no longer viewed as antithetical to modern sports science, but rather as highly complementary. Ancient IKS—particularly "Pranayama" for breath control—is being actively incorporated into the high-performance routines of elite contemporary athletes to optimize cardiovascular endurance and regulate autonomic nervous system responses under extreme stress. Advanced Ayurvedic recovery methods are being synthesized with modern sports medicine to provide athletes with personalized, biologically grounded recuperation strategies.

To visualize this historical and psychological trajectory, the evolution of Indian sports can be categorized into three distinct paradigm shifts:

Historical Era	Dominant Sporting Paradigm	Primary Psychological Motivator	Cognitive & Physiological Focus
Pre-Colonial (Ancient to 18th Century)	Psycho-Spiritual Mastery: Traditional sports (Mallakhamb, Kabaddi, Kho-Kho) embedded within IKS methodologies.	Intrinsic Motivation: The pursuit of physical excellence was driven by spiritual duty and the self-actualizing realization of Dharma.	Internal Equilibrium: Emphasis on rapid decision-making, spatial orientation, and the equilibrium of the Gunas.
Colonial & Post-Colonial (18th to 20th Century)	Western Hegemony: The imposition of a "civilizing mission" that institutionalized Cricket and Field Hockey.	External Validation: Athletic aspirations shifted toward measurable, Olympic-recognized formats and state patronage.	Structural Marginalization: Indigenous practices were stripped of institutional support and branded as outdated.
Contemporary (21st Century)	The "Glocal" Revival: The commercial triumph of franchise leagues (e.g., Pro Kabaddi League) and institutionalization by modern federations.	Extrinsic & Intrinsic Balance: Athletes face intense extrinsic pressures but must maintain intrinsic love for the game to prevent burnout.	The Hybridization Model: Synthesizing ancient cognitive tools (like Pranayama) with modern sports science to sustain mental toughness.

Ultimately, the progression of Indian sports is not a tale of replacement, but of integration. By embracing this hybridization, contemporary athletic institutions are recognizing that ancient Indian wisdom offers a distinct cognitive and physiological advantage in today's fiercely competitive arena.

5. Conclusion

The historical trajectory of Indian sports is fundamentally not a tale of replacement by Western paradigms, but rather a complex, ongoing process of integration. To understand the survival and modern resurgence of these indigenous practices, one must recognize the profound resilience of their adaptable psycho-spiritual and physiological foundations.

At its core, traditional Indian physical culture was inextricably embedded in a psycho-spiritual context where the human body—conceptualized as the Ksetra—was an essential instrument for the realization of Dharma. Within this epistemological framework, participation in grassroots games and martial disciplines was driven by high levels of intrinsic motivation, which effectively insulated practitioners from amotivation.

However, the imposition of a foreign physical culture during British colonial rule was a calculated sociological apparatus. This "civilizing mission" deliberately shifted the athletic aspirations of the Indian populace, fundamentally altering the motivation for physical exertion from the internal mastery of the IKS to the external, measurable validation of the Western sporting paradigm. As indigenous practices were systematically stripped of their institutional patronage, state funding and national identity became inextricably tied to foreign sports.

Despite centuries of systemic marginalization, the Indian Knowledge System has demonstrated profound resilience. Indigenous team sports such as Kabaddi and Kho-Kho inherently demanded sophisticated individual and collective decision-making processes under intense physiological distress. Today, the 21st century signifies a profound "Glocal" revival, most spectacularly demonstrated by the commercial triumph of franchise-based leagues that have redefined traditional Indian sports for a modern, global audience.

Modern athletes now operate in hyper-professionalized environments dominated by intense extrinsic motivators. For these elite athletes, balancing external pressures with their foundational intrinsic drive is vital for sustaining peak performance and maintaining mental toughness during gruelling competitive seasons. To achieve this, contemporary sports science has embraced a "Hybridization" model, wherein ancient IKS practices are no longer viewed as antithetical to modern training, but rather as highly complementary.

By actively incorporating practices like "Pranayama" to regulate autonomic nervous system responses under extreme stress, and utilizing Ayurvedic recovery methods for biologically grounded recuperation, modern sports medicine is validating indigenous methodologies. As contemporary sports science continues to evolve, the ancient wisdom embedded within the IKS—from the equilibrium of the Gunas to the application of Ayurgenomics—provides an undeniable cognitive and physiological advantage in today's fiercely competitive arena. Ultimately, the evolution of Indian sports proves that indigenous biomechanical practices are highly adaptable, successfully bridging the ancient focus on internal mastery with the complex demands of the modern global sports economy.

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YOGIC PSYCHOLOGY IN INDIGENOUS SPORTS: A PATHWAY TO MENTAL RESILIENCE AND NATIONAL WELL-BEING

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Abstract

The Native sports are a rich culture, which is rooted in the physical, spiritual and communal identity of the nation in the world. Combined with the postulates of the yogic psychology, these conventional sporting activities become formidable tools of establishing mental stability, emotional balance, and national welfare as well. This is a thematic research paper that looks at the intersection of yogic psychology and indigenous sports and how ancient mind-body philosophical paradigms can be used in the context of traditional athletic settings, to generate quantifiable psychological outcomes. The paper uses empirical research, philosophical literature, and cross-cultural studies to propose that indigenous sports when observed with yogic mind enables the development of a specific kind of psychological endurance that goes beyond competitive sport and becomes part of the overall socio-cultural and mental healthcare of a country. The study examines major themes such as psychophysiological advantages of the yoga practices in the indigenous sport setting, the value of indigenous games in fostering community cohesion and unity, and the policy implication of having yogic-psychological models to influence the national sports development program. The results indicate that this integration provides a culturally based, sustainable, and holistic framework in solving the increasing mental health problems of contemporary societies.

Keywords: Yogic psychology, indigenous sports, mental resilience, national well-being, mindfulness, Ayurveda, traditional games

Introduction

The international mental health discourse has been keen on highlighting the inadequacies of exclusively biomedical paradigms in the context of revealing the psychological versatility of diverse populations (World Health Organization, 2022). The overlap between traditional knowledge and sports science has become a new academic and policy topic in this context. The philosophical ramifications inherent in indigenous sports as traditionally defined physical activities based on the cultural, ecological, and social setting of particular communities have a philosophical richness to them, which is, nonetheless, very compatible with the principles of a yogic psychology (Alter, 2004; Sebastien and Collard, 2011).

The classical Indian school of thought that includes the Yoga Sutras of Patanjali, Samhkaya philosophy, Ayurvedic psychology, and the Vedantic epistemology forms a complete system of human mind, its disorders and the way to achieve mental balance (Rao, 2011). In contrast to Western psychological paradigms which are focused mostly on psychopathology, the yogic psychology is focused on a positive and growth-oriented approach, which involves the development of awareness (prajna), emotional regulation (chitta vritti nirodha) and body-mind- consciousness integration (Bharati, 2011).

Physical contests are not the only case of indigenous sports, including Kapaddi and Mallakhamba in South Asia, Capoeira in Brazil, the Inuit games in Canada, and Sepak Takraw in southeast Asia. They constitute cultural practices that inscribe collective memory, social values and spiritual wisdom (Paraschak & Forsyth, 2011). Looking at these sports in the perspective of the yogic psychology, one would come up with a strong point, as the conventional sporting activity, when infused with a conscious mental and spiritual approach, can be an instrument of personal psychological change and national health.
The four dimensions make up the thematic structure of this paper, namely: (1) the philosophical alignment of yogic psychology and indigenous sport; (2) the psychophysiological evidence of mind-body integration on indigenous sport situations; (3) socio-cultural dimensions of the indigenous sport as a community resilience practice; (4) policy

frameworks towards national integration of the yoga-indigenous sport practices. The implications of the study on future research and national health policy are the final aspect of the paper.

Philosophical Convergence: Yogic Psychology and Indigenous Sport Traditions

Foundations of Yogic Psychology

Yogic psychology is a science of consciousness, which is more detailed and elaborates to trace the framework and functions of human mind. The most prominent in this scheme is the Yoga Sutras of Patanjali (400 CE), where the mind (chitta) is discussed as a compound of three (functionally) related functions manas (sensory-motor mind), buddhi (discriminative intelligence), and ahamkara (ego-sense) (Patanjali, trans. Taimni, 1961). Yogic practice aims at the gradual calming of the mind (which is chitta vritti nirodha) resulting in the states of increased clarity, equanimity and finally, liberation (kaivalya).

Psychologically, yogic psychology is covered by ideas that are parallel and even precede the modern psychological ideas. Klesha (mental afflictions), or avidya (ignorance), asmita (ego- identification), raga (attachment), dvesha (aversion), and abhinivesha (fear of death) are an indigenous taxonomy of psychological suffering (Rao, 2011). A structured, behavioral, ethical, physiological and meditative regimen of dealing with these afflictions is provided by the eightfold path (Ashtanga Yoga) of Patanjali, a kind of integrative psychotherapy thousands of years earlier than the term was introduced (Shapiro, 2020).

According to Bharati (2011), the tridosha system of Ayurveda that classifies psychological constitutions (prakriti) into three main bio-psycho-spiritual types (Vata (air-ether), Pitta (fire- water), and Kapha (earth-water)) is also a part of yogic psychology. All types are connected to their own emotional impulses, cognitive orientations, and coping strategies, and provide a culturally attractive approach to psychological evaluation and treatment that is culturally close to both South Asian and most other indigenous groups.

Indigenous Sports as Embodied Philosophy

The native sports are hardly conceptualized by the practitioners as sheer physical activities. In ethnographic studies, it is always established that the traditional plays have deep metaphysical, cosmological and moral significance (Paraschak and Forsyth, 2011; Blanchard, 1995). As an example, the Kabaddi, a contact sport with its origins in ancient India is traditionally associated with breath control (pranayama), where players have to constantly chant Kabaddi and raid the court of the opponent, which is physiologically identical to breath retention (kumbhaka) guided by Hatha Yoga (Novaes et al., 2020; Brown and Gerbarg, 2005). It is not an accident though; the ancient design of the sport has principles of respiratory endurance and mental concentration which are directly related to the yogic breathing practices. In the same way the traditional Indian sport of performing gymnastic poses on a wooden pole or rope called Mallakhamba we can draw directly on the physical postures (asanas) and physical laws of strength-endurance which are found in the classical texts on hatha yoga (Singleton, 2010). Inuit elders describe the Inuit games of Alaska and Canada, such as the Kneel Jump, One-Foot-High Kick, and Two- Foot-High Kick, as exercises to build iglagiit (mental fortitude) and the physical and mental conditions of surviving in the Arctic, akin to the yoga of tapas (mentalfortifying by austerity). (Paraschak and Forsyth, 2011). This philosophical correspondence implies that in various cultures traditional societies worked out sport activities on their own, mind-body integration as a key element, which is a universal primitive wisdom, which yogic psychology offers a highly developed theoretical structure to interpret and organize (Alter, 2004).

Psychophysiological Evidence: Mind-Body Integration in Indigenous Sports

Neurobiological Correlates of Yogic-Indigenous Practice

In the past twenty years, the field of empirical studies dedicated to the psychophysiological impacts of yoga and mindfulness-based practices came to grow tremendously. A meta-analysis by Pascoe, Thompson, Jenkins, and Ski (2017) of 42 randomized controlled trials established that yoga-based interventions led to significant cortisol reductions, which is a main biomarker of chronic stress, as well as an increase in the levels of the neuroplasticity and brain-derived neurotrophic factor (BDNF) connected to neuroplasticity and cognitive resilience. These results are more applicable especially when they are evaluated in conjunction with other emerging studies on conventional sports, which have the same mind-body requirements. Neuroimaging evidence has shown that specific practices of breath-centered movement, which is a characteristic that both yoga and most native sports (like Kabaddi, Tai Chi (a martial arts sport that has indigenous Chinese origins), and some Aboriginal Australian ceremony physical practises)

use, correlates with changes in regional brain gray matter concentration, especially in the hippocampus, the anterior cingulate cortex and the temporo-parietal junction (Holzel et al., 2011).

These brain functions are related to improved learning, emotional regulation, and decreased anxiety and depression vulnerability. It should be mentioned that a more recent, larger-scale RCT also casts doubt on the scale of replication due to the magnitude of gray matter changes during short MBSR programs (Kral et al., 2022), which explains the value of hedged interpretation, but the empirical benefits of the yogic breath-focused movement on the autonomic regulation and psychological resilience remain strong and well-supported by empirical evidence (Pascoe, Thompson, and Ski, 2017; Novaes et al., 2020). Pranayama specifically triggers the prefrontal cortex, also known as the neurological centre of equanimity and volition: a well-controlled RCT by Novaes et al. (2020) showed that Bhastrika pranayama led to a significant reduction in state anxiety and a change in the activity of the amygdala, anterior cingulate, anterior insula, and lateral prefrontal cortex, all of which are directly related to the yogic objective of chitta vritti nirodha or the still of the mental fluctuations. Particularly, in the framework of indigenous sports, the similarities in the regulated breathing activity in Kabaddi and psychophysiology of pranayama are structurally enticing. The breath retention requirement of Kabaddi raiding is a natural kumbhaka (breath retention) process that triggers the parasympathetic nervous system and alters stress reactivity via vagal systems well- established to act in pranayama empirical literature (Brown and Gerbarg, 2005; Pascoe et al., 2017).

A meta-analysis and systematic review of 45 randomized controlled trials by Pascoe, Thompson, Jenkins, and Ski (2017b) showed that mindfulness-based practice, including practices that involve breath regulation, was significantly less likely to cause elevated cortisol, C-reactive protein, blood pressure, heart rate, and triglycerides than active controls. The results offer direct empirical evidence of the application of the principles of the yogic breathing in the case of the indigenous sport training.

Stress Regulation, Resilience, and the Autonomic Nervous System

Mental resilience as the capacity to positively adjust to adversity, trauma or great stress due to their dynamic nature (Masten, 2001) is also becoming a trainable psychological factor instead of an inherent personality trait. The autonomic nervous system (ANS) is the system which works mainly to develop resilience via the yogic psychology through improving the vagal tone and creating parasympathetic dominance the neurophysiological condition of calm alertness, social interaction and successful stress recovery (Porges, 2011).

Breath controlled physical exercise, which is a characteristic of both formal yoga and many native sporting activities, has been shown to be a highly useful process of vagal tone improvement. Brown and Gerbarg (2005) showed that slow rhythmical breathing at about five to six breaths per minute used in pranayama, and replicated in the controlled breathing patterns of Kabaddi, indigenous martial arts, and ceremony dance-sport, triggers the baroreceptor reflex and has a significant effect on the heart rate variability (HRV), an objective measure of autonomic flexibility and psychological endurance.

This neurophysiological process is, according to the yogic psychology, the formation of sattva guna, or quality of clarity, balance and light in the mind, as opposed to rajas (agitation) and tamas (inertia) within the Samkhya-Yoga system (Patanjali, trans. Taimni, 1961). In the terminology of yoga, native sport professionals practicing with mindfulness of breath and psychological well-being are developing the attributes of sattva that provide them psychological strength not just in the field of sport but in all aspects of life.

Flow States, Optimal Experience, and Samadhi

Another concept of flow, which is an ongoing state of total involvement in an intrinsically motivating task where there is no perception of effort, purposefulness, and the absence of self- consciousness introduced by Csikszentmihalyi (1990) has been widely reported in the research on sport psychology. Less systematic attention has been paid to the fact that flow states are structurally similar to the meditative absorption states (samadhi) of classical yogic psychology (Rao, 2011). Each of the two states implies a dissolution of the classical ego-sense (ahamkara), singular focus, and a contradictory state of striving to be effortless (yogic psychology calls this sahaja or natural spontaneity).

Indigenous sports due to the culturally imposed, rhythmical, and witness-on-the-community nature, seem especially effective in the creation of flow states. In a study by Swann, Keegan, Poggott, and Crust (2012), it was established that the frequency and depth of flow experience were higher among the athletes that took part in culturally relevant competitions than among those that took part in decontextualized competitive environments. This implies the

cultural embeddedness of indigenous sports - its embeddedness in community identity, the tradition of ancestors, and collective meaning - and it forms psychologically fertile situations of the type of ego-transcendent experience that both flow psychology and yogic psychology recognize as an apogee of mental well-being.

Socio-Cultural Dimensions: Indigenous Sports as Community Resilience

Collective Identity, Social Cohesion, and Mental Health

The social determinants of mental health find a good place in the modern literature on the field of public health. According to a systematic review conducted by Vigo, Thornicroft, and Atun (2016), social connectedness, community belonging, and cultural continuity were found to be some of the strongest protective factors against common mental disorders, such as depression, anxiety, and substance misuse. The only thing is that the indigenous sport is a unique way of dealing with all three of these factors simultaneously, as it is a form of living culture, which establishes routine chances of community meeting, intergenerational transfer of knowledge, and collective celebration.

The theoretical explanation of psychological health benefits of community sports offered by yogic psychology, especially its Vedanta aspect, is the notion of sangha (spiritual community) and the doctrine that the individual consciousness is, in essence, non-separate with collective consciousness (Bharati, 2011). Such non-dualistic view is consistent with the Durkheimian sociological notion of collective effervescence the feeling of energy and connection that people experience when engaged in shared rituals and joint actions and with the modern social neuroscience findings showing that coordinated physical activity among individuals triggers oxytocin release and facilitates prosocial bonding (Tarr, Launay, Cohen, and Dunbar, 2015).

With regard to indigenous sports, this principle reflects in the community nature of traditional games. Kabaddi is organized on the inter-individual coordination, where coordination of teams on a moment-to-moment basis is essential. The Maori kapa haka (traditional Maori performing art that has martial elements) are literally practiced to ensure community solidarity and psychological fortification (Durie, 2001). Aboriginal Australian traditional ball games (including Marn Grook, which might have been an ancestor to Australian Rules Football) were used as a non-violent way of settling inter-group feuds and also as a way of strengthening intra- communal ties. These socially intelligent designs represent a group wisdom regarding community mental health that is only yet to be properly explored by modern sports psychology.

Intergenerational Trauma Healing Through Indigenous Sport

To a number of indigenous people around the world, the aspect of traditional sports has a therapeutic value that does not just end with the psychological good of an individual, but extends to intergenerational trauma healing, the passing of traumatic stress-inducing elements of the traumatizing experiences through epigenetic, behavioral, and narrative levels (Brave Heart, Chase, Elkins, and Altschul, 2011). Societies that were disturbed during colonization and that were forced to adopt new cultures and suppress the indigenous ones have seen the destruction of traditional sports as part of the larger cultural dispossession. The rejuvenation of indigenous sports is not just a sports or cultural issue then; it is a psycho-social healing intervention.

The conceptual framework of yogic psychology provides a way of understanding this aspect of healing by its concept of samskara the deepest mental impressions caused by the past experiences that dictate the present psychological performance (Rao, 2011). The collective samskaras, which is akin to cultural trauma, or community memory wounds in modern psychology, can be managed by re-involving the conscious practice of traditionalities that renew cultural continuity, as well as arousing positive ancestral samskaras related to community strength, dignity, and happiness. The resurrection of indigenous sport programs among First Nations communities in Canada, Maori communities in New Zealand, as well as scheduled tribe communities in India have been linked with quantifiable improvement in community mental health symptoms, substance misuse and abuse reduction, and increased cultural pride and identity (Durie, 2001; Paraschak & Forsyth, 2011).

Gender, Equity, and Inclusive Well-Being

The overall study of yogic psychology in the indigenous sports should be able to answer the question of gender equity and inclusive participation. In the past, most native sports were gendered and the women could not participate in some of the traditional events (Blanchard, 1995). Nevertheless, the history of indigenous sport has been recorded by feminist scholars to reveal that indigenous sporting events of women have often featured traditional women-

based sporting activities as widely practiced and appreciated in various traditional cultures, and that the colonial oppression was often directed towards women traditional physical practices to the greatest extent (Paraschak and Forsyth, 2011). The recovery of women into the indigenous sporting situations as dictated by the yogic psychological values of non-discrimination (ahimsa and asteya applied to social affairs), equity and understanding of the psychological capability of every individual is an important aspect of the national welfare beyond the sporting events.

The studies have shown that the involvement of women in gender-sensitive physical exercises is attributed with a lot of enhancement in self-efficacy, body image, social connectedness and prevention of gender-based violence (Whitelaw, Teuton, Swift, and Scoular, 2010). Once the native sports are rejuvenated with explicit focus on gender equity and guided by the teachings of yoga about the inclusiveness of respect of everyone involved in the practice, they will become potent tools to achieve both the cultural maintenance and gender justice.

Policy Frameworks: Integrating Yogic-Indigenous Sports into National Well-Being Strategies

National Precedents and International Models

The possibility of indigenous sports integration as a national health and cultural policy has been identified by several countries. The Ministry of Youth Affairs and Sports in India has made the Khelo India program to be specifically introduced, which includes traditional indigenous sporting activities in addition to modern sporting in recognition of the cultural and psychological importance of traditional physical activities (Ministry of Youth Affairs and Sports, Government of India, 2018). The Aboriginal Sport Circle of Canada, and the Maori Sport New Zealand program can be compared to other policy frameworks such as recognizing indigenous sport as a tool of community health, cultural renewal and social wellbeing (Paraschak & Forsyth, 2011).

On the international level, the right of indigenous peoples to the preservation, regulation, protection, and development of their cultural heritage, including the traditional physical practices has been explicitly recognized by United Nations Declaration on the Rights of Indigenous People (UNDRIP, 2007). This international law system offers the normative basis of the national policies that incorporate indigenous sports, enhanced with the yogic psychological principles, in the mainstream health, education, and sports development systems.

A Framework for Integration: The Yogic-Indigenous Sports Well-Being Model

In accordance with both theoretical and practical evidence that has been discussed in this paper, the conceptual policy framework is introduced: the Yogic-Indigenous Sports Well-Being Model (YISWM). This model is based on four pillars that are interdependent. The first pillar is that of Cultural Authenticity, so that indigenous sports programs possess their cultural specificity, cosmological significance, and across-generational transmission strategies, as opposed to being decontextualized to generic categories of traditional sport. The second pillar is the Yogic Psychological Integration, which entails the integration of systematic mind-body awareness practices in indigenous sport training systems, such as pranayama, mindful movement, and meditative concentration, in a manner that is culturally coherent and empirically established. The third pillar is Community-Centered Implementation, which created programs that focused on community ownership, a mentor relationship, and community involvement, rather than on the individual indicators of mental strength, and understands the social-relational aspect of mental resilience. The fourth pillar is Evidence-Based Evaluation, which entails the establishment of culturally relevant assessment instruments that will not only capture individual psychological outcomes but also have indicators of the community well-being such as social cohesion, cultural pride, intergenerational connection, and collective efficacy.
The framework relies on Biopsychosocial spiritual model of health promoted by Engel (1977) and developed by Sulmasy (2002) to comprise spiritual aspects, and the framework of cultural diversity by UNESCO (2005) and the traditional medicine approach by WHO (2001). It is an interdisciplinary synthesis that makes yogic psychology a meta-framework that can enrich various indigenous sport traditions without cultural imperialism since yogic psychology is itself a creation of an indigenous tradition and reflects values of universal applicability.

Implementation Challenges and Ethical Considerations

There is the complex ethical issue in integrating yogic psychology in the local sporting activities. There is a danger of cultural appropriation, which is essentially the removal of native cultures of doing things and their commercialization in the realm of mainstream wellness or sports culture, and this is a serious challenge that has to be maneuvered through (Smith, 2012). Yogic psychology applied to indigenous sport has to work by the principles

of seva (service without self-interest) and satya (commitment to truth), and it must be the indigenous communities who benefit most of all the integration program, rather than outside researchers, commercial concerns or national prestige story lines.

Moreover, because of the variety of indigenous sports cultures around the world, there is no single model of yogic-indigenous integration that would be applicable. The YISWM should be the flexible meta-framework that can be adjusted to the cultural specifics and needs profound community consultation, practitioners who are culturally competent, and reflexive assessment should be continuous (Smith, 2012). The inclusion of elders of indigenous communities, traditional knowledge bearers, and youth as representatives of the indigenous communities in the design and governance of the programs is not a matter of choice but obligatory to an ethical and effective program application.

Discussion: Towards a Holistic Model of National Mental Well-Being

Through the evidence presented in this paper, there is a unified thesis: yogic psychology and local sports are integrative to provide a culturally imprinted, empirically valid, and philosophically consistent way of achieving the individual mental strength and national prosperity. This conclusion questions the current trend in mental health policy around the world to default towards Western psychological frameworks and imported sporting practices, usually, at the cost of native knowledge systems that entail centuries of experiential experience of what makes human beings happy and flourish psychologically.
The concept of national well-being, as identified by the Better Life Framework (2013) at OECD and by the Gross National Happiness Index in Bhutan, implies the dimensions of psychological well-being, community life, cultural involvement, time wellness, and meaning and purpose - exactly the ones that indigenous sports, enhanced by yogic psychological principles, is highly- placed to cover. The point is that indigenous sports and yogic psychology can be used in place of the whole mental health system, but as a culturally sensitive, community-based, preventive mental health intervention that augers clinical care and targets the social determinants of mental health on a population scale.

The interchange of yogic psychology and indigenous sport is also a sort of civilizational dialogue - an interaction between two traditions of cultural wisdom that, instead of generating a conflict, display a profound structural resonance on shared human issues: how to create a strong, clear, equanimous mind; how to establish strong communities; how to relate physical practice and spiritual ambition; how to transmit these abilities across generations. The very dialogue is a contribution to national and global well-being in times of growing cultural polarization and psychological disintegration.

Conclusion

This thematic research paper has revealed that the philosophical, psychophysiological, and socio-cultural convergence between yogic psychology and indigenous sports is deep and makes the combination of the two an effective avenue in achieving mental resilience and national well-being. The paper has posited that indigenous sports are not in the past but living laboratories to a type of holistic human development that modern psychology and popular health acutely require by examining the philosophical basis of yoga and neurobiological evidence on mind-body integration, socio-cultural resilience mechanisms in communities and the policy frameworks of their implementation. The Yogic-Indigenous Sports Well-Being Model proposed provides a workable conceptual model of how these insights can be translated into a national policy whereas it is the ethical principles of cultural authenticity, community ownership, and non-appropriation that offers the guardrails of responsible practices. Future studies are required to establish culturally acceptable psychometric tools to gauge the outcome of sports through the use of yoga, indigenous sport, in order to carry out longitudinal community-based research and also to systematically capture the various sport indigenous traditions that have not been well studied in academic literature. After all, the yogic psychology in local sports is a reversion to wisdom, which has always been with man, a wisdom that realizes the body as the expression of the mind, the mind as the expression of consciousness, the community as the ecology of the individual and sport as a sacred presence of the development of human excellence in all her fullest and most complete sense. By adopting this wisdom, nations do not look back but look forward towards a model of sustainable, culturally- based, and truly holistic, well-being.

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THE ROLE OF COGNITIVE AND EMOTIONAL PURIFICATION IN HOLISTIC HEALTH: A STUDY IN THE LIGHT OF PATANJALI AND ACHARYA SHRIRAM SHARMA

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Abstract

Holistic health represents an integrated approach to human well-being that encompasses physical, psychological, emotional, social, and spiritual dimensions. Ancient Indian philosophical traditions have long emphasized the purification of cognition and emotions as a prerequisite for achieving balanced health and inner harmony. Among these traditions, the teachings of Patanjali and Acharya Shriram Sharma provide profound insights into mental discipline and emotional refinement. Patanjali's yogic framework emphasizes Chitta Vritti Nirodha—the cessation of mental fluctuations—achieved through the systematic practice of Ashtanga Yoga. Acharya Shriram Sharma's philosophy of Scientific Spirituality complements this approach by advocating Pragya Yoga, along with the triadic spiritual framework of Upasana, Sadhana, and Aradhana, which aims at transforming thought patterns, refining emotions, and promoting selfless service.

This descriptive and analytical study examines how cognitive purification and emotional refinement contribute to holistic health through the integration of yogic philosophy and spiritual psychology. The paper further explores advanced practices such as Ātma Bodha Sādhana and Tattva Bodha Sādhana, which cultivate self-awareness and philosophical understanding. Drawing upon classical texts, modern yoga research, and interdisciplinary studies in psychology and spirituality, the study proposes an integrated conceptual framework linking cognitive discipline, emotional transformation, and spiritual awareness to holistic health outcomes. The findings suggest that combining the psychological insights of Patanjali with the spiritual practices of Acharya Shriram Sharma provides a comprehensive model for enhancing mental resilience, emotional stability, and overall well-being in contemporary society.

Keywords: Holistic health, cognitive purification, emotional purification, yoga psychology, Patanjali, Acharya Shriram Sharma, Pragya Yoga, spiritual psychology.

Introduction

In recent decades, the concept of health has evolved beyond the traditional biomedical model toward a more comprehensive understanding of human well-being. Modern health paradigms increasingly emphasize the interconnectedness of physical, psychological, emotional, social, and spiritual dimensions. This integrated perspective, commonly referred to as holistic health, recognizes that human well-being cannot be understood solely in terms of physical functioning but must also account for mental and emotional balance. Rapid social and technological changes have significantly influenced contemporary lifestyles. Increasing work pressure, social competition, and digital engagement have contributed to rising levels of stress, anxiety, emotional instability, and psychological disorders. These challenges have prompted researchers and health practitioners to explore traditional systems of knowledge that emphasize inner discipline and mental harmony. Ancient Indian philosophical traditions provide a profound understanding of the relationship between mind, emotions, and health. Among these traditions, the teachings of Patanjali occupy a central place. The Yoga Sutras of Patanjali present a systematic framework for understanding the nature of the mind and the methods required for achieving mental clarity and self-realization.

Patanjali defines yoga through the famous aphorism:

योगश्चित्तवृत्तिनिरोधः

Yogaḥ citta-vṛtti-nirodhaḥ (Yoga Sutra 1.2)
This statement implies that yoga is the process of regulating the fluctuations of the mind. According to Patanjali, uncontrolled mental modifications lead to suffering, confusion, and emotional disturbance. Therefore, purification of cognition becomes essential for attaining inner harmony.

In modern times, several spiritual thinkers have interpreted and applied these ancient principles in contemporary contexts. Among them, Acharya Shriram Sharma made a significant contribution by integrating yoga philosophy with social transformation and spiritual psychology. His concept of Scientific Spirituality emphasizes the transformation of thoughts, emotions, and behavior through disciplined spiritual practices.

Acharya Sharma introduced the concept of Pragya Yoga, which focuses on awakening higher wisdom (Pragya) through meditation, ethical living, and selfless service. Central to this philosophy is the triadic model of Upasana (spiritual communion), Sadhana (self-discipline), and Aradhana (selfless service). These practices collectively aim to purify cognition, refine emotions, and promote social harmony.

Furthermore, Acharya Sharma emphasized deeper stages of inner transformation through practices such as Ātma Bodha Sādhana (self-realization) and Tattva Bodha Sādhana (understanding the principles of reality). These practices cultivate self-awareness, philosophical insight, and ethical wisdom, which are essential for holistic development. The present study examines the role of cognitive and emotional purification in achieving holistic health by analyzing the philosophical perspectives of Patanjali and Acharya Shriram Sharma. By integrating classical yogic psychology with modern spiritual practices, the study proposes a comprehensive framework for promoting psychological resilience and overall well-being.

Objectives of the Study

1. To analyze the concept of cognitive purification in the teachings of Patanjali.
2. To examine the concept of emotional purification in the philosophy of Acharya Shriram Sharma.
3. To explore the relationship between mental purification and holistic health.
4. To compare the approaches of Patanjali and Acharya Shriram Sharma regarding mental and emotional transformation.

Research Methodology

This study adopts a descriptive and analytical research design based on textual analysis and literature review.

Sources of Data

Primary sources include:

- Yoga Sutras of Patanjali
- Writings of Acharya Shriram Sharma

Secondary sources include:

- Research articles on yoga psychology
- Books on meditation and spirituality
- Studies on holistic health.

Analytical Approach

The study employs conceptual analysis and comparative interpretation to examine the philosophical frameworks of Patanjali and Acharya Shriram Sharma.

Conceptual Framework: Holistic Health

Holistic health involves the harmonious integration of multiple dimensions of human existence.

Physical Health

Maintaining physiological balance through lifestyle practices such as exercise and proper nutrition.

Mental Health

Cognitive clarity, rational thinking, and intellectual functioning.

Emotional Health

The ability to manage emotions effectively and cultivate positive emotional states.-

Spiritual Health

A sense of purpose, ethical awareness, and connection with higher consciousness.
Cognitive and emotional purification act as bridges that integrate these dimensions.

Cognitive Purification in the Philosophy of Patanjali

The philosophical foundation of cognitive purification in yoga originates from the Yoga Sutras of Patanjali attributed to Patanjali.

Definition of Yoga

योगश्चित्तवृत्तिनिरोधः । Yoga Sutra 1.2
Yogaḥ citta-vṛtti-nirodhaḥ
Yoga is the cessation of the fluctuations of the mind.
This sutra establishes that mental disturbances are the root cause of suffering. Cognitive purification occurs when the mind becomes stable and free from unnecessary mental modifications.

Nature of Mental Modifications

वृत्तयः पञ्चतय्यः क्लिष्टा अक्लिष्टाः । Yoga Sutra 1.5
Mental modifications are of five kinds; they can be either painful or non-painful.
These five vrittis are:
1. Pramana (valid cognition)
2. Viparyaya (misperception)
3. Vikalpa (imagination)
4. Nidra (sleep)
5. Smriti (memory)
Understanding these processes helps achieve cognitive purification and emotional balance.

Method of Controlling the Mind

अभ्यासवैराग्याभ्यां तन्निरोधः ॥ Yoga Sutra 1.12
The fluctuations of the mind are controlled through practice (Abhyasa) and detachment (Vairagya).
This principle forms the psychological mechanism of cognitive purification.
मैत्री करुणा मुदितोपेक्षाणां सुखदुःखपुण्यापुण्यविषयाणां भावनातः चित्तप्रसादनम् ॥ Yoga Sutra 1.33
The mind becomes purified by cultivating attitudes of:

- Friendliness
- Compassion
- Joy
- Equanimity

Ashtanga Yoga as a Path of Purification

Patanjali proposed Ashtanga Yoga as a systematic method for purification:
1. Yama (ethical restraints)
2. Niyama (personal discipline)
3. Asana (posture)
4. Pranayama (breath control)
5. Pratyahara (withdrawal of senses)
6. Dharana (concentration)
7. Dhyana (meditation)
8. Samadhi (absorption) Concept of Pragya Yoga

Emotional Purification in the Philosophy of Acharya Shriram Sharma

Pragya Yoga and Cognitive–Emotional Purification

Pragya Yoga is a spiritual–psychological discipline developed and propagated by Acharya Shriram Sharma as part of the philosophy of Scientific Spirituality. The term Pragya refers to higher wisdom or awakened consciousness, while Yoga signifies union or disciplined integration of the mind and soul.

Pragya Yoga aims to awaken the inner intelligence (Pragya) that guides ethical behavior, emotional balance, and spiritual awareness. According to Acharya Shriram Sharma, human suffering arises from distorted thinking patterns, uncontrolled emotions, and lack of spiritual awareness. Pragya Yoga addresses these issues by combining meditation, moral refinement, and cognitive transformation.

In this sense, Pragya Yoga represents a practical method for achieving cognitive purification (Vichar Shuddhi) and emotional purification (Bhava Shuddhi).

Philosophical Foundations of Pragya Yoga

The philosophical foundation of Pragya Yoga integrates three key principles:

Thought Transformation (Vichar Shuddhi)

Acharya Shriram Sharma emphasized that thoughts shape human behavior and destiny. Negative thinking leads to emotional disturbance, while constructive thinking promotes psychological stability and well-being.
Pragya Yoga encourages individuals to cultivate positive thoughts such as:

- Compassion
- Self-discipline
- Altruism
- Gratitude

Through continuous self-reflection and meditation, individuals gradually replace negative mental patterns with constructive cognitive frameworks.

Emotional Refinement (Bhava Shuddhi)

Emotions play a critical role in determining mental health and interpersonal relationships. Pragya Yoga emphasizes the purification of emotions by cultivating virtues such as:

- Empathy
- Forgiveness
- Love
- Service

According to Acharya Shriram Sharma, emotional purification leads to psychological harmony and strengthens social cohesion.

Spiritual Awareness

Pragya Yoga also focuses on awakening higher consciousness through practices such as:

- Gayatri mantra
- Yajna
- Swadhyaya
- Selfless service (Seva)

These practices help individuals develop a sense of purpose and inner peace

Upasana, Sadhana, and Aradhana as a Model for Cognitive and Emotional Purification

A distinctive feature of the spiritual philosophy of Acharya Shriram Sharma is the integrated framework of Upasana, Sadhana, and Aradhana. This triadic model represents a comprehensive pathway for inner transformation and holistic development. According to Acharya Sharma, human life achieves harmony when spiritual awareness, self-discipline, and social responsibility are practiced simultaneously.

The concepts of Upasana, Sadhana, and Aradhana function as complementary stages of spiritual evolution that collectively facilitate cognitive purification, emotional refinement, and ethical development.

Upasana: Spiritual Connection and Cognitive Purification

Upasana literally means "sitting near the divine" or cultivating closeness with the higher consciousness. It involves devotional practices such as meditation, mantra chanting, and contemplation.
In the philosophy of Acharya Shriram Sharma, Upasana is primarily practiced through Gayatri meditation, which aims to awaken higher intelligence (Pragya). Through regular meditation and prayer, individuals develop mental clarity, inner peace, and spiritual awareness.

From a psychological perspective, Upasana contributes to cognitive purification by reducing mental disturbances and enhancing concentration. This aligns with the teachings of Patanjali in the Yoga Sutras of Patanjal
योगश्चित्तवृत्तिनिरोधः । Yoga Sutra 1.2

Yogaḥ citta-vṛtti-nirodhaḥ

Yoga is the cessation of mental fluctuations. Through practices such as meditation and mantra repetition, Upasana helps stabilize the mind and cultivate higher awareness.
Sadhana

Self-Discipline and Emotional Purification

While Upasana establishes a spiritual connection, Sadhana focuses on the systematic refinement of personality through self-discipline and ethical living. Sadhana includes practices such as self-control, introspection, moral conduct, and conscious cultivation of positive virtues.

Acharya Shriram Sharma emphasized that emotions such as anger, greed, jealousy, and hatred disturb mental harmony and hinder spiritual progress. Therefore, Sadhana involves transforming negative emotional tendencies into positive qualities such as compassion, humility, and patience.

In this way, Sadhana directly contributes to emotional purification (Bhava Shuddhi). By practicing self-discipline and self-awareness, individuals develop emotional stability and resilience.

Aradhana

Selfless Service and Social Harmony

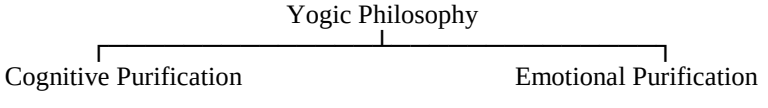
The third component of the triadic model is Aradhana, which refers to selfless service and dedication to the welfare of others. According to Acharya Sharma, true spirituality is not limited to personal meditation but must be expressed through compassionate action and social responsibility.

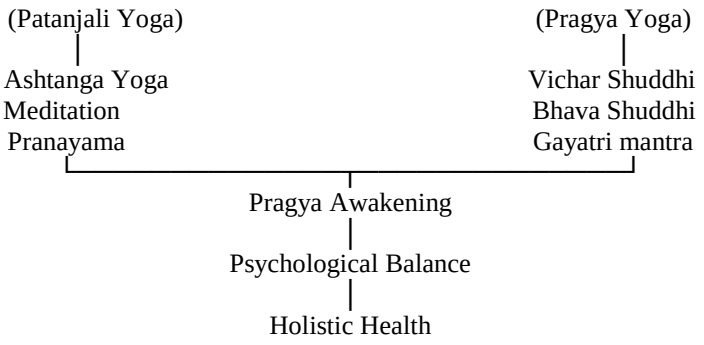
Aradhana encourages individuals to engage in altruistic activities such as community service, education, environmental protection, and humanitarian work. These actions strengthen empathy and foster collective well-being.

From the perspective of holistic health, Aradhana promotes social and emotional harmony, as individuals experience fulfillment and purpose through service.

Integration of Upasana, Sadhana, and Aradhana with Pragya Yoga
The practices of Upasana, Sadhana, and Aradhana collectively form the practical foundation of Pragya Yoga, a spiritual discipline developed by Acharya Shriram Sharma.
Their integrated functions can be summarized as follows:
The Role of Cognitive and Emotional Purification in Holistic Health: A Study in the Light of Patanjali and Acharya Shriram Sharma

Conceptual Framework Diagram





Discussion

The philosophies of Patanjali and Acharya Shriram Sharma emphasize that mental disturbances originate from uncontrolled thoughts and negative emotions. While Patanjali offers a structured yogic methodology for controlling mental fluctuations, Acharya Sharma highlights the importance of transforming thoughts and emotions through spiritual values. Modern psychology increasingly acknowledges the connection between cognitive patterns, emotional states, and health outcomes. Practices such as meditation, mindfulness, and positive thinking—closely aligned with yogic philosophy have been scientifically proven to reduce stress and enhance mental health.

Therefore, integrating yogic discipline with emotional refinement can serve as an effective approach to achieving holistic health.

Conclusion

Cognitive and emotional purification play a crucial role in achieving holistic health. The teachings of Patanjali provide systematic yogic methods for controlling mental fluctuations, while Acharya Shriram Sharma emphasizes the transformation of thoughts and emotions through spiritual practices. Both perspectives highlight the importance of mental discipline, ethical living, and spiritual awareness. The study concludes that the integration of yogic practices and value-based emotional refinement can significantly enhance psychological well-being, promote inner harmony, and support holistic health.

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ASSOCIATION BETWEEN STATIC AND DYNAMIC BALANCE WITH PLAYING ABILITY AMONG FIELD HOCKEY PLAYERS

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Abstract

Balance is a critical neuromuscular component that underpins athletic efficiency, particularly in invasion sports such as field hockey that demand rapid directional changes, postural control, and precise motor coordination. The present study examined the relationship between static balance, dynamic balance, and sport-specific playing performance among trained female field hockey players. A cross-sectional correlational research design was employed. Thirty female athletes (aged 18–22 years) from Lakshmibai National Institute of Physical Education and the Women's Hockey Academy, Gwalior, participated in the study. static balance was assessed using the Stork Stand Test, while dynamic balance was measured through the Star Excursion Balance Test (SEBT). Field hockey performance was evaluated using the Friedel Field Hockey Skill Test, which assesses essential technical skills relevant to competitive play. Descriptive statistics were computed to summarize the data, and the relationships among variables were analyzed using Karl Pearson's product–moment correlation coefficient. Statistical significance was set at $p < 0.05$. the findings revealed a moderate, positive association, between static balance and hockey skill performance ($r = 0.308$), which did not reach statistical significance ($p > 0.05$). In contrast, dynamic balance demonstrated a moderate and statistically significant positive relationship with playing performance ($r = 0.493$, $p < 0.05$). These results indicate that the capacity to maintain stability during dynamic movement tasks is more strongly associated with effective technical execution in field hockey than the ability to sustain static postural control. the study highlights the functional relevance of dynamic balance in enhancing sportspecific performance among female hockey players. From a practical perspective, the integration of structured dynamic balance training into conditioning programs may contribute to improved technical efficiency and competitive outcomes.

Introduction

Field hockey is a fast-paced team sport that requires technical skills, physical fitness, and tactical understanding. Players must perform various movements such as running, dribbling, passing, turning, and stopping while maintaining control of the ball. Because these movements occur continuously during a match, maintaining body balance becomes an important factor in performance. (Bressel et al., 2007)

Balance refers to the ability to maintain body stability during both stationary positions and movement. It is generally divided into static balance and dynamic balance. Static balance is the ability to maintain equilibrium while the body remains still, whereas dynamic balance is the ability to maintain stability during movement or while changing positions. (MR. Azhar Abbas, 2023)

In field hockey, players frequently change direction, accelerate, decelerate, and perform technical skills while moving. Therefore, the ability to maintain balance during these actions can significantly influence skill execution and overall performance. Understanding the relationship between balance and playing ability may help coaches design effective training programs for athletes. This study was conducted to examine the relationship between static balance, dynamic balance, and playing ability among female field hockey players.
(Hrysomallis, 2011)

Methodology

Selection of Subject: Total 30 **female hockey player with the age ranging between 18 to to 22 years were of** University Participants will be selected as a subject of this study. The players were selected from LNIPE, Gwalior and M.P hockey academy.

Table 1

S. No.	Variables	Test/Tool	Unit of Measurement	Scoring Method
1	Static Balance Ability	Stork Stand Balance Test	Time (in seconds)	Best of 3 trials (longest duration maintained)
2			Reach distance (in cm)	
	Dynamic Star Balance Ability	Excursion Balance Test (SEBT)		Average of distance in 8 direction, higher score indicates better dynamic balance
3	Field Hockey Skill Test	Friedel Field Hockey Test	Time (s), Score (successful hits)	Time to complete the skill course with accuracy. Fewer penalties and faster time show better performance.

Administration of Test and Collection of Data

The tests were conducted in a proper sports facility under controlled conditions. Before the collection of data and administration of tests, participants were given description, demonstrations and trial to ensure they understood the procedures.

Stork Balance Stand Test (SBT): The Stork Balance Stand Test is used to measure static balance. **Procedure:** In the Stork Balance Test, the participant stands barefoot with their hands placed on their hips and the stopwatch is started when the heel is raised. The participant continues to maintain this position for as long as possible, and the test is stopped if the heel touches the ground, the hands leave the hips, the non-supporting foot loses contact with the knee, or the participant loses balance

Scoring: The duration (in seconds) the individual maintains the position is recorded. Typically, the best of three attempts is considered (Johnson, 1979). Rating Score (seconds) Excellent >50 Good, 4050, Average 25-39, Fair 10-24 & Poor <10.

Fig.1: Performing Stork Balance Test

The Star Excursion Balance Test (SEBT): It is use to measure to asses a dynamic balance test used to assess lower limb strength, proprioception, and neuromuscular control. **(Gibble, 2003) Procedure:** The Star Excursion Balance Test is performed by having the participant stand barefoot at the centre of a star-shaped grid with eight lines extending in different directions.

Scoring: The score for each direction is the maximum reach distance (in cm) that the participant achieves without losing balance. Three trials are usually performed in each direction, and the best (maximum) reach distance is recorded.

Normalized Reach Distance = (Reach Distance ÷ Leg Length) × 100

Fig.2: Performing Star Excursion Balance Test

The Friedel Field Hockey Skill Test: The Friedel Field Hockey Test is designed to evaluate field hockey playing skills, focusing on control, dribbling, passing, and shooting accuracy. **(friedel, 1956) Procedure:** A 25 x 10-yard area is marked.

Ten passes or trials are to be received from the left and right side which means twenty trials are given to the subject to complete his/her test. On the signal, towards READY GO the subject moves forward from the starting line, and at the same time ball is rolled from the opposite corner of the player the targeted area. Meanwhile, the subject receives the pass in the target area and dribble with his or her hockey stick to the end line. Once the subject reaches the end line, he or she reverses direction and drives the ball back to the starting line. If the ball is not driven hard enough to reach the starting line, the subject has to follow the drive. The time taker stops the stopwatch as soon as the ball cuts across the starting line. Ten passes each are to be obtained from the right and left sides.
Scoring: The mean of the total time taken in twenty trials, 10 from the left corner and 10 from the right corner is the score of the skill test

Fig.3: Friedel Field Hockey Skill Test

Statistical Technique

The descriptive statistics Mean, Standard deviation, Min, Max, Standard error of mean were calculated for the selected variables. For testing the association between the variables, the Karl Pearson's Correlation has been applied at 0.05 level of significance.

Results

Table2: Descriptive Statistics of Static Balance, Dynamic Balance and Skill Performance

	Static Balance	Dynamic Balance	Skill Performance
Mean	41.43	132.7	7.121
Std. Deviation	13.32	1.281	0.395
Minimum	25.00	130.5	6.490

Maximum	72.00	134.9	7.880
No.	30	30	30

Table 1: represents the descriptive statistics of static balance, dynamic balance, and skill performance. The mean and standard deviation of static balance were 41.43 ± 13.32, dynamic balance was 132.7 ± 1.281, and skill performance were 7.121 ± 0.395, respectively.

Table 3: Correlation between static balance with skill performance

			n	Pearson's r	p
Static test	-	Skill performance	30	0.308	0.098

Table 2: shows that Correlation between static balance with skill performance is 0.308 at 0.05 level of significance with p-value of 0.098

Table 4: Correlation between dynamic balance with skill performance

			n	Pearson's r	p
Dynamic test	-	Skill performance	30	0.493	.006

Table 3: shows that Correlation between dynamic balance with skill performance is 0.493 at 0.05 level of significance with p-value of 0.006

Static balance and playing ability showed a weak positive correlation (r = 0.308) that was not statistically significant. Dynamic balance and playing ability showed a moderate positive correlation (r = 0.493) that was statistically significant. This indicates that players with better dynamic balance tend to perform better in hockey skill tests.

Discussion of Findings

The results of the study indicate that dynamic balance has a stronger relationship with field hockey performance than static balance. Field hockey requires players to move continuously, change directions rapidly, and maintain control of the ball while running. These movements demand a high level of dynamic stability. Mikel R. Stiffler (2015), Static balance, although important for general body control, may not directly influence performance in a fast-moving sport like hockey. On the other hand, dynamic balance enables athletes to maintain stability while executing skills such as dribbling, passing, and turning. Mahdi Rezaei (2013) the findings suggest that improving dynamic balance can enhance skill performance and overall efficiency in field hockey players.

Conclusion

The study concludes that dynamic balance plays a significant role in the playing ability of female field hockey players. A significant positive relationship was observed between dynamic balance and skill performance. In contrast, static balance showed only a weak and non-significant relationship with playing ability. Therefore, coaches and trainers should place greater emphasis on dynamic balance training in the conditioning programs of field hockey players. Such training can improve skill execution and overall performance in the sport.

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FROM INDIGENOUS ROOTS TO PROFESSIONAL ARENA: AN ANALYTICAL REVIEW OF THE EVOLUTION OF KHO-KHO AND ITS INJURY EPIDEMIOLOGY

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Abstract

Kho-Kho is one of India's oldest indigenous sports and represents an important element of the country's cultural and athletic heritage. Traditionally played in rural settings on mud surfaces, the sport has evolved significantly over the past century into a structured and professional discipline governed by formal rules and international competitions. The modernization of Kho-Kho has been facilitated by the establishment of governing bodies, organized championships, scientific training methods, and the recent introduction of professional leagues such as Ultimate Kho-Kho. While this transformation has enhanced the sport's visibility and competitiveness, it has also altered the biomechanical and physiological demands placed on athletes. The present analytical review examines the historical evolution of Kho-Kho and synthesizes available literature on injury epidemiology associated with the sport. Evidence from existing research indicates a high prevalence of musculoskeletal injuries among Kho-Kho players, particularly involving the knee, ankle, and wrist joints. Ligament sprains, muscle strains, and soft tissue injuries are the most frequently reported injury types. Furthermore, the shift from traditional mud courts to synthetic mat surfaces has modified the interaction between athletes and the playing surface, potentially increasing joint loading and ligament stress due to enhanced traction and higher game velocity. By integrating historical analysis with epidemiological evidence, this review highlights the relationship between structural modernization and injury patterns in Kho-Kho. The study emphasizes the need for systematic injury surveillance systems, biomechanical investigations, and evidence-based training interventions to promote athlete safety and sustainable professional development of the sport.

1. Introduction

Sport has long served as a medium for physical development, cultural expression, and social interaction across societies. Indigenous sports, in particular, provide insight into the cultural identity and traditional lifestyles of communities. India possesses a rich heritage of traditional games, including Kabaddi, Mallakhamb, Gilli-Danda, and Kho-Kho, which have historically been practiced for recreation, fitness, and competition (Majumdar & Mehta, 2010).

Among these traditional games, Kho-Kho holds a unique position due to its dynamic nature and emphasis on speed, agility, and strategic coordination. The sport is played between two teams of twelve players, with nine players from one team sitting in a central lane while the opposing team attempts to avoid being tagged by the chasing team. The objective of the chasing team is to eliminate opponents within a specified time by executing rapid directional changes and coordinated movements.

The physical demands of Kho-Kho are substantial. Players are required to perform repeated bouts of sprinting, abrupt deceleration, lateral movements, and quick directional changes. These movements involve complex neuromuscular coordination and impose significant biomechanical stress on the musculoskeletal system (Verma & Singh, 2015).

Historically, Kho-Kho was played in rural areas on open mud grounds with minimal formalization. However, over the past century, the sport has undergone a process of institutionalization and modernization, resulting in standardized rules, organized competitions, and professional training systems. The formation of the Kho-Kho Federation of India (KKFI) marked a significant milestone in the formal development of the sport.

In recent years, the emergence of professional leagues such as Ultimate Kho-Kho has further transformed the sport into a commercially viable and spectator-oriented event. These developments have introduced innovations such as synthetic mat surfaces, advanced broadcasting technologies, and professional coaching structures.

While these changes have significantly enhanced the popularity and professionalization of Kho-Kho, they have also altered the physical and biomechanical demands placed on athletes. Increased game speed, improved traction surfaces, and higher training intensity may influence the pattern and frequency of injuries among players.

Sports injuries represent a major concern in competitive athletics because they can affect performance, reduce participation, and compromise long-term athlete health (Bahr & Krosshaug, 2005). Understanding injury patterns within a sport is essential for developing effective preventive strategies.

Despite the growing popularity of Kho-Kho, scientific research on its injury epidemiology and biomechanical demands remains limited compared to other sports such as football or basketball. Therefore, a comprehensive review of existing literature is necessary to understand how the evolution of the sport has influenced injury patterns among athletes.

The present analytical review aims to:

1. Examine the historical evolution of Kho-Kho from a traditional rural game to a professional sport.
2. Analyze the biomechanical and physiological demands of the sport.
3. Review existing literature on injury epidemiology in Kho-Kho.
4. Discuss the implications of modernization on athlete safety and injury prevention.

2. Historical Evolution of Kho-Kho

2.1 Origins and Traditional Practice

Kho-Kho is believed to have ancient origins in the Indian subcontinent. Historical accounts suggest that the sport evolved from traditional chase-and-tag games played during ancient times. Some scholars trace its origins to games played during the era of the Mahabharata, where speed, agility, and tactical pursuit were essential components of physical recreation (Chatterjee, 2012).

Traditionally, Kho-Kho was played in rural communities as a recreational activity. The game required minimal equipment and could be played on open fields or village grounds. Mud surfaces were commonly used, and the rules were often flexible depending on local customs.

The simplicity of the game contributed to its widespread popularity across different regions of India. Players relied primarily on natural athletic abilities such as speed, agility, and endurance rather than structured training methods.

2.2 Institutionalization of the Sport

The formalization of Kho-Kho began during the early twentieth century when efforts were made to standardize rules and promote organized competition. The establishment of the Kho-Kho Federation of India (KKFI) played a pivotal role in regulating the sport and organizing national-level championships.

Standardization included:

- Regulation of playing field dimensions
- Establishment of uniform rules
- Organization of national tournaments
- Development of training programs

Educational institutions, particularly schools and universities, played an important role in promoting Kho-Kho through inter-school and inter-university competitions.

2.3 International Recognition

Over time, Kho-Kho expanded beyond national boundaries. The sport gained recognition in South Asian and Asian sporting events, leading to the formation of regional governing bodies and international tournaments.
The inclusion of Kho-Kho in Asian championships and international competitions significantly contributed to its global exposure.

2.4 Emergence of Professional Kho-Kho

The most significant transformation in the sport occurred with the introduction of professional leagues. The launch of Ultimate Kho-Kho represented a major step toward commercialization and modernization.
Key innovations introduced in professional Kho-Kho include:

- Synthetic mat-based playing surfaces

- Shorter and faster match formats
- Enhanced digital broadcasting
- Professional athlete contracts
- Advanced sports science support

These developments have elevated Kho-Kho to a new level of professional competition while simultaneously altering the physical demands placed on players.

3. Physiological and Biomechanical Demands of Kho-Kho

Kho-Kho is a high-intensity intermittent sport that requires players to perform repeated bursts of activity interspersed with brief recovery periods.

3.1 Speed and Acceleration

Players frequently perform short sprints ranging from 5 to 20 meters while attempting to tag opponents. Rapid acceleration requires high levels of muscular power and neuromuscular coordination.

3.2 Agility and Directional Changes

The sport involves frequent changes in direction, including cutting, pivoting, and dodging movements. These actions place significant stress on the knee and ankle joints.
Research indicates that sudden directional changes generate high shear forces and rotational loads on the knee joint (Lees, 2002).

3.3 Deceleration and Eccentric Muscle Action

Rapid deceleration requires eccentric muscle contractions, particularly in the quadriceps and hamstrings. Repeated eccentric loading increases the risk of muscle strain injuries.

3.4 Balance and Proprioception

Maintaining stability during high-speed movements requires strong proprioceptive ability and neuromuscular control.

5. Injury Epidemiology in Kho-Kho

Sports injury epidemiology examines the incidence, distribution, and causes of injuries among athletes.
Research on Kho-Kho indicates that musculoskeletal injuries are relatively common due to the sport's dynamic movement patterns.

4.1 Common Types of Injuries

Studies have identified the following injuries as most prevalent among Kho-Kho players:

- Ligament sprains
- Muscle strains
- Joint dislocations
- Soft tissue injuries
- Contusions

4.2 Anatomical Distribution

The majority of injuries occur in the lower extremities, reflecting the sport's emphasis on running and directional changes.
Most frequently affected areas include:

1. Knee joint
2. Ankle joint
3. Wrist
4. Thigh muscles

5. Shoulder joint

4.3 Mechanisms of Injury

Injuries typically occur during:

- Rapid directional changes
- Sudden deceleration
- Player collisions
- Falls during dodging maneuvers

These mechanisms highlight the importance of biomechanical factors in injury occurrence.

5. Impact of Playing Surface on Injury Risk

Playing surface characteristics significantly influence injury risk in sports.

5.1 Traditional Mud Surfaces

Traditional Kho-Kho was played on mud courts, which provided lower traction and greater shock absorption. Injuries were typically limited to minor abrasions and superficial impacts.

5.2 Synthetic Mat Surfaces

Modern professional Kho-Kho is played on synthetic mats designed to enhance speed and traction.

However, increased traction can lead to higher joint loading and ligament stress, particularly during rapid directional changes.

Studies in sports biomechanics suggest that surfaces with higher friction coefficients may increase the risk of anterior cruciate ligament (ACL) injuries due to restricted foot rotation during pivoting movements (Nigg & Segesser, 1988).

6. Discussion

The modernization of Kho-Kho has introduced both opportunities and challenges. Professional leagues have increased visibility and provided athletes with improved training environments. However, these developments have also intensified the physical demands of the sport.

Increased game speed, enhanced traction surfaces, and higher competitive intensity may contribute to evolving injury patterns.

Despite the growing popularity of Kho-Kho, scientific research on injury epidemiology in the sport remains limited. Most available studies are descriptive and lack long-term injury surveillance data.
To address these gaps, future research should focus on:

- Biomechanical analysis of sport-specific movements
- Longitudinal injury surveillance systems
- Evidence-based injury prevention programs
- Strength and conditioning protocols tailored to Kho-Kho

7. Conclusion

Kho-Kho has evolved from a traditional rural pastime to a modern professional sport with structured competitions and growing international recognition. While this transformation has enhanced the sport's popularity, it has also introduced new biomechanical and physiological challenges for athletes.

Musculoskeletal injuries particularly those affecting the knee and ankle joints—remain a major concern due to the sport's dynamic movement patterns.

Understanding the relationship between sport evolution and injury epidemiology is essential for ensuring athlete safety and sustainable development.

Future research should emphasize systematic injury monitoring, biomechanical investigations, and scientifically designed training interventions to support the long-term growth of Kho-Kho while protecting athlete health.

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HOW PRANAYAMA CAN HELP ATHLETES MANAGE STRESS IN PRESSURE SITUATIONS DURING COMPETITION: A SYSTEMATIC REVIEW

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Abstract

Competitive sports inherently involve high-pressure environments that significantly impact an athlete's mental health and technical performance. In the heat of competition, heightened levels of stress and anxiety often trigger a "fight or flight" response, leading to detrimental outcomes such as poor decision-making, reduced cognitive focus, and impaired physical execution. These psychological hurdles not only diminish immediate performance but can also lead to long-term burnout. This paper investigates Pranayama, a core component of yoga involving rhythmic breath control, as a targeted intervention to mitigate these effects.

By modulating the autonomic nervous system, Pranayama facilitates a shift from sympathetic dominance to parasympathetic activation, effectively regulating neurophysiological responses. This research explores how specific breathing techniques—such as Sudarshan Kriya or Nadi Shodhana—can positively influence an athlete's mental well-being, stabilize heart rate variability, and sharpen situational awareness. Furthermore, the study highlights the potential of Pranayama as a practical, non-invasive, and evidence-based strategy to optimize athletic performance. By integrating these practices into standard training regimens, athletes can develop the resilience needed to maintain composure under pressure, ultimately fostering both peak competitive excellence and holistic wellness.

Keywords: Pranayama, Athletic Performance, Neurophysiological Regulation, Autonomic Nervous System, Parasympathetic Activation, Heart Rate Variability, Stress Management

Introduction

The pursuit of athletic excellence has traditionally been characterized by the optimization of "Bio-Motor" abilities, including strength, speed, power, and cardiovascular endurance. However, as the margin between victory and defeat continues to slim in professional sports, the focus has shifted toward the "internal environment" of the athlete. Competitive sports are inherently high-arousal activities where the psychological pressure of the "clutch moment" can trigger profound physiological shifts. When an athlete perceives a high-stakes situation as a threat rather than a challenge, the body's sympathetic nervous system (SNS) takes control, initiating a "fight-or-flight" response. This results in elevated cortisol levels, increased muscle tension, and a narrowing of cognitive focus, often leading to what is colloquially known as "choking" under pressure.

Pranayama, a fundamental pillar of Hatha Yoga involving the conscious regulation of breath, offers a promising non-pharmacological solution to this autonomic imbalance. Unlike involuntary breathing, Pranayama allows the athlete to use the respiratory system as a manual "override" for the nervous system. By manipulating the rate, depth, and rhythm of the breath, athletes can theoretically stimulate the vagus nerve and induce a state of parasympathetic dominance. This transition is not merely about "relaxation" in the traditional sense; it is about achieving a state of "relaxed alertness" where the heart rate is stabilized, and the brain's executive functions remain accessible despite environmental stressors.

While much of sports psychology has relied on cognitive-behavioral strategies like visualization or self-talk, Pranayama provides a "bottom-up" physiological approach. By stabilizing the body first, the mind follows. This systematic review aims to synthesize existing literature to determine how specific Pranayama protocols—ranging from slow-paced techniques like *Nadi Shodhana* to vibratory techniques like *Bhramari*—impact the neurophysiological markers of stress in athletes, thereby identifying its potential as a core component of modern athletic training.

Methodology

This systematic review was conducted to evaluate the efficacy of Pranayama in managing athletic stress. The following structured approach was used:
Search Strategy*:* Searches were conducted across Google Scholar, PubMed, and Shodhganga using keywords: "Pranayama," "Athlete Stress," "Heart Rate Variability (HRV)," "Neurophysiological Regulation," and "Autonomic Nervous System."

Inclusion Criteria: The review included peer-reviewed articles, clinical trials, and systematic reviews published between 1988 and 2025. Studies were required to focus on objective physiological markers (HRV, SpO_2, or fMRI data) in healthy or athletic populations.

Data Synthesis: Findings were categorized into three primary domains: autonomic modulation, neurocognitive changes, and training-induced vs. immediate effects.

Neurophysiological and Physiological Findings

Autonomic Modulation and HRV

The primary indicator of stress resilience in this review is Heart Rate Variability (HRV). Slow Pranayama techniques have been shown to increase the High-Frequency (HF) component of HRV, which represents increased vagal tone (Latha & Lakshmi, 2022). Furthermore, *Mahat* (complete breathing) has been identified as a superior technique for increasing peripheral oxygen saturation (SpO_2), ensuring that the athlete's tissues remain oxygenated even during the rapid heart rate shifts common in competition (Catela et al., 2024).

Brain Connectivity and Anxiety

Neuroimaging evidence suggests that breathing practices like *Bhastrika* reduce functional connectivity between the prefrontal cortex and the insula (Novaes et al., 2020). This reduction is crucial for athletes as it prevents the "over-analysis" of internal anxiety signals, keeping the focus on external situational awareness.

The Fatigue Threshold in Practice

A significant finding in the literature is the impact of session duration. While 15–20 minutes of practice facilitates parasympathetic activation, sessions exceeding 30 minutes may induce physical fatigue, causing a paradoxical shift back toward sympathetic (stress) activation (De & Mondal, 2019).

Identified Research Gaps

Field-Based Performance: Most studies are laboratory-based; there is a lack of data measuring real-world scoring or technical accuracy during live competition.

Sport-Specific Customization: Research has not yet differentiated between the breathing needs of endurance athletes vs. precision-based athletes (e.g., archers or shooters).

Long-Term Sustainability: The persistence of these neurophysiological changes during the off-season remains unquantified.

Conclusion

The synthesis of the reviewed literature provides compelling evidence that Pranayama is not merely a relaxation tool but a sophisticated neurophysiological intervention capable of redefining athletic performance under pressure. By intentionally modulating the respiratory rate and rhythm, athletes can effectively "hack" their autonomic nervous system, transitioning from a state of sympathetic-driven panic to one of parasympathetic-mediated composure. This shift is objectively verifiable through increased Heart Rate Variability (HRV) and stabilized blood volume pulse, which serve as the physiological foundation for maintaining technical precision when the stakes are highest.
However, the practical application of Pranayama must be handled with scientific precision. As identified in this review, the "fatigue threshold"—where benefits diminish after 30 minutes of practice—underscores the need for evidence-based coaching. Rather than long, exhausting sessions, athletes benefit most from targeted "micro-doses" of breathwork that align with their specific competitive needs.

Ultimately, Pranayama offers a path toward peak competitive achievement that does not come at the expense of an athlete's mental or physiological health, fostering a sustainable culture of high performance and holistic wellness.

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ROLE OF ARTIFICIAL INTELLIGENCE FITNESS APPLICATIONS TOWARDS ENHANCEMENT OF GYM ATTENDANCE AMONG COLLEGE STUDENTS

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Introduction

Technological innovations transformed modern society in various ways, including how individuals approached health and fitness. In recent years, Artificial Intelligence (AI) was integrated into mobile applications to provide intelligent solutions in areas such as healthcare, education, and personal development. Among these advancements, AI-powered fitness applications emerged as important tools for promoting physical activity and healthy lifestyles.

College students often experienced numerous challenges such as academic pressure, irregular schedules, and lack of motivation, which negatively affected their physical activity levels. As a result, many students failed to maintain regular exercise habits or consistent gym attendance. AI fitness applications provided innovative features that helped users overcome these challenges by offering personalized workout routines, reminders, goal-setting mechanisms, and progress monitoring systems.

The increasing popularity of fitness applications among young individuals suggested that technology served as a motivational factor for engaging in regular exercise. These applications used artificial intelligence algorithms to analyze user data such as body weight, fitness goals, exercise performance, and physical activity patterns. Based on this information, the applications provided tailored recommendations that guided users through effective workout routines.

The present study examined how AI-based fitness applications influenced gym attendance among college students. By analyzing students' perceptions and experiences with these digital tools, the research attempted to understand the role of technology in encouraging physical activity and improving overall fitness behavior among youth.

Objectives of the Study

The study aimed to achieve the following objectives:

1. To examine the role of AI fitness applications in promoting gym attendance among college students.
2. To analyze students' perceptions regarding the effectiveness of AI-based fitness applications.
3. To evaluate the motivational impact of AI fitness applications on students' exercise behavior.
4. To identify key features of AI fitness applications that influenced gym participation.

Research Questions

The research addressed the following questions:

1. Did AI fitness applications influence gym attendance among college students?
2. How did students perceive the usefulness of AI fitness applications in maintaining regular exercise routines?
3. Which features of AI fitness applications contributed most to increasing motivation for gym participation?

Hypotheses

H0 (Null Hypothesis): AI fitness applications did not have a significant impact on gym attendance among college students.

H1 (Alternative Hypothesis): AI fitness applications had a significant impact on gym attendance among college students.

Literature Review

Previous studies highlighted the growing importance of digital technologies in promoting health and physical fitness. Earlier research indicated that mobile health applications positively influenced individuals' exercise habits by providing personalized fitness guidance and real-time feedback.

Fitness applications that incorporated artificial intelligence demonstrated the potential to improve exercise adherence by analyzing user behavior and providing customized workout recommendations. These personalized features increased motivation and encouraged individuals to remain consistent in their fitness routines.

Research focusing on college students showed that individuals who used fitness tracking applications were more likely to engage in regular physical activity compared to those who did not use such technologies. Features such as reminders, goal tracking, and progress monitoring played an important role in motivating students to maintain exercise routines.

Studies also suggested that digital fitness platforms helped users monitor their physical activity and improve their health awareness. Artificial intelligence systems provided adaptive workout programs based on individual fitness levels, making exercise plans more effective and personalized.

Methodology

The study adopted a mixed-method research design that combined quantitative and qualitative approaches.

Population and Sample

The population consisted of college students who attended gyms and used fitness applications for workout guidance. A sample of 100 students was selected using a random sampling method.

Data Collection

Primary data were collected through a structured questionnaire that included Likert-scale statements. Informal interviews were also conducted with selected participants to gain deeper insights into their experiences.

Data Analysis

The collected data were analyzed using descriptive statistics such as mean and standard deviation. Reliability analysis and correlation analysis were also conducted using SPSS statistical software.

Results

The analysis of the collected data revealed several important findings regarding the use of AI fitness applications among college students.

Most respondents reported that AI fitness applications helped them maintain regular gym attendance. Reminder and notification features encouraged students to follow their workout schedules more consistently.

Personalized workout plans generated by AI algorithms were perceived as highly beneficial. Students indicated that these customized programs helped them perform exercises effectively and achieve their fitness goals.

Progress tracking features also played an important role in motivating students. By monitoring physical progress such as calories burned, workout duration, and improvement in performance, students felt encouraged to remain physically active.

Discussion

The findings supported previous research that highlighted the positive impact of digital fitness technologies on exercise behavior. AI fitness applications functioned as virtual trainers that guidedusers through structured workout routines.

For college students who struggled with time management and motivation, these applications provided convenient solutions for maintaining regular exercise habits. Artificial intelligence allowed these applications to adapt to individual needs and deliver personalized fitness guidance.

Social interaction and gamification elements present in many fitness applications also increased motivation. Students shared achievements, monitored progress, and compared results with peers, which created a sense of accountability and engagement.

Conclusion

The study examined the impact of artificial intelligence fitness applications on gym attendance among college students. The findings revealed that these applications played a significant role in encouraging students to participate in regular physical activity.

AI fitness applications provided personalized workout plans, performance tracking, goal setting, and motivational reminders that helped students maintain consistency in their exercise routines.

The study concluded that AI fitness applications served as valuable tools for promoting healthy lifestyles among college students.

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PLYOMETRIC IMPACT ON EXPLOSIVE STRENGTH OF MALE BASKETBALL PLAYERS

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Abstract

The current study focused to determine the impact of plyometric exercise on explosive strength among male basketballers. Forty male basketballers aged 18 to 25 years from GGV, Bilaspur, Chhattisgarh, were randomly selected as individuals who participated. The participants were placed into 2 equal groups: experimental (20) and control (20). The experimental group took part in a 6-weeks plyometric training program that met 3 times per week on alternate days, whereas the control group extended with their regular basketball training without plyometrics.

The Vertical Jump (Explosive Strength) Test was used to assess explosive strength both prior to and following training. The data were determined using descriptive statistics such as mean and standard deviation, and the hypothesis was tested using Analysis of Covariance (ANCOVA) at a significance level of 0.05.

The outcome showed that the experimental group's explosive strength improved significantly, with the mean score increasing from 42.50 cm in the pre-test to 50.10 cm in the post-test. In contrast, the control group improved only little, from 43.00 cm to 44.30 cm. The ANCOVA analysis revealed a significant difference between the groups with an F-ratio of 14.92, which exceeded the required value at the 0.05 level of significance.

The study invented that plyometric exercise significantly increases the explosive strength of male basketball players. Therefore, plyometric exercises can be effectively incorporated into the training programmes of basketball players to enhance their performance.

Keywords: Plyometric Training, Explosive Strength, Vertical Jump, Basketball Players, Experimental Study.

1. Introduction:

Basketball is a complicated sport that necessitates a combination of technical ability, physical conditioning, tactical strategies, and a strong motivational mindset. The ability to create high levels of strength is regarded as one of the most important characteristics in obtaining peak athletic performance. Among the different physical traits required in basketball, muscular strength, physical fitness & body size are important factors in determining a player's performance. Various studies have studied techniques for measuring and improving these traits, there is still a scarcity of study into effective ways to improve muscular strength and fitness in basketball players.

Basketball is a highly demanding and physically challenging game. Over time, the performance capacity of athletes has exceeded the limits originally anticipated by the inventors of the game.. The game allows individual athletes to demonstrate their physical abilities within offensive and defensive strategies. Attributes such as power, speed and the ability to change direction quickly are essential components of the game. Therefore, athletes must focus on developing strength, agility and speed to maintain optimal performance throughout the duration of the game.

Explosive strength refers to the ability of an individual to exert maximum force in the shortest possible time. It plays a vital role in many sports activities, including jumping, sprinting, and rapid directional changes. Agility is also an important component in sports performance because players frequently need to change direction quickly and coordinate movements of different parts of the body during gameplay.

Plyometric training is considered an effective method for improving the physical demands required in basketball. Training programmes designed for basketball players should include repeated high-intensity efforts followed by adequate recovery periods to simulate the specific demands of the game. Plyometric exercises such as depth jumps, box jumps, and jump training are commonly used to enhance explosive power and motor performance.

Plyometric training has been widely incorporated into basketball training programmes because it effectively improves power output and jumping ability. These exercises involve rapid stretching and contracting of muscles, enabling athletes to produce greater force in a shorter period of time. Plyometric training also involves explosive

movements such as stopping, starting, and rapidly changing direction, which help improve agility and overall athletic performance.

Plyometric exercise improves explosive strength and power output. Adams et al. (1992) and Holcomb (1996) found that plyometric exercises greatly boost muscular power by training the muscles to do more work in a shorter time. As a result, plyometric training is widely considered as one of the most effective ways to improve performance in team sports like basketball.

The Study's Objective:

- The study aims to assess the impact of plyometric exercise on explosive strength in male basketball players.
- To compare explosive strength after and before plyometric training.

2. Method and Procedure:

Hypothesis:

H1: Plyometric training will significantly improve the explosive strength of male basketballers.
H0: Plyometric training will not significantly affect explosive strength.

Research Design:

The study used an experimental research design with 2 groups:
Experimental (n = 20)
Control (n = 20)
The experimental group performed plyometric training for 6 weeks, while the control group followed regular basketball training.

Delimitations:

- The study was restricted to male basketballers of G.G.V. University, Bilaspur, Chhattisgarh.
- The study was confined to forty (40) male basketball players (20 in the experimental and 20 in the control).
- All subjects who have participated in university level and national level, age ranging from eighteen to twenty-five (18-25) years, selected randomly.
- Plyometric exercise was limited to 1 hour for 6 weeks, with subjects attending 3 days per week on alternate days.

Training Schedule:

The Plyometric Training Programme will be administered three times each week, on alternate days. The training program would last six weeks, with sessions on Mondays, Wednesdays and Fridays. The training program's load will gradually increase throughout the session.

Table 1: Training Programme: Plyometric

MONDAY								
Exercise	**Week 1 & Week 2**		**Week 3**		**Week 4 & Week 5**		**Week 6**	
	Repetition	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**
Jump Squat	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Jump	15	2	20	2	20	3	20	4
Strides	15	2	20	2	20	3	20	4
Skipping	15	2	20	2	20	3	20	4
WEDNESDAY								
Exercise	**Week 1 & Week 2**		**Week 3**		**Week 4 & Week 5**		**Week 6**	
	Repetition	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**
Side way box jump	15	2	20	2	20	3	20	4
Jump over t tuck jump	15	2	20	2	20	3	20	4

Sumo Jump	15	2	20	2	20	3	20	4
Hamstring cur fast	15	2	20	2	20	3	20	4
Jumping on Toes	15	2	20	2	20	3	20	4
FRIDAY								
Exercise	**Week 1 & Week 2**		**Week 3**		**Week 4 & Week 5**		**Week 6**	
	Repetition	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**	**Repetition**	**Sets**
One Leg Hop jump	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Way Jump	15	2	20	2	20	3	20	4
Depth jump	15	2	20	2	20	3	20	4
Scissor Jump	15	2	20	2	20	3	20	4

Statistical Techniques:

The data collected from the pre-test and post-test scores of the experimental & control groups were measured with appropriate statistical techniques. Descriptive statistics such as **Mean** and S.D. were calculated to determine the average performance and variability of explosive strength among the subjects.

To assess the significance of the differences between the groups, Analysis of Covariance (ANCOVA) was used to control for pre-test differences and determine the impect of the plyometric training program on explosive strength. The level of significance for evaluating the hypothesis was set at 0.05.

3. Analysis of the Results

The study looked at the effect of a 6 week plyometric training program on the explosive strength of male basketball players. Descriptive statistics and ANCOVA were used to assess the training's impact.

Table 1: Descriptive Statistics of Explosive Strength (Vertical Jump Test in cm)

Group	Test	N	Mean (cm)	Standard Deviation
Experimental Group	Pre-test	20	42.50	3.20
Experimental Group	Post-test	20	50.10	3.45
Control Group	Pre-test	20	43.00	3.10
Control Group	Post-test	20	44.30	3.25

The descriptive statistics express that the experimental group (20) demonstrated a substantial improvement in explosive strength following the plyometric training programme. The mean vertical jump score raised from 42.50 cm (SD = 3.20) in the pre-test to 50.10 cm (SD = 3.45) in the post-test.

In contrast, the control group (20) showed only a minimal improvement, with the mean increasing slightly from 43.00 cm (SD = 3.10) in the pre-test to 44.30 cm (SD = 3.25) in the post-test.

Figure 1. Comparison of Pre-test & Post-test Mean Vertical Jump Scores of Experimental & Control Groups

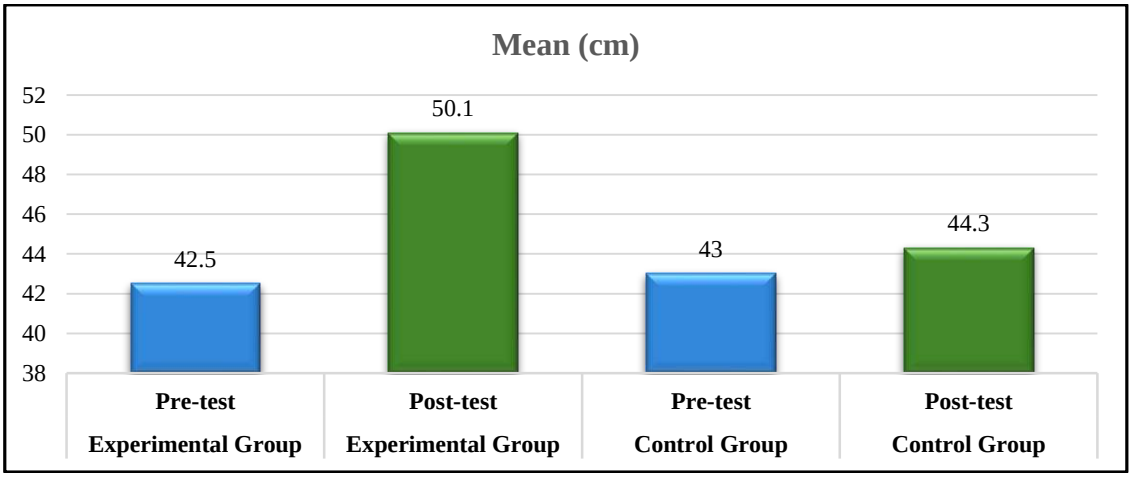

Table: Analysis of Covariance (ANCOVA) on Explosive Strength (Vertical Jump in cm)

Source of Variation	Sum of Squares	df	Mean Square	F-Ratio
Between Groups	482.64	1	482.64	14.92*
Covariate (Pre-test)	96.18	1	96.18	2.97
Error	1196.72	37	32.34	
Total	1775.54	39		

Significant at 0.05 level of confidence

Adjusted Post-Test Means

Group	Adjusted Mean
Experimental Group	49.85
Control Group	44.12

The obtained F-ratio (14.92) for the adjusted post-test scores is greater than the required table value at the 0.05 level of significance. This indicates that there is a significant difference between experimental & control groups after adjusting the pre-test scores.

The experimental groups significantly improved ($p < 0.05$), according to the ANCOVA analysis and descriptive statistics. Plyometric exercises should be incorporated into basketball players' training regimens since they increase explosive strength.

4. Conclusion:

The study's findings indicate that male basketball players' explosive strength was greatly enhanced by the plyometric training regimen. From the pre-test to the post-test, the experimental group's Explosive Strength (Vertical Jump in cm) performance significantly improved, while the control group just slightly improved.

The descriptive statistics and ANCOVA analysis show significant improvement in the experimental groups ($p < 0.05$). Plyometric workouts improve explosive strength and should be included in basketball players' training programs.

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THE ROLE OF YOGA IN ENHANCING MENTAL HEALTH AND EMOTIONAL WELL-BEING: A COMPREHENSIVE REVIEW OF EVIDENCE, MECHANISMS, AND APPLICATIONS

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Abstract

Mental health and emotional well-being are increasingly recognized as critical determinants of overall health, productivity, and quality of life. Rising prevalence of stress-related disorders, anxiety, depression, and emotional dysregulation has prompted growing interest in holistic and integrative approaches that complement conventional mental health care. Yoga, an ancient mind–body discipline originating in India, has gained global acceptance as a therapeutic practice that integrates physical postures, breath regulation, meditation, and ethical principles to promote psychological balance and emotional resilience.

This journal-style review critically examines the role of yoga in enhancing mental health and emotional well-being by synthesizing evidence from empirical studies, systematic reviews, and meta-analyses published over the past two decades. The paper explores the impact of yoga on key mental health outcomes, including stress reduction, anxiety management, depressive symptom alleviation, emotional regulation, mindfulness, and overall psychological well-being across diverse populations. Additionally, theoretical frameworks and underlying physiological and psychological mechanisms—such as autonomic nervous system regulation, neuroendocrine modulation, mindfulness-based cognitive processes, and self-regulatory capacity—are discussed to explain yoga's therapeutic effects.

The review further evaluates methodological approaches used in yoga-based mental health research, highlighting strengths, limitations, and gaps in existing literature. Findings consistently suggest that regular yoga practice is associated with significant improvements in emotional stability, stress coping ability, and mental well-being, particularly when practiced over sustained periods and delivered through structured interventions. However, variability in yoga styles, intervention duration, and outcome measures presents challenges for generalization and comparison across studies.

The paper concludes that yoga represents a valuable, low-cost, and accessible complementary approach for mental health promotion and emotional well-being. While yoga should not replace clinical interventions for severe psychiatric disorders, its integration into preventive health strategies, educational settings, workplace wellness programs, and community mental health initiatives holds substantial promise. Directions for future research and implications for practice are also outlined.

Keywords: Yoga; Mental Health; Emotional Well-Being; Stress Management; Anxiety; Depression; Mind–Body Interventions; Psychological Well-Being; Mindfulness

Introduction

Mental health and emotional well-being are fundamental components of human health, influencing how individuals think, feel, behave, and interact with others. According to the World Health Organization, mental health is not merely the absence of mental illness but a state of well-being in which individuals realize their abilities, cope effectively with normal life stresses, work productively, and contribute meaningfully to society. In recent decades, rapid urbanization, academic and occupational pressures, technological overexposure, and changing social structures have contributed to a noticeable rise in mental health challenges worldwide. Conditions such as stress, anxiety, depression, emotional burnout, and psychosomatic disorders are now among the leading causes of disability and reduced quality of life across age groups and cultures.

Conventional approaches to mental health management—primarily psychotherapy and pharmacological treatment—have demonstrated effectiveness in addressing a wide range of psychological disorders. However, these approaches are not without limitations. Pharmacological treatments may be associated with side effects, dependency concerns, and limited long-term adherence, while psychotherapy often requires sustained access to trained professionals, which may not be feasible in low-resource settings. As a result, there is growing interest in complementary and

integrative health practices that support mental health in a holistic, accessible, and preventive manner. Among these practices, yoga has emerged as one of the most widely studied and adopted mind–body interventions.

Yoga is a multifaceted discipline that originated in ancient India and has evolved over thousands of years. Traditionally rooted in philosophical texts such as the Yoga Sutras and the Upanishads, yoga emphasizes the integration of body, mind, and consciousness. In contemporary contexts, yoga is commonly practiced as a system combining physical postures (asanas), breath control techniques (pranayama), meditation (dhyana), relaxation, and ethical observances that encourage mindful living. While initially associated with spiritual development, yoga has increasingly been examined through scientific and medical lenses for its potential therapeutic benefits.

The global popularity of yoga has expanded dramatically, with millions of individuals practicing it for physical fitness, stress relief, emotional balance, and personal growth. This widespread adoption has prompted researchers to investigate yoga's effectiveness as a mental health intervention. A growing body of empirical research suggests that yoga may positively influence psychological functioning by reducing stress responses, enhancing emotional regulation, improving mood, and fostering resilience. These benefits appear to extend across diverse populations, including students, working professionals, older adults, individuals with chronic illness, and those experiencing clinically significant mental health symptoms.

Despite increasing evidence supporting yoga's mental health benefits, questions remain regarding the mechanisms through which yoga exerts its effects, the consistency of outcomes across different yoga styles, and the methodological quality of existing studies. Variability in intervention design, duration, instructor expertise, and outcome measures presents challenges for drawing definitive conclusions. Furthermore, while yoga is often promoted as a universal solution for mental health, it is essential to critically examine the evidence to avoid overstated claims and to clarify its appropriate role as a complementary rather than standalone treatment.

Background and Conceptual Framework

Mental Health and Emotional Well-Being

Mental health encompasses cognitive, emotional, and behavioral functioning, while emotional well-being specifically refers to an individual's ability to understand, express, and regulate emotions effectively. Emotional well-being plays a crucial role in resilience, interpersonal relationships, decision-making, and overall life satisfaction. Chronic emotional distress, when left unaddressed, can impair immune functioning, increase vulnerability to physical illness, and contribute to the development of mental disorders such as anxiety and depression.

Modern psychological models increasingly emphasize preventive and strength-based approaches to mental health, focusing on enhancing coping skills, emotional awareness, and self-regulation rather than solely treating pathology. Within this context, mind–body practices such as yoga align closely with contemporary mental health promotion goals, as they emphasize self-awareness, stress management, and balance.

Yoga as a Mind–Body Intervention

Yoga is best understood as a holistic mind–body practice rather than a single technique. Its physical postures promote strength, flexibility, and bodily awareness, while breathing practices influence autonomic nervous system activity. Meditation and relaxation techniques cultivate attention regulation, present-moment awareness, and emotional stability. Together, these elements create a comprehensive system that addresses both physiological and psychological dimensions of health.

From a scientific perspective, yoga is often categorized alongside other mind–body interventions such as mindfulness-based stress reduction, tai chi, and meditation. What distinguishes yoga is its integrative nature, combining movement, breath, and cognitive focus within a single practice. This integration may be particularly effective in addressing stress-related and emotion-based disorders, which involve both bodily and mental processes.

Review of Literature

The relationship between yoga and mental health has been the subject of increasing scholarly attention over the past two decades. Researchers across psychology, psychiatry, neuroscience, and public health have explored yoga as a

complementary intervention for improving emotional well-being and reducing psychological distress. This section critically reviews existing literature on yoga's impact on mental health, focusing on stress, anxiety, depression, emotional regulation, mindfulness, and population-specific outcomes.

Yoga and Stress Reduction

Stress is one of the most commonly reported mental health concerns in modern society and is closely linked to emotional dysregulation, burnout, anxiety, and psychosomatic illness. Numerous studies have identified yoga as an effective intervention for stress management. Randomized controlled trials and quasi-experimental studies consistently demonstrate that yoga practice leads to significant reductions in perceived stress levels compared to no-intervention control groups.

The stress-reducing effects of yoga are often attributed to its influence on physiological stress systems. Yoga practices emphasize slow, controlled breathing and relaxation, which are associated with decreased activation of the hypothalamic–pituitary–adrenal (HPA) axis and reduced cortisol secretion. Lower cortisol levels correspond with improved emotional stability, enhanced coping ability, and reduced physiological arousal.
Workplace-based yoga interventions have shown particularly promising results. Employees who participate in regular yoga sessions report lower occupational stress, improved mood, and better work–life balance. Similarly, student populations practicing yoga demonstrate reduced academic stress, improved concentration, and enhanced emotional resilience. These findings suggest that yoga may serve as an effective preventive strategy in high-stress environments.

Yoga and Anxiety Management

Anxiety disorders are among the most prevalent mental health conditions globally, characterized by excessive worry, physiological hyperarousal, and impaired emotional regulation. A substantial body of evidence supports the use of yoga as a complementary approach for reducing anxiety symptoms.

Clinical trials involving individuals with generalized anxiety disorder, social anxiety, and subclinical anxiety consistently report reductions in anxiety severity following yoga interventions. Yoga's emphasis on breath awareness and mindfulness appears to play a crucial role in regulating autonomic nervous system activity, shifting the body from a sympathetic "fight-or-flight" state toward parasympathetic dominance.

Pranayama practices, in particular, have been associated with reductions in heart rate, blood pressure, and respiratory rate, all of which are commonly elevated in anxious individuals. Meditation components further support anxiety reduction by enhancing attentional control and reducing maladaptive cognitive patterns such as rumination and catastrophizing.

While yoga is not considered a replacement for evidence-based anxiety treatments such as cognitive-behavioral therapy, the literature supports its role as an adjunctive practice that enhances emotional self-regulation and reduces symptom severity.

Yoga and Depression

Depression is a leading cause of disability worldwide and is characterized by persistent low mood, loss of interest, emotional numbness, and cognitive impairment. Research examining yoga's impact on depressive symptoms has expanded considerably, with multiple systematic reviews and meta-analyses indicating moderate but significant antidepressant effects.

Yoga interventions have been shown to improve mood, increase positive affect, and reduce depressive symptom scores across clinical and non-clinical populations. These effects are thought to result from a combination of neurobiological and psychological mechanisms, including increased neurotransmitter availability, improved stress regulation, and enhanced self-efficacy.

Movement-based aspects of yoga may also contribute to behavioral activation, a core component of depression treatment. Unlike traditional exercise, yoga integrates physical movement with mindfulness and relaxation, which may increase adherence among individuals who struggle with motivation or fatigue.

However, the literature also highlights variability in outcomes based on depression severity, intervention duration, and yoga style. Gentle and mindfulness-based yoga practices appear particularly suitable for individuals with moderate depression, whereas more intensive practices may not be appropriate for all clinical populations.

Yoga and Emotional Regulation

Emotional regulation refers to the ability to identify, understand, and manage emotional responses in adaptive ways. Poor emotional regulation is a central feature of many mental health disorders, including anxiety, depression, and trauma-related conditions.

Yoga has been shown to enhance emotional regulation through increased interoceptive awareness and mindfulness. By encouraging practitioners to observe bodily sensations, breath patterns, and emotional states without judgment, yoga fosters emotional acceptance and reduces impulsive emotional reactions.

Studies involving adolescents and young adults indicate that regular yoga practice improves emotional awareness, reduces emotional reactivity, and enhances coping strategies. These findings are particularly relevant for preventive mental health interventions, as emotional regulation skills developed early in life contribute to long-term psychological resilience.

Qualitative research further supports these findings, with participants frequently reporting increased calmness, emotional clarity, and improved ability to respond rather than react to stressful situations following sustained yoga practice.

Yoga, Mindfulness, and Psychological Well-Being

Mindfulness, defined as present-moment awareness with an attitude of non-judgment, is a key component of many yoga practices. Research suggests that yoga enhances mindfulness skills, which in turn mediate improvements in mental health outcomes.

Higher levels of mindfulness are associated with reduced rumination, improved emotional balance, and greater life satisfaction. Yoga-based mindfulness practices have been shown to improve self-compassion, acceptance, and psychological flexibility—qualities closely linked to emotional well-being.

Psychological well-being extends beyond symptom reduction to include positive functioning, meaning in life, and personal growth. Studies measuring well-being outcomes consistently report improvements in vitality, self-esteem, and overall quality of life among yoga practitioners.

Population-Specific Findings

Research on yoga and mental health spans diverse populations:

- **Students and Adolescents:** Yoga programs in educational settings reduce academic stress, improve emotional regulation, and enhance concentration.
- **Working Adults:** Workplace yoga interventions improve stress management, job satisfaction, and emotional balance.
- **Older Adults:** Yoga supports emotional well-being by reducing loneliness, anxiety, and age-related stress.
- **Clinical Populations:** Individuals with mood disorders, trauma exposure, or chronic illness benefit from tailored yoga interventions, though clinical supervision is recommended.
- Despite positive findings, the literature emphasizes the need for population-specific adaptations and caution when applying yoga to vulnerable groups.

Mind–Body Connection Theory

One of the most widely accepted explanations for yoga's psychological benefits is the mind–body connection theory. This framework emphasizes the bidirectional relationship between mental states and physiological processes. Emotional stress and psychological distress are known to manifest in bodily tension, altered breathing patterns, and dysregulated autonomic nervous system activity. Yoga directly addresses these physical manifestations, thereby influencing mental states.

Through deliberate postures and controlled breathing, yoga enhances bodily awareness and reduces somatic tension. This heightened interoceptive awareness allows individuals to recognize early signs of emotional distress and respond more adaptively. Over time, this mind–body integration improves emotional self-regulation and reduces vulnerability to stress-related disorders.

Autonomic Nervous System Regulation

A substantial body of research highlights yoga's role in regulating the autonomic nervous system (ANS), which consists of the sympathetic (stress-related) and parasympathetic (relaxation-related) branches. Chronic psychological stress is associated with sustained sympathetic activation, leading to anxiety, irritability, emotional instability, and impaired cognitive functioning.

Yoga practices—particularly pranayama and relaxation techniques—promote parasympathetic activation. Slow, rhythmic breathing stimulates the vagus nerve, which plays a critical role in emotional regulation and stress recovery. Increased vagal tone is associated with improved mood, reduced anxiety, and enhanced emotional resilience.

Empirical studies measuring heart rate variability (HRV), a marker of autonomic balance, consistently report improvements following regular yoga practice. Higher HRV reflects greater adaptability to stress and better emotional control, providing a physiological basis for yoga's mental health benefits.

Neuroendocrine and Neurochemical Mechanisms

Yoga also influences mental health through neuroendocrine and neurochemical pathways. Chronic stress disrupts the hypothalamic–pituitary–adrenal (HPA) axis, leading to excessive cortisol release. Elevated cortisol levels are associated with anxiety, depression, sleep disturbances, and emotional dysregulation.

Research indicates that yoga practice reduces cortisol levels and normalizes HPA axis functioning. In addition, yoga has been associated with increased levels of neurotransmitters such as gamma-aminobutyric acid (GABA), which plays a key role in reducing neural excitability and promoting relaxation. Low GABA levels have been linked to anxiety and mood disorders, suggesting that yoga's ability to enhance GABA activity may contribute to its anxiolytic and antidepressant effects.

Emerging neuroimaging studies further suggest that yoga may influence brain regions involved in emotion regulation, including the prefrontal cortex, amygdala, and hippocampus. These changes may support improved emotional processing and reduced stress reactivity.

Mindfulness and Cognitive-Behavioral Mechanisms

Yoga incorporates core elements of mindfulness, which involves sustained attention to present-moment experiences with acceptance and non-judgment. Mindfulness-based mechanisms are particularly relevant for mental health, as they counteract maladaptive cognitive patterns such as rumination, worry, and negative self-evaluation.

Through meditation and mindful movement, yoga enhances attentional control and cognitive flexibility. Practitioners learn to observe thoughts and emotions without becoming overwhelmed by them, which reduces emotional reactivity and promotes psychological stability. This process mirrors key principles of cognitive-behavioral therapy, where individuals are encouraged to recognize and modify unhelpful thought patterns.

By fostering present-moment awareness, yoga reduces excessive focus on past regrets or future anxieties—two cognitive processes strongly associated with depression and anxiety. As a result, yoga enhances emotional clarity, self-awareness, and adaptive coping strategies.

Self-Regulation and Emotional Resilience

Self-regulation refers to the ability to manage internal states, impulses, and behaviors in pursuit of long-term goals. Emotional dysregulation is a core feature of many mental health disorders and contributes to stress vulnerability.
Yoga strengthens self-regulatory capacity by integrating physical discipline, breath control, and mental focus. Regular practice encourages consistency, patience, and self-observation, which translate into improved emotional control in daily life. Over time, individuals develop greater tolerance for discomfort, enhanced stress coping skills, and increased emotional resilience.

Qualitative studies frequently report that yoga practitioners experience a greater sense of inner calm, emotional stability, and confidence in managing life challenges. These subjective experiences align with quantitative findings on reduced emotional reactivity and improved psychological well-being.

Holistic and Philosophical Perspectives

Beyond physiological and psychological mechanisms, yoga's philosophical foundations contribute to its mental health effects. Traditional yogic principles such as contentment (santosha), self-discipline (tapas), and self-study (svadhyaya) promote adaptive attitudes toward life stressors.
Although these ethical dimensions are less frequently examined in empirical research, theoretical perspectives suggest they encourage positive self-concept, emotional acceptance, and resilience. By emphasizing balance, moderation, and self-awareness, yoga supports a holistic approach to mental well-being that extends beyond symptom reduction.

Integration of Mechanisms

Rather than operating through a single pathway, yoga's mental health benefits arise from the integration of multiple mechanisms. Physiological relaxation supports emotional regulation, mindfulness enhances cognitive control, and philosophical principles promote adaptive coping. Together, these processes create a synergistic effect that enhances overall mental health and emotional well-being.

Methodological Approaches and Research Design

Research examining the effects of yoga on mental health and emotional well-being employs a wide range of methodological approaches, including randomized controlled trials, quasi-experimental designs, mixed-methods studies, and systematic reviews. While the growing body of literature provides valuable insights, methodological diversity also presents challenges in terms of comparability and generalizability. This section outlines commonly used research designs, measurement tools, and analytical strategies, with particular emphasis on mixed-methods approaches suitable for investigating yoga's psychological effects.

Research Design

An empirical investigation into the role of yoga in enhancing mental health and emotional well-being is well suited to a mixed-methods research design. Mixed-methods approaches integrate quantitative and qualitative data, allowing researchers to capture both measurable psychological outcomes and subjective experiences of participants. This design is particularly appropriate for mind–body interventions such as yoga, where experiential and emotional changes may not be fully captured through standardized scales alone.

Quantitative methods are typically used to assess changes in mental health indicators such as stress, anxiety, depression, and well-being, while qualitative methods provide deeper insight into participants' emotional processes, perceptions, and lived experiences. The integration of these methods enhances the validity and richness of findings.

Participants

Participants in yoga-based mental health studies commonly include adults aged 18 to 65 years with varying levels of psychological stress, anxiety, or emotional distress. Inclusion criteria may involve individuals experiencing mild to moderate mental health symptoms, while exclusion criteria often include severe psychiatric conditions requiring intensive clinical intervention.

Sampling strategies frequently involve stratification based on prior yoga experience to control for familiarity effects. This ensures balanced representation of beginners and experienced practitioners, allowing for more accurate assessment of intervention outcomes. Participants are typically recruited from community settings, educational institutions, healthcare facilities, or workplace wellness programs.

Ethical considerations are central to participant selection, with informed consent, confidentiality, and the right to withdraw emphasized throughout the research process.

Intervention Design

A structured yoga intervention is essential for ensuring consistency and replicability. A commonly adopted intervention model involves a 12-week yoga program, with weekly instructor-led sessions lasting 60 to 90 minutes. Sessions generally incorporate a balanced combination of:

1. Physical postures (asanas) designed to promote bodily awareness and relaxation
2. Breathing techniques (pranayama) to regulate physiological arousal
3. Meditation and guided relaxation to enhance mindfulness and emotional regulation

In addition to supervised sessions, participants are often encouraged to engage in home practice using guided audio or video materials. Home practice enhances skill consolidation and supports the integration of yoga into daily life, which is critical for sustained mental health benefits.

The intervention is typically delivered by certified yoga instructors with experience in therapeutic or mental health–oriented yoga practices to ensure safety and appropriateness.

Outcome Measures

Qualitative Measures

Qualitative data are often collected through semi-structured interviews or focus group discussions conducted post-intervention. These interviews explore participants' subjective experiences, perceived emotional changes, coping strategies, and integration of yoga practices into daily life.
Open-ended questions encourage participants to reflect on emotional awareness, stress management, and overall well-being, providing contextual depth to quantitative findings.

Qualitative Analysis

Qualitative data are analyzed using thematic analysis, a systematic method for identifying, analyzing, and interpreting patterns within textual data. This process involves coding interview transcripts, generating themes related to emotional regulation and mental well-being, and integrating these themes with quantitative results.
The triangulation of quantitative and qualitative findings strengthens the credibility and interpretive depth of the study.

Methodological Strengths

Mixed-methods designs offer several strengths in yoga research, including comprehensive data capture, enhanced ecological validity, and greater sensitivity to subjective psychological changes. Standardized outcome measures facilitate comparison across studies, while qualitative data provide insight into mechanisms and individual variability.

Limitations and Challenges

Despite methodological advances, challenges remain. Variability in yoga styles, instructor expertise, session frequency, and participant adherence complicates interpretation. Reliance on self-report measures may introduce response bias, and short intervention durations limit understanding of long-term effects.
Future studies should prioritize standardized protocols, larger sample sizes, and longitudinal designs to strengthen causal inference and generalizability.

Discussion

The purpose of this paper was to examine the role of yoga in enhancing mental health and emotional well-being through a comprehensive review of empirical evidence, theoretical mechanisms, and methodological approaches. The findings synthesized across studies consistently indicate that yoga is associated with meaningful improvements in psychological functioning, particularly in reducing stress, anxiety, and depressive symptoms, while enhancing emotional regulation, mindfulness, and overall well-being. This discussion integrates key findings, interprets their significance, and situates yoga within the broader mental health landscape.

Conclusion

Yoga has emerged as a meaningful holistic practice with the potential to enhance mental health and emotional well-being. Empirical research indicates stress reduction, improved emotional regulation, and enhanced psychological well-being associated with regular yoga practice (*Effect of Yoga on Mental Health*, 2022; *The Effects of Yoga on Positive Mental Health*, 2025; *Yoga And Mental Health: A Review*, 2019). Nevertheless, greater methodological consistency and longitudinal research are needed to strengthen causal claims and clarify mechanisms.
As mental health concerns continue to grow globally, integrating accessible mind-body practices like yoga presents a valuable addition to comprehensive public health strategies.

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खेल प्रदर्शन में पोषण एवं सहनशक्ति का योगदान

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सारांश

खेल प्रदर्शन में पोषण और सहनशक्ति महत्वपूर्ण हैं, विशेषकर सहनशक्ति वाले खेलों में। उचित आहार ग्लाइकोजन भंडार बनाए रखने में मदद करता है और थकान को कम करके एथलीट की कार्यक्षमता को बढ़ाता है। यह अध्ययन सहनशक्ति बढ़ाने में मुख्य भोजन अवयवों और पानी की मात्रा के प्रभाव का विश्लेषण करता है, जिसमें एरोबिक क्षमता, ऊर्जा प्रणाली की दक्षता, और मानसिक दृढ़ता शामिल हैं।

अनुसंधान ने विभिन्न खेल श्रेणियों के एथलीटों के आहार पैटर्न और उनके प्रदर्शन का विश्लेषण किया, जिसमें कार्बोहाइड्रेट लोडिंग और व्यायाम के दौरान तरल सेवन की आवश्यकता शामिल थी। परिणाम बताते हैं कि उच्च कार्बोहाइड्रेट आहार (60 ग्राम/किलोग्राम) थकान को टालता है और व्यायाम के दौरान इलेक्ट्रोलाइट्स और कार्बोहाइड्रेट का सही मिश्रण प्रदर्शन को 15–20% तक बढ़ा सकता है। प्रोटीन और कार्बोहाइड्रेट का सेवन व्यायाम के तुरंत बाद मांसपेशियों की रिकवरी को 40% तक तेज करता है, जिससे एथलीट लंबे समय तक बेहतर प्रदर्शन कर पाते हैं। इस अध्ययन में विभिन्न खेल श्रेणियों के एथलीटों के आहार पैटर्न और उनके प्रदर्शन का विश्लेषण किया गया है। मुख्यतः इसमें कार्बोहाइड्रेट लोडिंग, व्यायाम के दौरान तरल पदार्थ का सेवन, और मांसपेशियों की मरम्मत के लिए प्रोटीन की आवश्यकता को लेकर शोध पत्रों और प्रयोगात्मक डेटा की समीक्षा की गई है। सहनशक्ति के आकलन के लिए ट्रेडमिल परीक्षण, कूपर 12-मिनट रन, और वर्टिकल जंप होल्ड परीक्षण का उपयोग किया गया, जो एथलीटों की उच्च-तीव्रता वाले प्रयासों को बनाए रखने की क्षमता पर प्रभाव डालते हैं।

खेलों में सफलता के लिए केवल प्रशिक्षण ही पर्याप्त नहीं है; एक सुनियोजित पोषण और सहनशक्ति बढ़ाने वाली व्यायाम रणनीति आवश्यक है। एथलीटों को अपने प्रशिक्षण के आधार पर कार्बोहाइड्रेट, प्रोटीन, और पानी का संतुलन व्यक्तिगत रूप से करना चाहिए।

मुख्य शब्द: पोषण, सहनशक्ति, खेल प्रदर्शन।

खेल प्रदर्शन में पोषण की भूमिका

परिचय

खेल प्रदर्शन कई महत्वपूर्ण कारकों पर निर्भर करता है, जिनमें शारीरिक क्षमता, प्रशिक्षण, मानसिक स्थिति, पर्यावरण तथा पोषण प्रमुख हैं। इनमें से पोषण को आधुनिक खेल विज्ञान में अत्यंत महत्वपूर्ण स्थान दिया गया है। किसी भी खिलाड़ी के लिए केवल नियमित अभ्यास या तकनीकी दक्षता ही पर्याप्त नहीं होती, बल्कि उसके शरीर को सही मात्रा में ऊर्जा, आवश्यक पोषक तत्व तथा पर्याप्त जल की आवश्यकता होती है। यदि खिलाड़ी का आहार संतुलित और वैज्ञानिक तरीके से निर्धारित किया जाए, तो यह उसके प्रदर्शन को बेहतर बनाने, थकान को कम करने तथा शरीर की कार्यक्षमता को बनाए रखने में महत्वपूर्ण भूमिका निभाता है।

वर्तमान समय में खेल पोषण एक महत्वपूर्ण अध्ययन क्षेत्र के रूप में विकसित हो चुका है। खेल पोषण का मुख्य उद्देश्य खिलाड़ियों को ऐसा आहार प्रदान करना है, जो उनके प्रशिक्षण, प्रतियोगिता और पुनर्प्राप्ति की आवश्यकताओं को पूरा कर सके। उचित पोषण खिलाड़ियों को पर्याप्त ऊर्जा प्रदान करता है, जिससे वे लंबे समय तक अभ्यास कर सकते हैं और प्रतियोगिता के दौरान बेहतर प्रदर्शन कर सकते हैं। इसके अतिरिक्त संतुलित आहार शरीर की प्रतिरक्षा प्रणाली को मजबूत बनाता है और चोट लगने की संभावना को भी कम करता है।

खेलों में ऊर्जा की आवश्यकता सामान्य व्यक्तियों की तुलना में अधिक होती है। जब खिलाड़ी प्रशिक्षण या प्रतियोगिता में भाग लेते हैं, तो उनके शरीर में ऊर्जा की खपत तेजी से बढ़ जाती है। इस ऊर्जा की पूर्ति मुख्य रूप से कार्बोहाइड्रेट, प्रोटीन और वसा जैसे मैक्रोन्यूट्रिएंट्स द्वारा होती है। कार्बोहाइड्रेट शरीर के लिए प्रमुख ऊर्जा स्रोत होते हैं और ये मांसपेशियों में ग्लाइकोजन के रूप में संग्रहित रहते हैं। जब खिलाड़ी व्यायाम करता है, तो यह ग्लाइकोजन ऊर्जा प्रदान करता है। यदि शरीर में ग्लाइकोजन की मात्रा कम हो जाती है, तो खिलाड़ी को थकान महसूस होने लगती है और उसका प्रदर्शन प्रभावित हो सकता है।

प्रोटीन भी खिलाड़ियों के लिए अत्यंत महत्वपूर्ण पोषक तत्व है। यह मांसपेशियों के निर्माण, विकास तथा क्षतिग्रस्त ऊतकों की मरम्मत में सहायता करता है। कठोर प्रशिक्षण के दौरान मांसपेशियों पर अधिक दबाव पड़ता है, जिससे उनमें सूक्ष्म स्तर पर क्षति हो सकती है। ऐसे में प्रोटीन युक्त आहार मांसपेशियों की मरम्मत करके उन्हें मजबूत बनाने में मदद करता है। इसी प्रकार वसा भी शरीर के लिए ऊर्जा का एक महत्वपूर्ण स्रोत है, विशेष रूप से लंबे समय तक चलने वाले व्यायाम के दौरान।

इसके अतिरिक्त विटामिन और खनिज भी खिलाड़ियों के लिए अत्यंत आवश्यक होते हैं। ये शरीर की विभिन्न जैव रासायनिक प्रक्रियाओं को नियंत्रित करते हैं तथा शरीर की प्रतिरोधक क्षमता को मजबूत बनाते हैं। आयरन, कैल्शियम, सोडियम और पोटैशियम जैसे खनिज तत्व मांसपेशियों के कार्य, हड्डियों की मजबूती तथा शरीर में द्रव संतुलन बनाए रखने में महत्वपूर्ण भूमिका निभाते हैं। साथ ही पर्याप्त मात्रा में जल का सेवन भी खिलाड़ियों के लिए आवश्यक है, क्योंकि यह शरीर के तापमान को नियंत्रित रखने और थकान को कम करने में सहायक होता है।

इस प्रकार स्पष्ट है कि पोषण खेल प्रदर्शन का एक अत्यंत महत्वपूर्ण घटक है। उचित और संतुलित आहार न केवल खिलाड़ियों को ऊर्जा प्रदान करता है, बल्कि उनकी सहनशक्ति, शक्ति और समग्र स्वास्थ्य को भी बेहतर बनाता है। इसलिए आधुनिक खेल प्रशिक्षण में पोषण को एक अनिवार्य तत्व के रूप में स्वीकार किया गया है। सही पोषण रणनीति अपनाकर खिलाड़ी अपने प्रदर्शन को उच्च स्तर तक पहुंचा सकते हैं और प्रतियोगिताओं में बेहतर परिणाम प्राप्त कर सकते हैं।

अध्ययन के उद्देश्य

इस अध्ययन के मुख्य उद्देश्य निम्नलिखित हैं:

1. खेल प्रदर्शन में पोषण की भूमिका का अध्ययन करना।
2. सहनशक्ति बढ़ाने में कार्बोहाइड्रेट, प्रोटीन और वसा के महत्व का विश्लेषण करना।
3. व्यायाम के दौरान जल और इलेक्ट्रोलाइट्स के प्रभाव का अध्ययन करना।
4. पोषण और सहनशक्ति के संबंध को वैज्ञानिक दृष्टिकोण से समझना।
5. एथलीटों के लिए उपयुक्त पोषण रणनीति का सुझाव देना।

साहित्य समीक्षा

खेल पोषण पर अनेक वैज्ञानिक अध्ययनों ने यह सिद्ध किया है कि उचित पोषण खेल प्रदर्शन को बेहतर बनाने में महत्वपूर्ण भूमिका निभाता है।

Costill (1991) ने अपने अध्ययन में बताया कि कार्बोहाइड्रेट मांसपेशियों के लिए प्रमुख ऊर्जा स्रोत है और इसकी कमी से जल्दी थकान हो सकती है।

Jeukendrup (2014) के अनुसार लंबे समय तक चलने वाले व्यायाम के दौरान कार्बोहाइड्रेट का सेवन सहनशक्ति और प्रदर्शन दोनों को बढ़ाता है।

Walker आदि (2000) ने अपने अध्ययन में पाया कि उच्च कार्बोहाइड्रेट आहार लेने वाले खिलाड़ियों में मांसपेशियों का ग्लाइकोजन स्तर अधिक होता है और वे लंबे समय तक व्यायाम कर सकते हैं।

Podlogar और Wallis (2022) के अनुसार सहनशक्ति खेलों में कार्बोहाइड्रेट की भूमिका अत्यंत महत्वपूर्ण है क्योंकि यह शरीर को तुरंत ऊर्जा प्रदान करता है।

इन सभी अध्ययनों से स्पष्ट होता है कि पोषण विशेष रूप से कार्बोहाइड्रेट, प्रोटीन और तरल पदार्थ खेल प्रदर्शन को बेहतर बनाने में महत्वपूर्ण भूमिका निभाते हैं।

अनुसंधान पद्धति

यह अध्ययन मुख्य रूप से साहित्य आधारित अनुसंधान पर आधारित है। इसमें विभिन्न शोध पत्रों, पुस्तकों और वैज्ञानिक जर्नलों का अध्ययन किया गया है।

सहनशक्ति का आकलन करने के लिए सामान्यतः उपयोग किए जाने वाले परीक्षणों में शामिल हैं:

1. ट्रेडमिल टेस्ट
2. कूपर 12 मिनट रन टेस्ट

3. VO2 Max टेस्ट
4. लैक्टेट थ्रेशहोल्ड टेस्ट

इन परीक्षणों के माध्यम से एथलीट की सहनशक्ति क्षमता का मूल्यांकन किया जाता है।
खेल प्रदर्शन में पोषण की भूमिका, पोषण दो प्रकार के होते हैं:

- मैक्रोन्यूट्रिएंट्स
- माइक्रोन्यूट्रिएंट्स

खेल प्रदर्शन को बेहतर बनाने के लिए मैक्रोन्यूट्रिएंट्स और माइक्रोन्यूट्रिएंट्स दोनों अत्यंत महत्वपूर्ण होते हैं। मैक्रोन्यूट्रिएंट्स शरीर को ऊर्जा और निर्माण सामग्री देते हैं, जबकि माइक्रोन्यूट्रिएंट्स शरीर की विभिन्न जैव-रासायनिक प्रक्रियाओं को नियंत्रित करते हैं। नीचे इनके अंतर्गत आने वाले प्रमुख तत्व दिए गए हैं।

मैक्रोन्यूट्रिएंट्स: मैक्रोन्यूट्रिएंट्स वे पोषक तत्व हैं जिनकी शरीर को अधिक मात्रा में आवश्यकता होती है और जो ऊर्जा प्रदान करते हैं।

1) **कार्बोहाइड्रेट:** कार्बोहाइड्रेट शरीर के लिए ऊर्जा का प्रमुख स्रोत है। सहनशक्ति आधारित खेलों में मांसपेशियों में संग्रहित ग्लाइकोजन ऊर्जा प्रदान करता है। अनुसंधानों से पता चलता है कि कार्बोहाइड्रेट का सेवन व्यायाम के दौरान ऊर्जा स्तर को बनाए रखने और थकान को कम करने में मदद करता है। कार्बोहाइड्रेट लोडिंग एक लोकप्रिय रणनीति है जिसका उपयोग प्रतियोगिता से पहले ग्लाइकोजन भंडार को बढ़ाने के लिए किया जाता है।

   मुख्य स्रोत: चावल, गेहूं, रोटी, आलू, फल, शहद, दलिया

2) **प्रोटीन:** प्रोटीन मांसपेशियों की मरम्मत और विकास के लिए आवश्यक होता है। व्यायाम के बाद प्रोटीन का सेवन मांसपेशियों की रिकवरी को तेज करता है और चोट के जोखिम को कम करता है। एथलीटों को सामान्य व्यक्तियों की तुलना में अधिक प्रोटीन की आवश्यकता होती है।

मुख्य स्रोत: दालें, दूध, अंडा, मांस, सोयाबीन, पनीर

3) **वसा:** वसा शरीर के लिए दीर्घकालिक ऊर्जा का स्रोत है। कम तीव्रता वाले लंबे व्यायाम के दौरान शरीर वसा का उपयोग ऊर्जा के रूप में करता है। वसा में घुलनशील विटामिन (A, D, E, K) के अवशोषण में मदद |

   मुख्य स्रोत: घी, तेल, मेवे, बीज, मक्खन

4) **जल और इलेक्ट्रोलाइट्स:** व्यायाम के दौरान पसीने के माध्यम से शरीर से जल और इलेक्ट्रोलाइट्स निकल जाते हैं। यदि इनकी पूर्ति न की जाए तो शरीर में निर्जलीकरण हो सकता है जिससे प्रदर्शन में गिरावट आती है।

माइक्रोन्यूट्रिएंट्स: माइक्रोन्यूट्रिएंट्स वे पोषक तत्व हैं जिनकी शरीर को कम मात्रा में आवश्यकता होती है, लेकिन ये शरीर के सही कार्य और खेल प्रदर्शन के लिए बहुत महत्वपूर्ण हैं।

(A) विटामिन

विटामिन A – दृष्टि और प्रतिरक्षा के लिए
विटामिन B समूह – ऊर्जा उत्पादन और तंत्रिका तंत्र के लिए
विटामिन C – रोग प्रतिरोधक क्षमता और ऊतकों की मरम्मत
विटामिन D – हड्डियों की मजबूती
विटामिन E – एंटीऑक्सीडेंट, मांसपेशियों की सुरक्षा
विटामिन K – रक्त का थक्का जमाने में सहायक

(B) खनिज

कैल्शियम – हड्डियों और दांतों के लिए
आयरन – रक्त में हीमोग्लोबिन बनाने के लिए
मैग्नीशियम – मांसपेशियों और नसों के कार्य के लिए
पोटैशियम – मांसपेशियों के संकुचन और जल संतुलन
सोडियम – इलेक्ट्रोलाइट संतुलन

जिंक – प्रतिरक्षा और ऊतक मरम्मत

सहनशक्ति और खेल प्रदर्शन

सहनशक्ति वह क्षमता है जिसके द्वारा खिलाड़ी लंबे समय तक थकान के बिना शारीरिक गतिविधि कर सकता है।

सहनशक्ति खेल प्रदर्शन का एक अत्यंत महत्वपूर्ण घटक है। सहनशक्ति का अर्थ है शरीर की वह क्षमता जिसके द्वारा खिलाड़ी लंबे समय तक बिना अधिक थकान के शारीरिक गतिविधि कर सकता है। जिन खेलों में लंबे समय तक निरंतर प्रयास की आवश्यकता होती है, जैसे दौड़, साइक्लिंग, तैराकी और फुटबॉल, उनमें सहनशक्ति का विशेष महत्व होता है।

1. लंबे समय तक प्रदर्शन बनाए रखने की क्षमता

अच्छी सहनशक्ति वाले खिलाड़ी लंबे समय तक उच्च स्तर का प्रदर्शन बनाए रख सकते हैं। इससे वे प्रतियोगिता के पूरे समय सक्रिय रहते हैं और अंतिम क्षणों तक अपनी ऊर्जा बनाए रखते हैं।

2. थकान को कम करना

सहनशक्ति बढ़ने से शरीर की थकान सहन करने की क्षमता बढ़ती है। इससे खिलाड़ी जल्दी थकते नहीं हैं और लगातार बेहतर प्रदर्शन कर पाते हैं।

3. हृदय और फेफड़ों की क्षमता में वृद्धि

सहनशक्ति प्रशिक्षण से हृदय और फेफड़ों की कार्यक्षमता बढ़ती है। इससे शरीर में ऑक्सीजन की आपूर्ति बेहतर होती है, जो मांसपेशियों को अधिक समय तक काम करने में मदद करती है।

4. ऊर्जा उपयोग की दक्षता

अच्छी सहनशक्ति के कारण शरीर ऊर्जा का उपयोग अधिक प्रभावी तरीके से करता है। इससे खिलाड़ी लंबे समय तक ऊर्जा बनाए रख सकता है और प्रदर्शन बेहतर होता है।

सहनशक्ति दो प्रकार की होती है:
1. एरोबिक सहनशक्ति
2. एनारोबिक सहनशक्ति

एरोबिक सहनशक्ति: एरोबिक सहनशक्ति वह क्षमता है जिसके द्वारा शरीर लंबे समय तक मध्यम तीव्रता वाले कार्य को बिना अधिक थकान के कर सकता है। इसमें शरीर ऊर्जा उत्पादन के लिए ऑक्सीजन का उपयोग करता है।

सरल शब्दों में, जब कोई खिलाड़ी दौड़ना, साइकिल चलाना, तैरना या तेज चलना जैसे कार्य लंबे समय तक करता है और शरीर को ऊर्जा के लिए ऑक्सीजन की आवश्यकता होती है, तो उसे एरोबिक सहनशक्ति कहा जाता है।

1. एरोबिक सहनशक्ति की परिभाषा

खेल विज्ञान के अनुसार, "एरोबिक सहनशक्ति वह क्षमता है जिसके द्वारा खिलाड़ी ऑक्सीजन की सहायता से लंबे समय तक शारीरिक गतिविधि को जारी रख सकता है।"

2. एरोबिक सहनशक्ति के उदाहरण

लंबी दूरी की दौड़, साइकिलिंग, तैराकी, तेज चलना, मैराथन

3. एरोबिक सहनशक्ति के लाभ

हृदय और फेफड़ों की क्षमता बढ़ती है, शरीर में ऑक्सीजन की आपूर्ति बेहतर होती है, थकान कम होती है और लंबे समय तक काम करने की क्षमता बढ़ती है, खेल प्रदर्शन में सुधार होता है, शरीर की ऊर्जा प्रणाली अधिक प्रभावी बनती है

4. एरोबिक सहनशक्ति बढ़ाने के तरीके

नियमित लंबी दूरी की दौड़, साइकिलिंग और तैराकी, जॉगिंग और तेज चलना, इंटरवल ट्रेनिंग. संतुलित पोषण और पर्याप्त जल सेवन

खेलों में महत्व:

एरोबिक सहनशक्ति विशेष रूप से उन खेलों में महत्वपूर्ण है जिनमें लंबे समय तक लगातार गतिविधि होती है, जैसे: मैराथन, फुटबॉल, हॉकी, क्रिकेट, साइकिलिंग।

एनेरोबिक सहनशक्ति:

एनेरोबिक सहनशक्ति वह क्षमता है जिसमें खिलाड़ी कम समय के लिए बहुत अधिक तीव्रता के साथ कार्य कर सकता है, बिना ऑक्सीजन की पर्याप्त उपलब्धता के। इसमें शरीर ऊर्जा प्राप्त करने के लिए मुख्य रूप से एनेरोबिक ऊर्जा प्रणाली का उपयोग करता है।

दूसरे शब्दों में, जब शरीर को अचानक बहुत अधिक ऊर्जा की आवश्यकता होती है और ऑक्सीजन की आपूर्ति पर्याप्त नहीं होती, तब शरीर ग्लाइकोजन को तोड़कर ऊर्जा उत्पन्न करता है। इस प्रक्रिया में लैक्टिक एसिड बनता है, जिससे थकान जल्दी महसूस होती है।

परिभाषा

एनेरोबिक सहनशक्ति वह क्षमता है जिसके द्वारा खिलाड़ी अल्प समय के लिए अधिकतम या लगभग अधिकतम तीव्रता पर कार्य कर सकता है, जहाँ ऊर्जा उत्पादन के लिए ऑक्सीजन की आवश्यकता नहीं होती।

एनेरोबिक सहनशक्ति की विशेषताएँ

उच्च तीव्रता वाला कार्य, कम समय की अवधि (लगभग 10 सेकंड से 2 मिनट तक), ऑक्सीजन की कमी में ऊर्जा उत्पादन, लैक्टिक एसिड का निर्माण, जल्दी थकान का अनुभव

एनेरोबिक सहनशक्ति वाले खेल

एनेरोबिक सहनशक्ति उन खेलों में अधिक महत्वपूर्ण होती है जहाँ तेज गति और शक्ति की आवश्यकता होती है, जैसे: 100 मीटर और 200 मीटर दौड़, 400 मीटर दौड़, भारोत्तोलन, कुश्ती, बॉक्सिंग, जिम्नास्टिक, फुटबॉल में तेज स्प्रिंट

एनेरोबिक सहनशक्ति बढ़ाने के तरीके

स्प्रिंट प्रशिक्षण, इंटरवल ट्रेनिंग, हाई इंटेंसिटी इंटरवल ट्रेनिंग, प्लायोमेट्रिक एक्सरसाइज, वेट ट्रेनिंग

खेल प्रदर्शन में महत्व

विस्फोटक शक्ति बढ़ाता है, गति और ताकत में सुधार करता है, कम समय में अधिक ऊर्जा उत्पन्न करने की क्षमता बढ़ाता है, तेज गति वाले खेलों में प्रदर्शन बेहतर बनाता है, सहनशक्ति को बढ़ाने में नियमित प्रशिक्षण के साथ-साथ उचित पोषण भी आवश्यक होता है।

चर्चा:

इस अध्ययन के परिणामों से यह स्पष्ट होता है कि खेल प्रदर्शन को बेहतर बनाने में पोषण की भूमिका अत्यंत महत्वपूर्ण होती है। एथलीटों की शारीरिक क्षमता, सहनशक्ति और रिकवरी प्रक्रिया पर उचित पोषण का सीधा प्रभाव पड़ता है। विशेष रूप से कार्बोहाइड्रेट का पर्याप्त सेवन मांसपेशियों में ग्लाइकोजन के भंडार को बढ़ाने में सहायक होता है, जिससे खिलाड़ियों को लंबे समय तक ऊर्जा प्राप्त होती है और उनकी सहनशक्ति में वृद्धि होती है।

इसके अतिरिक्त, प्रोटीन मांसपेशियों की मरम्मत, पुनर्निर्माण तथा विकास में महत्वपूर्ण भूमिका निभाता है। तीव्र प्रशिक्षण और प्रतियोगिताओं के बाद मांसपेशियों में होने वाले सूक्ष्म क्षति की भरपाई के लिए प्रोटीन अत्यंत आवश्यक होता है। इसी प्रकार जल और इलेक्ट्रोलाइट्स शरीर के तापमान को नियंत्रित रखने, जल संतुलन बनाए रखने तथा निर्जलीकरण से बचाने में सहायक होते हैं, जो खेल प्रदर्शन के लिए अनिवार्य है।

अतः यह कहा जा सकता है कि एथलीटों के लिए संतुलित, वैज्ञानिक और आवश्यकता-आधारित आहार योजना का पालन करना अत्यंत आवश्यक है। उचित पोषण न केवल खेल प्रदर्शन को सुधारता है, बल्कि खिलाड़ियों के समग्र स्वास्थ्य, सहनशक्ति और पुनर्प्राप्ति क्षमता को भी सुदृढ़ बनाता है।

निष्कर्ष

इस अध्ययन से यह स्पष्ट होता है कि खेल प्रदर्शन को बेहतर बनाने में पोषण और सहनशक्ति का महत्वपूर्ण और परस्पर पूरक संबंध है। एथलीट के शारीरिक प्रदर्शन, ऊर्जा स्तर और कार्यक्षमता को बनाए रखने में संतुलित आहार की महत्वपूर्ण भूमिका होती है। उचित पोषण के अभाव में खिलाड़ी की सहनशक्ति, शक्ति और रिकवरी क्षमता प्रभावित हो सकती है, जिससे उसके समग्र प्रदर्शन पर नकारात्मक प्रभाव पड़ता है।
कार्बोहाइड्रेट एथलीटों के लिए प्रमुख ऊर्जा स्रोत के रूप में कार्य करते हैं, जो मांसपेशियों में ग्लाइकोजन के भंडार को बढ़ाकर लंबे समय तक शारीरिक गतिविधि करने की क्षमता प्रदान करते हैं। वहीं प्रोटीन मांसपेशियों की मरम्मत और पुनर्निर्माण में सहायक होते हैं, जिससे प्रशिक्षण के बाद शरीर की रिकवरी प्रक्रिया तेज होती है। वसा भी शरीर को दीर्घकालिक ऊर्जा प्रदान करने में सहायक होती है। इसके अतिरिक्त जल और इलेक्ट्रोलाइट्स शरीर के तापमान को संतुलित रखने, निर्जलीकरण को रोकने तथा शारीरिक संतुलन बनाए रखने में महत्वपूर्ण भूमिका निभाते हैं।
अतः यह निष्कर्ष निकाला जा सकता है कि वैज्ञानिक आधार पर निर्धारित संतुलित पोषण एथलीटों की सहनशक्ति को बढ़ाने और खेल प्रदर्शन को उच्च स्तर तक पहुँचाने में अत्यंत आवश्यक है। इसलिए खेल प्रशिक्षण कार्यक्रमों में पोषण संबंधी जागरूकता और उचित आहार योजना को विशेष महत्व दिया जाना चाहिए

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सूर्य नमस्कार : एक सम्पूर्ण शरीर व्यायाम

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साराश

सूर्य नमस्कार, एक मूलभूत योगिक अभ्यास है जो बारह आसनों की श्रृंखला के माध्यम से सूर्य, जो जीवन ऊर्जा का एक आवश्यक स्रोत है, का सम्मान करता है। यह विधि एक संपूर्ण शारीरिक व्यायाम प्रदान करती है जो गति, मानसिक एकाग्रता और नियंत्रित श्वास (प्राणायाम) को एकीकृत करके वायुवीय (Aerobic) गतिविधि को ध्यान के साथ जोड़ती है। सूर्य नमस्कार का प्रत्येक चक्र पूरे शरीर को काम में लाता है, तथा मध्य शरीर की ताकत और लचीलापन बढ़ाता है।

इसके अतिरिक्त, सूर्य नमस्कार का लयबद्ध प्रवाह चयापचय, विषहरण और पाचन अंगों की मालिश में सहायता करता है, ये सभी आंतरिक स्वास्थ्य को बढ़ावा देते हैं। समन्वित श्वास यह सुनिश्चित करती है कि रक्त परिसंचरण और हृदय संबंधी सहनशक्ति में सुधार करके महत्वपूर्ण अंगों को पर्याप्त ऑक्सीजन मिले। हानिकारक हार्मोन (Cortisol) के स्तर को कम करके और चिंता को कम करके, यह अभ्यास मानसिक स्वास्थ्य बढ़ते हुए तनाव को कम करता है। सूर्य नमस्कार, जब सूर्योदय के समय खाली पेट किया जाता है, तो शरीर की आंतरिक घड़ी को प्रकृति के साथ सामंजस्य बिठाकर शारीरिक स्फूर्ति, मानसिक स्पष्टता और भावनात्मक संतुलन को बढ़ावा देता है।

सूर्य नमस्कार की विशेषता यह है कि यह पारंपरिक व्यायाम से परे जाकर समग्र स्वास्थ्य को प्रोत्साहित करता है। चाहे इसे उष्मिकरण (Warm-up) के रूप में इस्तेमाल किया जाए या ध्यान तकनीक के रूप में, यह बिना किसी उपकरण के सहनशक्ति बढ़ाने और आंतरिक शांति को विकसित करने का एक कारगर तरीका है। नियमित अभ्यास, विशेष रूप से गतिहीन जीवनशैली में, समस्थैतिक्ता (Homeostasis) और दीर्घकालिक स्फूर्ति बनाए रखने में बहुत सहायक होता है। कुल मिलाकर, सूर्य नमस्कार संतुलन और नवीनीकरण के लिए एक संपूर्ण जीवनशैली उपकरण है।

मुख्य शब्दः सूर्य नमस्कार, समस्थैतिक्ता, उष्मिकरण, वायुवीय, स्वास्थ्य ।

प्रस्तावना -

योग भारतीय संस्कृति की एक प्राचीन और वैज्ञानिक परंपरा है, जिसका उद्देश्य शरीर, मन और आत्मा के बीच संतुलन स्थापित करना है। आधुनिक समय में योग को विश्व स्तर पर स्वास्थ्य और फिटनेस के एक प्रभावी साधन के रूप में स्वीकार किया गया है। योग की विभिन्न विधियों में सूर्य नमस्कार का विशेष स्थान है। सूर्य नमस्कार का शाब्दिक अर्थ है "सूर्य को नमस्कार करना"। भारतीय परंपरा में सूर्य को ऊर्जा और जीवन का स्रोत माना जाता है, इसका इतिहास हमारो वर्षों पुराना है योग केवल शारीरिक व्यायाम नहीं बल्कि एक समग्र जीवन पद्धति है।योग के विभिन्न अंगों में से आसान प्रणायाम,ध्यान और शुद्धीकरण शामिल है इन्ही मे से एक प्रमुख अभ्यास सूर्य नमस्कार है इससे शरीर की सभी मांसपेशिया सक्रिय हो जाती हैं।

योग भारत की प्राचीन सांस्कृतिक धरोहर है, जिसका इतिहास हजारों वर्षों पुराना है। योग केवल शारीरिक व्यायाम नहीं बल्कि एक समग्र जीवन-पद्धति है। योग के विभिन्न अंगों में आसन, प्राणायाम, ध्यान और शुद्धि क्रियाएँ शामिल हैं। इन्हीं में से एक प्रमुख अभ्यास सूर्य नमस्कार है

सूर्य की पराबैंगनी किरणें विटामिन डी प्रदान करती हैं, मनोदशा में सुधार करती हैं, हड्डियों को मजबूत बनाती हैं, प्रतिरक्षा प्रणाली को मजबूत करती हैं और दैनिक लय को विनियमित करने में मदद करती हैं।
यह अभ्यास शारीरिक गतिविधि, श्वसन नियंत्रण और मानसिक एकाग्रता का संयोजन है। यही कारण है कि इसे सम्पूर्ण शरीर व्यायाम कहा जाता है।

आधुनिक जीवन शैली में शारीरिक गतिविधि की कमी, तनाव और असंतुलित जीवनशैली के कारण स्वास्थ्य संबंधी समस्याएँ तेजी से बढ़ रही हैं। ऐसे में सूर्य नमस्कार एक सरल, सुलभ और प्रभावी अभ्यास के रूप में उभर कर सामने आया है।जीवनशैली में शारीरिक गतिविधियों की कमी के कारण मोटापा, मधुमेह, तनाव और हृदय रोग जैसी समस्याएँ बढ़ रही ।

अध्ययन का उद्देश्य-

इस शोध अध्ययन के मुख्य उद्देश्य निम्नलिखित हैं-

सूर्य नमस्कार के महत्व का अध्ययन करना।
सूर्य नमस्कार की विधि और चरणों को समझना।
सूर्य नमस्कार के शारीरिक लाभों का विश्लेषण करना।
सूर्य नमस्कार के मानसिक एवं मनोवैज्ञानिक लाभों का अध्ययन करना।
सूर्य नमस्कार को सम्पूर्ण शरीर व्यायाम के रूप में स्थापित करना।

सूर्य नमस्कार के महत्व का अध्ययन –

सूर्य नमस्कार की परंपरा वैदिक काल से जुड़ी हुई है। यह हठयोग की एक महत्वपूर्ण क्रिया है वेदों और उपनिषदों में सूर्य को ऊर्जा और जीवन का प्रतीक माना जाता है।सूर्य को देवता के रूप में पूजा जाता था और विभिन्न मंत्रों तथा शारीरिक क्रियाओं के माध्यम से सूर्य की उपासना की जाती थी। समय के साथ इन क्रियाओं को व्यवस्थित रूप दिया गया और सूर्य नमस्कार की वर्तमान श्रृंखला विकसित हुई। योग ग्रंथों में सूर्य नमस्कार को शारीरिक और मानसिक संतुलन बनाए रखने का एक महत्वपूर्ण साधन बताया गया है।

20वीं सदी में योगाचार्यों ने सूर्य नमस्कार को लोकप्रिय बनाया और इसे आधुनिक योग अभ्यास में शामिल किया। आज यह विश्वभर में योग अभ्यास का एक महत्वपूर्ण भाग बन चुका है। आज के समय में सूर्य नमस्कार केवल आध्यात्मिक अभ्यास नहीं बल्कि एक वैज्ञानिक व्यायाम के रूप मे भी स्वीकार किया गया है।
यह शरीर के विभिन्न तंत्र जैसे-
मांसपेशी तंत्र
श्वसन तंत्र
पाचन तंत्र
हृदय तंत्र
तंत्रिका तंत्र
पर सकारात्मक प्रभाव डालता है।

सूर्य नमस्कार की संरचना-

सूर्य नमस्कार 12 आसनों की एक श्रृंखला है, जिनका अभ्यास क्रमबद्ध तरीके से किया जाता है। प्रत्येक आसन शरीर के अलग-अलग अंगों को सक्रिय करता है।

मुख्य आसन इस प्रकार हैं:

प्रणामासन

इस आसन में सीधे होके दोनों हाथों को नमस्कार मुद्रा में जुड़ना। मन को शांत करना और श्वास को नियंत्रित करना।
समान्य सुरक्षीत,लेकिन संतुलन की समस्या वाले लोगों को सावधानी रखना चाहिए।

हस्त उत्तानासन

दोनो हाथो को ऊपर उठाकर शरीर को पीछे की ओर मोड़ना।
इससे छाती और फेफडो का विस्तार होता है।
अधिक पिछे झुकना कमर में दर्द हो सकता है।

पदहस्तासन

इस आसन में झुककर हाथो से पैरो को छुना।
इससे रीढ की हड्डी और पैरो की मांसपेशियों में खिंचाव आता है।
स्लिप-डिस्क या गम्भीर कमर दर्द वाले लोग को सावधानी रखना चाहिए।

अश्व संचलनासन

इस आसन में एक पैर पीछे ले जाकर घटना जमीन पर रखना।
इससे जांघो और कुल्हो को मजबूत बनाता है।

संतुलन और लचीलापन बढ़ाता है धुलने की समस्या वाले लोगों को दर्द होता है।

दंडासन

इस आसन में शरीर को सीधा रखते हुए दोनों पैरो को पीछे ले जाते हैं
कंधे मजबूत शरीर की स्थिरता बढ़ाने है।
कमजोर कलाई या कंधे पर दबाव पड़ता है।

अष्टांग नमस्कार

इस आसन में शरीर के आठ अंगों को जमीन से स्पर्श कराना। छाती और बावजूद की शक्ति बढ़ाती है।
गर्दन या कन्धे की चोट में सावधानी आवश्यक।

भुजंगासन

इस आसन में छाती को ऊपर उठाना। रीढ की हड्डी का लचीलापन बढ़ाता है।
आधिक झुकने से कमर दर्द हो सकता है।

पर्वतासन

इस आसन में शरीर को उल्टे V आकर में लाना।पूरे शरीर की स्ट्रेचिंग रक्त संचार बेहतर बनाने है।हाई ब्लड प्रेशर या कलायी दर्द वाले व्यक्तियो के लिए कठिन हो सकता है।

अश्व संचलनासन

पैरो और कुल्हो का संतुलित व्यायाम शरीर का समन्वयक बेहतर होता है।घुटने पर अधिक दबाव पड़ सकता है।

पदहस्तासन
इस आसन में पीठ और पैरो में लचीलापन तनाव कम करने मे सहायता करता है।कमर दर्द वाले लोगों को धीरे-धीरे करना चाहिए।

हस्त उत्तानासन
इस आसन में झाती और फेफड़ो की झमता बढ़ती है शरीर में ऊर्जा का अनुभव होता है
ज्यादा पीछे झुकना में मांसपेशियों में खिंचाव हो सकता है।

प्रणामासन
इस आसन में शरीर और मन को स्थिर करता है अभ्यास का संतुलित समापन इसका कोयी नुकसान नहीं होता है।

सूर्य नमस्कार करने की विधि

सूर्य नमस्कार का अभ्यास सामान्यतः सुबह खाली पेट किया जाता है। अभ्यास करते समय शरीर को स्थिर और मन को शांत रखना आवश्यक है।

Not-सूर्य नमस्कार करने से 30 मिनट व्यक्ति को खाली पेट होना चाहिये तथा सूर्य नमस्कार करने के 30 मिनट बाद ही खाना चाहिए।
प्रत्येक आसन के साथ श्वास लेने और छोड़ने की विशेष विधि होती है।
उदाहरण के लिए-

पीछे झुकते समय श्वास लेना
आगे झुकते समय श्वास छोड़ना
संतुलन वाले आसनों में सामान्य श्वास लेना
नियमित अभ्यास से शरीर धीरे-धीरे इस प्रक्रिया के अनुकूल हो जाता है

शारीरिक लाभ-

सूर्य नमस्कार 12 शक्तिशाली योग आसनों का एक समूह है, जो संपूर्ण शारीरिक फिटनेस के लिए एक बेहतरीन व्यायाम है। यह शरीर को लचीला, मजबूत और ऊर्जावान बनाता है, वजन घटाने में मदद करता है, पाचन तंत्र सुधारता है, रक्त संचार बढ़ाता है, और तनाव कम कर मानसिक शांति प्रदान करता है। पारंपरिक योग का भाग।

सम्पूर्ण शरीर का व्यायाम-

सूर्य नमस्कार में शरीर के लगभग सभी अंग सक्रिय होते हैं। यह मांसपेशियों को मजबूत बनाता है और शरीर को लचीला बनाता है।

हृदय स्वास्थ्य में सुधार-

यह एक प्रकार का एरोबिक व्यायाम है, जिससे हृदय और रक्त संचार प्रणाली मजबूत होती है।

पाचन तंत्र में सुधार-

सूर्य नमस्कार से पेट के अंगों की मालिश होती है, जिससे पाचन क्रिया बेहतर होती है। पेट के आसनो की वजह से पाचन क्रिया सुधरती है गैस और कब्ज जैसी समस्याओं राहत मिल सकती है

वजन नियंत्रण-

नियमित अभ्यास से शरीर की अतिरिक्त चर्बी कम होती है।तेजी से कयी राउंड करने पर यह कैलोरी बर्न करती है जिससे वजन कम करने मे मदत मिलती है।

शरीर की लचीलापन बढ़ाना-

यह शरीर की मांसपेशियों और जोड़ों को लचीला बनाता है पूरे शरीर की मांसपेशियों (हाथ, पैर, पेट, पीठ) को स्ट्रेच और टोन करता है, जिससे शरीर में लचीलापन और मजबूती आती है।

त्वचा और बालों के लिए-

बेहतर रक्त संचार के कारण त्वचा में चमक आती है और बालों का झड़ना भी कम हो सकता है।

मजबूत रीढ़ की हड्डी-

यह रीढ़ की हड्डी को लचीला और मजबूत बनाता है।

हार्मोनल संतुलन-

यह शरीर के एंडोक्राइन सिस्टम को सक्रिय करता है, जिससे हार्मोनल संतुलन बना रहता है।

मानसिक लाभ –

सूर्य नमस्कार मानसिक स्वास्थ्य के लिए अत्यंत लाभकारी है, जो तनाव, चिंता और अवसाद को कम करने में मदद करता है। यह सांसों के तालमेल के साथ किया जाता है, जिससे एकाग्रता बढ़ती है, मन शांत रहता है, और शरीर में सकारात्मक ऊर्जा व खुशी का संचार होता है।

एकाग्रता और स्मरण शक्ति बढ़ाता है-

तनाव और चिंता कम करता है। मानसिक शांति प्रदान करता है। शोध के अनुसार सूर्य नमस्कार का अभ्यास मानसिक तनाव को कम करता है और मन को शांत करता है। इसमें नियमित अभ्यास बेहद जरूरी होता है जिससे ध्यान और एकाग्रता में वृद्धि होती है। सकारात्मक सोच को बढ़ावा देता है।

आत्मविश्वास में वृद्धि करता है-

विभिन्न आयु वर्गों के लिए महत्व

बच्चों के लिए-

शारीरिक विकास में सहायक एकाग्रता बढ़ाने में मददध्यान में वृद्धि, एकाग्रता और पढ़ाई में बेहतर प्रदर्शन।

युवाओं के लिए-

फिटनेस बनाए रखने में सहायक तनाव कम करता है मानसिक तनाव कम करने और काम के दबाव को प्रबंधित करने में सहायक। यह निर्णय लेने की क्षमता तेज करता है।

वृद्ध लोगों के लिए

शरीर को सक्रिय बनाए रखता है जोड़ों की गतिशीलता बढ़ाता है।मानसिक शांति और स्पष्टता के लिए हल्का और बेहतर होता है।
खाली पेट अभ्यास करना चाहिए।

सुबह के समय अभ्यास करना अधिक लाभकारी है।

इसमें पेट को आगे-पीछे मोड़ने और मोड़ने वाली मुद्राएं होती हैं। भरे पेट योग करने से पेट में ऐंठन, मतली, उल्टी या असहजता हो सकती है, और यह पाचन क्रिया में बाधा डाल सकता है, जबकि खाली पेट यह ऊर्जा और लचीलापन

चर्चा-

सूर्य नमस्कार को सम्पूर्ण शरीर व्यायाम इसलिए कहा जाता है क्योंकि इसमें शरीर के लगभग सभी अंग सक्रिय होते हैं। यह केवल मांसपेशियों को ही नहीं बल्कि श्वसन, पाचन और तंत्रिका तंत्र को भी प्रभावित करता है।

आधुनिक शोध यह दर्शाते हैं कि सूर्य नमस्कार नियमित शारीरिक व्यायाम के समान लाभ प्रदान कर सकता है। यह शरीर की ऊर्जा को बढ़ाता है और मानसिक संतुलन बनाए रखने में मदद करता है। आज के समय में जब जीवनशैली रोग तेजी से बढ़ रहे हैं, सूर्य नमस्कार एक सरल और प्रभावी उपाय के रूप में सामने आया है। इससे अनेक रोग जैसे-वजन घटाना,तनाव,उच्च रक्तचाप,मधुमेह,हार्मोन संतुलन तथा रीढ की हड्डी के रोग बेहतर बनाता है। सूर्य नमस्कार स्त्री,पुरुष बाल,युवा और वृद्ध सभी के लिए उपयोगी होता है।हालाँकि सूर्य नमस्कार के कई लाभ बताए जाते हैं, फिर भी कुछ शोधों में इसकी कुछ सीमाएँ भी बताई गई हैं।

पहली आलोचना यह है कि सूर्य नमस्कार को कभी-कभी अत्यधिक बढ़ा-चढ़ाकर प्रस्तुत किया जाता है। कुछ लोग इसे सभी रोगों का समाधान मानते हैं, जबकि वैज्ञानिक दृष्टि से यह पूरी तरह सही नहीं है।

दूसरी बात यह है कि यदि इसे गलत तकनीक से किया जाए तो कमर, कंधे या घुटनों में चोट लग सकती है। विशेष रूप से शुरुआती लोगों को प्रशिक्षित योग शिक्षक के मार्गदर्शन में अभ्यास करना

निष्कर्ष-

इस अध्ययन से यह निष्कर्ष निकलता है कि सूर्य नमस्कार एक सम्पूर्ण शरीर व्यायाम है, जो शारीरिक, मानसिक और आध्यात्मिक स्वास्थ्य के लिए अत्यंत लाभकारी है।

नियमित अभ्यास से मांसपेशियों की शक्ति, लचीलापन, हृदय स्वास्थ्य और मानसिक शांति में सुधार होता है। इसके साथ ही यह तनाव को कम करने और जीवन की गुणवत्ता को बढ़ाने में भी सहायक है।

यह शरीर की मांसपेशियों को मजबूत करता है, हृदय और श्वसन तंत्र को स्वस्थ बनाता है तथा मानसिक तनाव को कम करता है। नियमित अभ्यास से व्यक्ति का समग्र स्वास्थ्य बेहतर होता है। इसलिए सूर्य नमस्कार को दैनिक जीवन का हिस्सा बनाना चाहिए ताकि स्वस्थ और संतुलित जीवन प्राप्त किया जा सके।

हालांकि इसके कई लाभ है, लेकिन इसे सही तकनीक और मार्गदर्शन के साथ करना

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EFFECT OF SURYANAMASKAR ON FLEXIBILITY OF CRICKET PLAYERS

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Abstract

Background: The tremendous increase in the popularity of yoga has gained the interest in its effect on fitness among the cricketers. **Objective:** The objective of the project was to discover the influence of Suryanamaskar training on flexibility of Cricket players. For the present project a total of 30 Cricket players were selected from Lakshmibai National Institute of Physical Education, Gwalior the age of the subjects were comprise 19-21 years. **Methods:** The variables selected for the present project were Suryanamaskar training (independent variable) and flexibility (dependent variables). The flexibility data was obtained through pre and posttest. For the research experimental group design was used in which pretest was conducted before Suryanamaskar training and posttest was conducted after five weeks Suryanamaskar training and sit and reach test was used. For comparing flexibility pre and posttest descriptive analysis and independent t-test was applied at 0.05 level of significant. **Result:** The finding of the project revealed that there was significant difference between pre and posttest flexibility of Cricket players ($t=4.29$, $p<0.05$).

Conclusion: On the basis of findings it was concluded that the Suryanamaskar training may be beneficial for the enhance of flexibility of Cricket players.

Keywords: Suryanamaskar training, Flexibility, Cricket players

Introduction

Suryanamaskar is an ancient Indian tradition of giving homage to God when the sun rises in the morning through a series of physical poses with controlled breathing aiming for its physical, mental, and spiritual benefits (Parag and Manjunath, 2012). Suryanamaskar is a graceful unified performance of twelve poses with controlled breathing and relaxation. It reduces stiffness, refreshes the body, energizes the mind, and purifies the subtle energy channels. There have been several studies conducted on Suryanamaskar, and significant improvement in flexibility was noted. (Bhavanani et al., 2011; Choudhary & Krzytof, 2010; 2011; Saraswati, 2008).

Suryanamasker is the greeting to the God Sun, is also a part of Indian traditional yogic practices. Suryanamasker is the one of the healthiest practice of yogic practices. It has basically 12 exercise, each having different postures and they are act on the human body. It is making the human life as socially acceptable, mentally relaxed, physically fit, psychologically balanced, and spiritually awakened (Bhavanani et al., 2011; Saraswati, 2008). India has a rich tradition of yogic practices. Nowadays yoga, the ancient practice of postures, breathing, and meditation is getting a lot of attention from health care professionals. With increasing scientific research taking place in yoga, it's therapeutic properties are being examined too (Woodyard, 2011; Field, 2016).

The term Suryanamaskar is derived from two words “surya” which means “sun” and namaskar which means “salutation”. With respect to Suryanamaskar, surya is like flame and namaskar is like a reverence. Suryanamaskar is a continuous series of twelve physical movements. The alternating back and forward bending movements flexed and extended the spine to its maximum bending capacity often producing a total body treatment. It promotes rest and relaxation, improves muscle flexibility, strengthens abdominal muscles and promotes human organ performancxe etc (Field, 2016; Ross & Thomas, 2010). So many specialists have been found success on this front. Flexibility is the most critical factor that can affect a Cricket player's performance. Bowlers, batsman, fielders and wicket-keepers place significant emphasis on physical fitness factors and flexibility is the significant factor of fitness. It describes the utilization of your joints and their muscles, through their full range of motion (Stretch, 2003). Suryanamaskar is the combination of twelve asanas, holding and resting movements which is the fundamental factors of increasing the flexibility of multiple muscles and joints (Behm & Chaouachi, 2011). At today's competitions cricket players require greater preparation especially for the workout of fast bowlers, batsman, fielders

and wicket-keepers, it is true that significant emphasis is placed on each of the developing physical fitness factors (Phillips et al., 2010).

As such, the contemporary approach to keep into account each of the components of cricket as part of the total body and size of each cricketer and to provide an explanation of how far each of these components will help in the performance of a cricketer under match conditions (Haree, Dietrich, 1982).

Mantras of Suryanamaskar

After completing each round of Suryanamaskar and chanting Omkara with the sacred mantra in honour of Surya, or sun god, the Asanas each provide a mantra to pray to at the same time.

1. Om Mitraya Namah
2. Om Ravaye Namah
3. Om Suryaya Namah
4. Om Bhanave Namah
5. Om Khagaya Namah
6. Om Pusne Namah
7. Om Hiranyagarbhay Namah
8. Om Adityay Namah
9. Om Savitre Namah
10. Om Arkay Namah
11. Om Bhaskaraye Namah
12. Om Savitrasurya Narayanaya Namah (Saraswati, 2008; Iyengar, 1966).

The study included the total of 30 male cricket players, who consisted of batsman, bowlers, fielders, and wicket keeper with the ages of 19-21 years studying in the department of physical education, Lakshmibai National Institute of Physical Education, Gwalior were selected as subjects.

Materials and Methods

Study Design

This project was conducted to examine whether practicing Suryanamaskar can improve flexibility in male cricket players using a randomized controlled trial design. In this design, participants were divided into two groups: an Experimental Group that performed Suryanamaskar training and a Control Group that continued their regular activities without Suryanamaskar practice. This arrangement helped ensure that any changes in flexibility could be attributed mainly to the training program rather than other factors. Flexibility was measured twice for all participants: once before the start of the 5-week training period (pretest) and once after its completion (posttest). Comparing the pretest and posttest scores between the two groups allowed us to observe both within-group changes and differences attributable to the Suryanamaskar intervention.

Participants

At the initial stage, male cricket players aged approximately 19 to 21 years from a physical education institute were approached to participate in the project. All players were actively involved in cricket training and general physical activity, making them suitable for yoga-based exercise without undue risk. The aims and procedures of the study were clearly explained, and voluntary informed consent was obtained from each participant. Players with recent musculoskeletal injuries, major health issues, or conditions that could interfere with safe yoga practice or influence flexibility measurements were excluded from participation. After screening, 30 eligible cricket players were selected and enrolled in the study.

Sample Size and Group Allocation

The final sample consisted of 30 male cricket players, who were randomly allocated into two equal groups to reduce selection bias. Fifteen players were assigned to the Experimental Group (Suryanamaskar Group), and fifteen players were assigned to the Control Group. The Experimental Group participated in the Suryanamaskar training program in addition to their usual cricket-related activities, while the Control Group continued only with their regular routine without any added yoga training. Having 15 participants in each group provided a manageable and balanced sample for comparing the effects of the intervention on flexibility between groups over the 5-week period. **(Table 1)**

Table 1 : Groups

Groups	Participants
Experimental Group	15
Control Group	15

Training Protocol

The Experimental Group followed a structured Suryanamaskar training program for 5 weeks under supervision. Training sessions were conducted on selected days each week and included a standard warm-up, followed by multiple rounds of Suryanamaskar involving forward and backward bending, stretching, and coordinated breathing, and ended with a short cool-down. Emphasis was placed on correct posture, controlled movement, and proper breathing patterns during each round. Session duration and frequency were kept consistent throughout the 5-week period, and attendance was monitored to ensure adequate exposure to the training. The Control Group did not perform Suryanamaskar and continued their usual cricket practice and physical activities without any additional intervention. **(Table 2)**

Table 2: Training Protocol

S.No.	Yogic Practices	Duration	Weeks
1	Warm up Loosening exercises Jumping Jacks High knees Butt Kicks Dynamic Squats Forward Lunges	10 minutes	
2	Suryanamasker	12 rounds / 16 minutes	1-3
3	Suryanamasker	12 rounds / 12 minutes	4-5
4	Cool Down Meditation	5 minutes	

Data Collection

Flexibility was selected as the primary outcome measure and was assessed for all 30 participants using the sit-and-reach test. Each player completed the test once before the start of the Suryanamaskar program (pretest) and once after the 5-week period (posttest), regardless of group. During the test, players sat with their legs extended, reached forward along a measuring scale, and the best attempt was recorded in centimetres. Testing was conducted under similar environmental conditions and at approximately the same time of day to reduce variability. The pretest and posttest scores for both the Experimental Group and the Control Group were recorded in a data sheet and later used for statistical analysis to compare changes within each group and differences between the two groups in flexibility.

Training Protocol

The intervention in this project consisted of a structured Suryanamaskar training program carried out over a period of 5 weeks. Participants attended supervised training sessions on selected days each week, during which they practiced a series of Suryanamaskar rounds that included forward and backward bending, stretching, and coordinated breathing. Each session began with a brief warm-up, followed by the main Suryanamaskar practice and a short cool-down. The total duration of each training session was kept consistent, and players were instructed to maintain proper posture and breathing throughout the practice. Attendance was recorded regularly to ensure that all participants completed the majority of the prescribed sessions during the 5-week period.

Statistical Analysis

The collected data were calculated through descriptive and inferential statistics. Pretest and posttest flexibility scores in the Experimental and Control Groups were also summarized using descriptive statistics (mean and standard deviation) so that the information is quantified. A independent t-test was used to find out the outcome of the 5 weeks Suryanamaskar training programme. The experimental and control group posttest flexibility scores were compared with an independent samples t-test (two-sample, which makes equal variances) to compare the scores of the two groups. The descriptive statistics and t-test were therefore used in the study to identify the effect of Suryanamaskar training programme on male cricket players in terms of flexibility.

Result

The physical characteristics (Figure 1) of the male cricket players investigated in the study were categorized into two groups (Experimental Group, consisting of those who performed Suryanamaskars, and Control Group). There were no significant differences in age, height, body weight, and pre-test flexibility scores between the two groups at baseline ($p > 0.05$). Therefore, both groups were equivalent prior to any intervention that they would receive.

A total of 30 cricketers were screened and enrolled in this trial, all of whom met the criteria to participate in the study and were randomly assigned to one of two groups with 15 male subjects in each group for a total of 30 participants at the start of the study. All subjects adhered to their training programmes for the entire 5-week training intervention; thus, they participated in the study and did not drop out or experience any adverse events. All 30 subjects' data were therefore considered in the overall analysis.

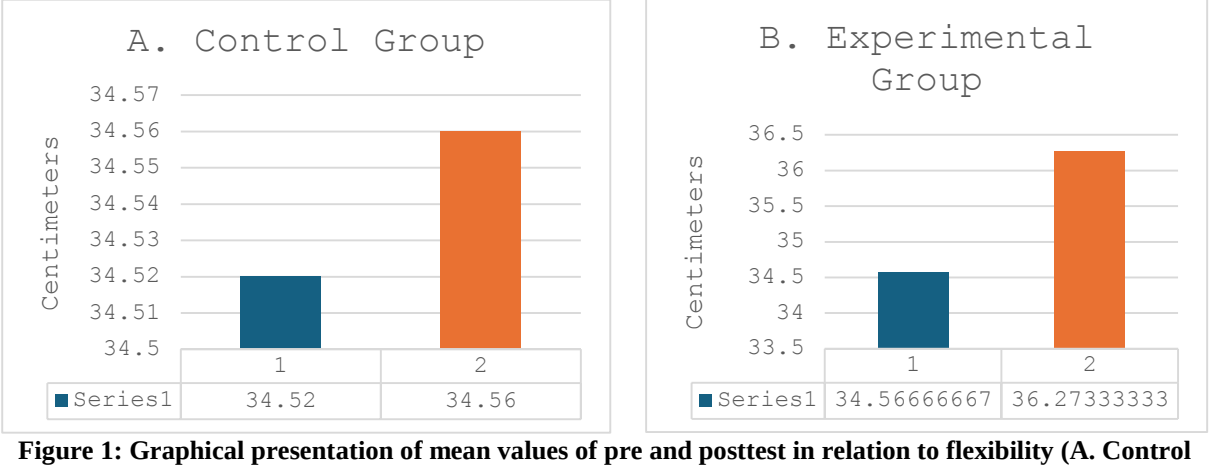

Figure 1: Graphical presentation of mean values of pre and posttest in relation to flexibility (A. Control Group and B. Experimental Group)

According to Table 3 the total change in flexibility following the 5 week Suryanamaskar training programme. The Experimental Group showed significant improvement in flexibility over the Control Group following this Suryanamaskar training programme. Specifically, the mean (36.27) post-test flexibility score for the Experimental Group was significantly higher than that of the Control Group (34.56).

Statistical analysis using an independent samples t-test yielded a significant difference between the mean flexibility scores for both groups ($t = 4.29$, $df = 28$, $p = 0.000$); the p-value falls well below 0.05 significance. his shows that the improvement seen in the Experimental Group was not by chance.

There is an increase in range of motion after the Suryanamaskar training. The effect size, calculated using the variance showed that the training program had a moderate to large effect on flexibility performance. On the hand the Control Group, which kept doing their regular cricket activities without yoga did not improve much in flexibility. The results were not statistically significant ($p > 0.05$). In general the results show that the Suryanamaskar training had a positive effect on the flexibility of male cricket players over 5 weeks. The Suryanamaskar training helped improve flexibility. The findings also highlight the importance of Suryanamaskar training for cricket players. Suryanamaskar training is good, for flexibility.

Table 3: Comparative statistics of pre and posttest of flexibility

Group	N	Mean	SD	df	t-stat	p-value
EG	15	36.27	1.35	28	4.29	0.00
CG	15	34.56	0.75	28		

t(28)=4.29

Discussion

The study we did shows that a 5-week Suryanamaskar training program can really help male cricket players become more flexible. We found a difference between the group that did Suryanamaskar and the group that just kept practicing cricket as usual. The group that did Suryanamaskar was more flexible after the 5 weeks. The group that just practiced cricket did not get more flexible. This tells us that Suryanamaskar can be an addition to regular cricket training. It can help players move better and be more efficient. Suryanamaskar has lots of movements that help stretch the muscles and make the joints more mobile. It stretches the hamstrings, hip flexors lower back shoulders and calf muscles.

These movements help the muscles and tendons become more elastic. They also help the joints move easily and the muscles work better together. Flexibility is very important in cricket. Players need to be flexible to bowl, bat, field and keep wickets. Even a small improvement in flexibility can make a difference in how well a player performs and how often they get injured. We also found that just practicing cricket is not enough to make players more flexible. Cricket training usually focuses on skills, strength and endurance.. It does not always help players move their joints through their full range of motion. Suryanamaskar helps with this. It provides a way to stretch and improve flexibility. The deep breathing that is part of Suryanamaskar also helps. It can improve blood flow to the muscles reduce muscle tightness and make it easier to stretch. Over the 5 weeks these changes added up. Finding is in agreement with the result of Choudhary and Krzytof, (2010) and Sankar and Pancholi, (2011). Yoga asana were also shown to improve flexibility and health perception (Cowen and Adams, 2005).

The findings are similar to studies that have shown that yoga can help athletes become more flexible and fit . Our study shows that Suryanamaskar can be especially helpful for cricket players. It is a cost and low-impact way to improve flexibility. This is especially helpful for players who do not have access to training equipment or physiotherapy. Being more flexible can also help reduce the risk of injury. Many cricket players get hurt because they are not flexible enough. They get hamstring strains, lower pain and shoulder stiffness.. If they are more flexible they can move more easily and smoothly. This reduces the stress on their muscles and ligaments. Overall our study shows that Suryanamaskar can be an addition to cricket training. It can help players become more flexible and perform better. Suryanamaskar can be a tool, for cricket players who want to improve their flexibility and reduce their risk of injury.

Limitations

Thus study was limited. We only studied a group of players for 5 weeks. Future studies could look at longer training periods. Include other types of physical fitness like strength and agility. They could also compare Suryanamaskar to types of flexibility training.

Future Recommendations

A bigger sample size that consists of more varied athletic groups, such as the cricketers of multiple competitive levels, age groups, and both genders, should be used in future studies on the impacts of the Suryanamaskar training. The extension of the demographic population would enhance the normalisability of the results and offer a more profound idea of how yogic interventions impact the flexibility and overall performance in a wide range of sporting settings. The long term outcomes of the Suryanamaskar practice of more than five weeks should also be researched to find out whether improvements in flexibility may be progressive, plateau or cause other physical fitness parameters, including strength, agility, balance, and coordination. Longitudinal research would make it clear if the benefits are sustainable and what the best length of time is to train the staff. Also, in future studies, the sport-specific performance measures, including the speed of bowling, range of motion during batting, hitting accuracy, speed of sprints between wickets, and the performance of agility, may be considered. The study involving biomechanical and physiological measurements, and psychological ones, including focus, stress management, and recovery perception,

would give a better insight into the role of yogic training in the overall performance in cricket. Individualized programs can enable the athletes to focus on the flexibility limits of certain joints like shoulders, hips, hamstring and lower back that are important in playing cricket.

Conclusion

The results of the current research study reveal that Suryanamaskar training is a viable secondary programme to enhance the flexibility of pure male cricketing players. There was a statistically significant difference between the Experimental and Control Groups in the sense that the latter improved in terms of flexibility more than the former did. Suryanamaskar is a comprehensive and realistic approach of physical conditioning utilizing a combination of dynamic stretching, regulated breathing and a programmed movement patterns. Being a cost-effective, equipment-free and low-impact type of training, it can be readily incorporated into the area of regular cricket training. Enhanced mobility can optimize the movement, decrease muscle rigidity and minimize the possibility of frequent injuries in cricket. The findings generally indicate that Suryanamaskar should be incorporated as an add-on to the contemporary sports conditioning programme of cricketers. Nonetheless, the possibility is to recommend further studies involving bigger sample, more varied, extending the period of intervention, and sport specific performance estimated with the aim to enhance the evidence base and best implement it into training competitive sports.

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A REVIEW STUDY ON THE EFFECTS OF PRANAYAMA ON SHOOTING PERFORMANCE

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Abstract

Shooting performance depends critically on respiratory control, autonomic stability, and psychological composure, as even minor thoracic movement or fluctuations in arousal can affect shot accuracy. This review synthesizes current evidence on the role of pranayama as a structured respiratory intervention for enhancing rifle and pistol shooting performance. Pranayama, involving controlled inhalation (puraka), exhalation (rechaka), and breath retention (kumbhaka), offers a systematic method for optimizing ventilation mechanics and autonomic regulation.

The reviewed literature indicates that slow, regulated breathing enhances parasympathetic activity, improves heart rate variability, strengthens respiratory musculature, and stabilizes cardiovascular responses. Neurophysiological findings further suggest modulation of cortical and limbic networks associated with attentional control, emotional regulation, and stress reduction. Empirical studies involving shooters and comparable athletic populations report improvements in breath-holding capacity, lung function, anxiety management, and shooting accuracy following structured pranayama practice.

Overall, pranayama is scientifically sound and a performance-relevant adjunct for improving physiological steadiness and cognitive clarity in shooting sports. However, further sport-specific randomized controlled trials are required to establish standardized training protocols and confirm long-term performance benefits.

Key words: shooting, pistol, rifle, physiology, pranayama, respiratory mechanics.

1. Introduction

Shooting is an aim-based competitive sport requiring the use of pistols and rifles of various ranges to fire bullets or pellets toward a target, with the objective of achieving maximum points through accuracy. Since even minor disruptions can influence shot placement and scores, the sport demands strict control over breathing, stable posture, intense focus, and psychological composure. The discipline emphasizes mental clarity and fine motor coordination rather than physical strength. Shooting is governed internationally by the International Shooting Sport Federation (ISSF) and is practiced in multiple disciplines, including rifle, pistol, and shotgun events.

The key to a successful shooting performance is to maintain a solid stance with your body and keep your mind calm and focused. The natural movements of inhaling and exhaling lead the chest and rifle to move slightly vertically, which makes it difficult to discharge a shot precisely. For this reason, breathing is very important. Shooters regulate their breathing at the final moment of a typical exhalation to prevent such movements and preserve stability and accuracy when aiming. However, prolonged and frequent breath holding can result in oxygen deficiency, which can cause muscle tremors, visual disturbance, loss of concentration, and involuntary diaphragmatic movements that impair accuracy. It can also make you feel exhausted after exhaling, making it difficult to find stability for every shot. Well-controlled breathing patterns that strike a balance between physiological demands and technical accuracy in order to prevent such situations.

In this context, pranayama- a yogic practice of breath regulation and a beneficial tool for teaching respiratory manipulation- helped the shooters to enhance performance. Research indicates that pranayama has demonstrated numerous positive effects on the body and mind by improving oxygen intake. (Jerath R, 2006)and it also affects the central nervous system and reduces reaction time, which benefits the body and mind by improving oxygen absorption. Therefore, it becomes crucial to investigate how pranayama affects shooting performance. Understanding its impact may assist in evaluating whether structured breathing exercises can improve physiological stability, mental focus, and overall shooting accuracy. Pranayama-based breathing techniques could be methodically included in current shooting training programs if they are shown to be advantageous, acting as a useful supplementary tool to raise shooters' competitive consistency and performance.

2. Aims and objectives of this study

The aim of this review paper is to critically examine and summarize available research evidence on the role of pranayama in enhancing rifle and pistol shooting performance, with emphasis on breath regulation, mental control, and performance consistency.

3. Breathing and Shooting Performance

As breathing directly affects postural stability, neuromuscular coordination, and mental attention, it is essential to shooting performance. Effective breathing techniques are essential for maintaining postural stability, fine motor control, and shot accuracy in shooting sports. Controlled modulation of the thoracic cavity's pressure-volume relationship is crucial during the targeting and triggering phases of breathing. The diaphragm and external intercostal muscles contract during inspiration, increasing thoracic volume, which lowers intrapulmonary pressure and permits air to enter the lungs. Excessive chest movement at this stage, however, may cause problems with visual stability and body alignment. Shooters usually coordinate the shot during a brief breathing pause after passive expiration, when the diaphragm is relaxed, thoracic volume is steady, and intrapulmonary pressure matches air pressure. The diaphragm relaxing and the ribs moving downward during expiration lower the thoracic volume, which permits air to leave the lungs and encourages muscle relaxation. This regulated breathing pattern improves neuromuscular coordination, reduces physiological tremors, and stabilizes the rifle or pistol. Therefore, mastering ventilation mechanics is essential to attaining accuracy, consistency, and peak performance in shooting disciplines. (William D. McArdle, 2023)

4. Pranayama Concept and Physiological Basis

The concept of pranayama originates from classical yoga philosophy, particularly from the Yoga Sutras of Patanjali, where it is defined as the deliberate control of inhalation (*puraka*), exhalation (*rechaka*), and breath retention (*kumbhaka*). Unlike normal breathing, pranayama emphasizes slow, deep, and rhythmic respiratory patterns that aim to harmonize bodily functions and stabilize mental activity. It has been interpreted as a combination of the words prana + ayama, and also as a combination of the words prana + yama. The word ayama means 'expanding the dimension', so in the first sense, pranayama means expanding the dimension of prana. The word yama means 'restraint' or 'control', so here pranayama refers to the control or restraint of prana. (Saraswati, 2009). Pranayama consists of three component Puraka (Inspiration), Kumbhaka (breath retention), and Rechaka (Expiration).

a. **Puarak:** The respiratory and cardiovascular systems undergo significant physiological changes as a result of puraka, or inspiration. Thoracic volume rises with gradual, controlled inspiration, which lowers intrapulmonary pressure and facilitates effective air entry into the lungs. Better oxygen supply to bodily tissues is the outcome of this process, which also increases alveolar ventilation and oxygen uptake. Puraka enhances cardiac filling and permits more myocardial relaxation at the circulatory level by lowering heart rate and lengthening the diastolic period. The ensuing systolic contraction improves blood circulation by becoming more efficient. A condition of calm alertness is also produced; physiological arousal is decreased, and parasympathetic activity is encouraged via controlled inspiration. (Dr. Kanchan Joshi, 2017) (William D. McArdle, 2023)
b. **Rechaka:** Rechaka is a slow, controlled expiration technique that improves respiratory efficiency by allowing carbon dioxide and air to be expelled from the lungs more effectively. Extended exhalation promotes a change in parasympathetic nervous system activity and progressively lowers intrathoracic pressure. As a consequence, there is a drop in heart rate, physiological arousal, and muscle tension. In addition to increasing ventilatory efficiency, controlled expiration also helps to stabilize internal physiological circumstances, which promotes general relaxation and energy conservation. (Dr. Kanchan Joshi, 2017) (William D. McArdle, 2023)
c. **Kumbhaka:** Kumbhaka is characterized by transient dyspnea, which causes the blood's oxygen content to gradually drop and its carbon dioxide content to rise. Increased carbon dioxide improves cerebral circulation and awakens latent capillaries by causing vasodilation, especially in cerebral blood vessels. This improves the brain tissues' ability to use oxygen and exchange gases efficiently. Additionally, Kumbhaka improves respiratory control and internal physiological stability by teaching the nervous system to withstand elevated carbon dioxide levels. (Dr. Kanchan Joshi, 2017) (William D. McArdle, 2023)

5. Psychological Effects of Pranayama

From a physiological perspective, pranayama functions as a form of respiratory neuromodulation capable of influencing autonomic, cardiovascular, pulmonary, and central nervous system activity. Scientific evidence indicates

that slow and controlled breathing techniques enhance parasympathetic nervous system activity while reducing sympathetic dominance, thereby improving autonomic balance. (G K Pal, 2004). This shift toward vagal predominance has been associated with reductions in resting heart rate, improved heart rate variability (HRV), and decreased blood pressure in both healthy and hypertensive individuals. (Thanalakshmi J, 2020 May)

Regular practice of pranayama has also demonstrated beneficial effects on cardiovascular efficiency through improved baroreflex sensitivity and respiratory–cardiac synchronization, leading to reduced myocardial oxygen demand. Additionally, controlled breathing patterns increase tidal volume and reduce respiratory frequency, resulting in enhanced alveolar ventilation and improved pulmonary function. (Singh V, 1990).Neurophysiological studies further suggest that pranayama may influence activity in brain regions such as the prefrontal cortex and amygdala, which are involved in emotional regulation and stress response. (Novaes MM, 2020)

6. Psychological Effects of Pranayama

Pranayama, defined as the voluntary regulation of breathing through controlled inhalation, exhalation, and breath retention, has been increasingly recognized for its influence on psychological functioning, particularly in the domains of stress regulation, anxiety reduction, emotional control, and cognitive performance. Emerging psychophysiological research suggests that pranayama exerts its psychological effects primarily through modulation of autonomic nervous system activity and respiratory-linked neural pathways. Slow and rhythmic breathing practices are known to enhance parasympathetic activity while attenuating sympathetic arousal, thereby reducing physiological stress responses and improving emotional stability. (Brown, 2005).This shift toward vagal predominance contributes to improved emotional regulation and resilience to stress-induced psychological disturbances.

Neurophysiological investigations further support these findings. A randomized controlled trial conducted by (Novaes MM, 2020)demonstrated that regular practice of Bhastrika pranayama significantly reduced anxiety levels and altered functional connectivity in brain regions such as the amygdala, anterior cingulate cortex, and prefrontal cortex, which are critically involved in emotional processing and executive control. Similarly, (Streeter, 2012) reported increased gamma-aminobutyric acid (GABA) activity following yoga-based breathing interventions, suggesting a neurochemical mechanism underlying mood stabilization and anxiolytic effects.

Recent systematic reviews and meta-analyses have provided further empirical support for these observations. (Zaccaro, 2018) reported that slow-paced breathing significantly reduced perceived stress and anxiety by improving heart rate variability (HRV), an established marker of autonomic regulation and psychological adaptability. In addition, (Laborde, 2017)concluded that voluntary breath regulation techniques are associated with enhanced cognitive functioning and mood stabilization, mediated by improved vagal tone and prefrontal cortical activity. A meta-analysis by (Russo, 2017) further demonstrated that slow breathing interventions significantly decreased state anxiety levels and improved attentional control by modulating amygdala hyperactivity and enhancing cortical inhibition mechanisms involved in stress reactivity.

7. Review of Previous Studies

Numerous studies have looked at how pranayama, when paired with other yoga techniques, might improve physiological and psychological factors that are directly linked to performance in sports.

A study (Patel, 2021)investigated the effect of selected pranayama on breath-holding capacity in rifle and pistol shooters. Thirty female players aged 15–30 years from the Ahmedabad Rifle Club participated in an eight-week pranayama training program. The results showed a significant improvement in breath-holding capacity in the post-test compared to the pre-test at the 0.05 level, indicating that pranayama training effectively enhances respiratory control in shooting players.

Another study (Karaduman, 2022) found that pistol shooting performance is positively related to respiratory muscle strength and pulmonary function in police cadets. Significant correlations were observed between shooting scores and inspiratory–expiratory muscle strength, as well as lung capacity measures. The findings indicate that efficient respiratory function is an important factor for better shooting performance, highlighting the relevance of breathing-based interventions.

A study (Smriti Kapoor1, 2008)found that a 3-week training program combining pranayama and kriya significantly improved breath-holding time, lung function, and shooting performance in 30 Indian Army shooters compared to a control group, demonstrating the effectiveness of these yogic practices for enhancing shooting performance.

8. Conclusion

The findings of this review substantiate pranayama as a strategically relevant intervention for shooting athletes. Precision shooting demands optimal synchronization between respiration, neuromuscular control, and psychological stability. Pranayama directly targets these domains by enhancing ventilatory efficiency, autonomic balance, respiratory muscle control, and emotional regulation.

By reducing physiological tremors, improving oxygen utilization, stabilizing heart rate, and promoting attentional steadiness, pranayama aligns closely with the biomechanical and psychological requirements of rifle and pistol shooting. Empirical evidence supports its role in improving breath-holding capacity, pulmonary function, anxiety regulation, and performance consistency.

However, the current research base is limited by methodological variability and short intervention durations. Future investigations should employ rigorous experimental designs, larger samples, and standardized breathing protocols tailored specifically to shooting disciplines.

In conclusion, pranayama represents a low-cost, non-invasive, and scientifically grounded training modality with substantial potential to enhance competitive shooting performance when systematically integrated into structured training programs.

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THE RISE OF INDIGENOUS SPORTS THROUGH KHELO INDIA AND THEIR CHANCES OF BEING INCLUDED IN THE OLYMPIC GAMES IN THE NEAR FUTURE

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Abstract

This paper checks the importance of India's indigenous sports and the role of Khelo India scheme in promoting and uplifting the indigenous games and promoting India's global sporting ambitions. Few indigenous games like kabaddi, Kho- Kho, malkhamb are deeply engraved in India's cultural heritage and knowledge system. They are useful in developing physical fitness, discipline, character building and overall wellbeing. These games were prevalent in the ancient and the medieval history of India but unfortunately due to the colonial inversion they lost their charm. In the recent times various government scheme programmes and leagues have been adopted to revitalize these indigenous games. Recently the Khelo India scheme has played a pivotal role in finding grass root talent development of the infrastructure and promotion of the indigenous games. The government is continuously working to provide the funding, training and infrastructure to the athletes. This paper also discusses the international Olympic committees' criteria for the Olympic inclusion and also highlights the challenges faced y the indigenous games. However, games like kabaddi, kho-kho, Yogasana have strong potential for the future Olympic inclusion. The study concludes that strong And sustained government policies promotion can change indigenous sports into globally played professions. It will also strengthen India's aspiration in becoming global sporting power

Keywords: - Indigenous games, Olympics, Khelo India, Kho- Kho, kabaddi, Yogasana malkhamb

About Khelo India

Sports and fitness have a priceless place in a person's life. Participating in sports fosters teamwork, leadership, goal-setting, risk-taking, and strategic and analytical thinking. A strong nation and an equally healthy society are the results of a fit and healthy individual. The whole development of our country is greatly influenced by sports. India has made consistent strides in sports during the past few years. This enormous potential must be displayed on a worldwide scale. It's time to develop youthful talent, provide them with the best facilities, and offer them the best training possible. In order for athletes to show off their full potential, we must foster a strong sense of engagement in sports. Only then would India be able to fulfil its ambition of becoming a sports super power.

Indigenous Sports

Deeply rooted in customs and cultural legacy, indigenous sports and games in India provide a variety of physical activities for people, especially kids. The historical roots and current relevance of Traditional Indigenous Sporting Games (TISG) are examined in this analysis, with a focus on how they support character development and overall wellness. Kancha (marble), Spinning Top, Hide and Seek, Hopscotch, Thoda, Gatka, Kalarippayattu, and Silambam (a type of staff fencing) are examples of ancient indigenous sports that are timeless and widely popular across the country.

These activities provide a special fusion of character development and physical fitness. These games, which are frequently practiced in rural and open areas, give kids the chance to play physically while developing critical abilities like resilience, coordination, and teamwork. Fundamental principles that are echoed in ancient Indian books such as the Vedas, Upanishads, Ramayana, and Mahabharata are ingrained in these indigenous sports. A community can foster a sense of cultural identity and pride while also advancing children's holistic development by embracing and revitalizing these indigenous sports. In addition to increasing their physical fitness, children who actively participate in these traditional indigenous games also get important character-building experiences that support their general wellbeing and personal development.

History of Kabaddi

Beginning around 1930, the current game of Kabaddi was played throughout India and some regions of South Asia. In 1921, Maharashtra created the earliest known set of regulations for Kabaddi, an Indian native sport, based on the combined Sanjeevani and Gemini patterns for Kabaddi tournaments. The regulations drafted in 1921 were then

modified by a committee that was established in 1923. The 1923 All India Kabaddi. Tournament was held under the revised regulations. The Senior National competition began in 1952, while the All India Kabaddi Federation was established in 1950 to oversee the game's promotion.

The Indian Kabaddi Federation of India (AKFI), a new organization associated with the Indian Olympic Association (IOA), was founded in 1972 with the goal of popularizing the sport in India and its Asian neighbours. Following the establishment of this organization, Kabaddi underwent a transformation, and national championships for junior and sub-junior boys and girls began. The first Asian Kabaddi Championship took place in 1980, and it was featured as a demonstration game during the 9th Asian Games in New Delhi in 1982. India has made history in Indian sports by capturing five gold medals in a row at the Asian Games, which were held in Hiroshima in 1994, Bangkok in 1998, Busan in 2002, and most recently in Doha in 2006. India defeated Iran in the championship match to win the first World Cup. In 2007, Panvel, India hosted the second World Cup, and India once again became Champion. India took up the gold medal at the First Asian Women's Championship in Hyderabad in 2005. In 2006, women's kabaddi made its debut at the South Asian Games in Colombo, Sri Lanka.

The 15th Asian Games in Doha offered a fantastic chance to introduce Kabaddi to the large number of Europeans and Australians who helped organise the Asian Games. Kabaddi has benefited greatly from this favorable publicity for its future growth in the continents of Europe, USA, Australia and Africa. The 2nd Asian Indoor Games, which took place in Macau from October 25 to November 3, 2007, featured Kabaddi. The sport has become more engaging and beneficial for competent players who can now overcome bigger players with improved abilities and methods because to the advent of mats, shoes, new techniques, and rule revisions.

Kho Kho

The sport's domestic and international visibility has significantly increased over the past ten years, thanks to the support of the Kho Kho Federation of India (KKFI). Currently, it is played in schools throughout India, has a presence in more than 55 nations on all six continents, and is present in more than 680 districts. Due in large part to the KKFI's organization of the 2022 launch of the Ultimate Kho Kho League, the game has become increasingly popular among audiences of all ages, especially Gen Z. Athletes have found great inspiration in the grants and honors that the federation bestows, including the Bharat Award, the Abhimanyu Award, the Janaki Award, the Rani Laxmibai Award, and the Ekalavya Award. These are in addition to the government-instituted major national awards like as the Dronacharya Award, Khel Ratna, and Arjuna Award. Kho Kho is becoming more and more regarded as a viable career option, comparable to other popular sports that provide both cash incentives and public recognition.

Mallakhamb

The term "Mallakhamb" refers to a little-known physical culture performed in India. First mentioned in the Manasollasa (1135 AD), Mallakhamb originated in the Indian state of Maharashtra. This game was first played by others in the 17th century according to Shri. Balambhatta Dada Deodhar. Mallakhamb comes in a variety of forms, including pole, rope, hanging, Niradhar (without support), on a cane, on a floating platform, and with weapons, among others. As part of the National Gymnastics Championships, the Gymnastics Federation of India held the Mallakhamb. First National Championships in Gwalior, Madhya Pradesh, in 1962.

The Mallakhamb game was added to the All India Inter-university Gymnastic Championship in 1968–69. On January 29, 1981, the Mallkhamb Federation of India was established during the Mallkhamb championships. Since then, many Mallakhamb state associations that are linked with MFI have been hosting the National Mallakhamb championships for men, women, girls, and boys of all ages. SGFI includes Mallakhamb in the 2008–09 National School Games. Up to 2015, various Indian states had hosted 35 national championships for Mallakhamb players of various ages. However, despite mallakhamb's extraordinary and growing popularity in recent years, surprisingly little research has been done in this particular field.

Kalaripayattu

The word "kalari" in Malayalam, the language spoken in Kerala, refers to a particular type of gymnasium where the martial art is practiced, which is based on the concept of a sound body and sound mind. Because of its excellent system of physical training, effective armed and unarmed self-defense techniques, training for excellent flexibility for physical and mental strength, and its foundation in Dravidian Indian culture, it is one of the oldest and most comprehensive art forms in India, if not the world. All martial arts are said to have their roots in Kalaripayattu. From the misty mountains to the serene backwaters, the spirit of resilience and discipline has long been nurtured, finding

its most profound expression in Kalaripayattu.

Background

An important turning point in the history of sports and physical education occurred during India's ancient period, specifically during the early Vedic era, which lasted from roughly 1500 BCE to 500 BCE. With an obvious reflection of the socio-religious ethos of the time, this era speaks eloquently about the incorporation of physical activities into daily life, education, and religious activities. Between 200 BCE and 500 CE, India's Classical Period saw a shift in the history of physical education and the growth of sports. It was marked by a combination of intellectual development, spiritualism, and the emergence of the country's culture under several dynasties, including the Maurya, Gupta, and Southern Kingdoms of Chola and Pallava. Between 500 and 1500 AD, India saw the rise of numerous powerful empires, such as the Gupta, Chola, and Mughal empires, in addition to numerous local kingdoms. Due to societal structures, military requirements, and cultural exchanges, significant progress had been made in the fields of physical education andsports development throughout that era. The British colonial rule had a significant impact on the development of sports and physical education throughout India's Colonial Period, which lasted from the 1600s until the country's independence in 1947. Following India's independence, from 1947 onwards, physical education and sports saw a spectacular phase of development that saw growing connections to international sports, institutionalisation at the national level, and integration into educational institutions. The diversity and depth of India's sports culture have been greatly enhanced by these historical layers, which also highlight the significance of physical education in light of the country's realization of its identity and standing abroad.

The Khelo India Initiative: Goals And Indigenous Sports

By creating a solid foundation for all sports performed in our nation and establishing India as a great athletic nation, the Khelo India program aims to revitalize sports culture in India at the grassroots level. Launched in 2016–17, the 'Khelo India – National Programme for Development of Sports' aimed to promote excellence nationwide and encourage widespread participation. The program was redesigned and authorized for a three-year period, from 2017–18 to 2019–20. During the COVID-19 pandemic, it was granted a one-year extension till 2020–21. It has undergone yet another revision and been prolonged for five more years, from 2021–2022 to 2025–2026. The following five elements make up the scheme:

1. Building and Improving Sports Facilities.
2. Athletic Events and the Development of Talent.
3. Sports Academies and Khelo India Centers.
4. The Fit India Movement.

Promotion of Indigenous Sports Across India

The Khelo India Scheme's "Promotion of Rural and Indigenous Games" sub-component is especially focused on the growth and advancement of these types of games across the nation. Mallakhamb, Kalaripayattu, Gatka, Thang-Ta, Yog asana, and Silambam are indigenous/traditional games that are part of the yearly Khelo India University/Youth Games and have been identified for promotion under this component. Under this component, grants are approved for the construction of infrastructure, equipment assistance, coach appointments, coach training, and scholarships for the designated athletes.

Push From Ministry Of Youth Affairs And Sports

Mallakhamb, Kalaripayattu, Gatka, Thang-Ta, Yog asana, and Silambam are the six indigenous games that have been selected for promotion under the Khelo India Scheme's "Promotion of Rural and Indigenous Games" sub-component and have been included in the Khelo India Games. Since "sports" is a state subject, it is primarily the responsibility of the respective State/Union Territory Governments to develop sports, including improving sports facilities in remote and rural tribal areas. The Union Government only helps them by filling in important gaps. Current Development and Commercialization. 1. Media exposure and professional leagues

The financial trajectory of traditional Indian sports underwent a radical change with the establishment of the Pro Kabaddi League (PKL) in 2014. PKL turned Kabaddi into a prime-time television extravaganza by introducing high production standards, player auctions, celebrity endorsements, and international transmission with the help of STAR Sports and corporatesponsors. Similar to this, the Ultimate Kho Kho League, which debuted in 2022, uses a franchise- based concept modeled after the Indian Premier League (IPL) to modernize and professionalize the Kho-Kho sport. These leagues revitalize local talent pools by drawing young audiences and creating job chances for

athletes in remote areas. 2. Government Programs and Assistance with Policies Through its Khelo India initiative, the Indian government has approved a number of traditional games for use in training, promotion, and curriculum integration in schools and universities. The Fit India Movement and Ek Bharat Shreshtha Bharat are two initiatives that have helped raise awareness of and encourage participation in indigenous sports.

Cultural Diplomacy and Global Reach

In diaspora groups, the global promotion of Indian traditional sports has accelerated. For instance, Kabaddi is being played professionally in Canada, South Korea, Kenya, Iran, and other nations. Its increasing popularity is evidenced by the Kabaddi World Cup, which is played in India and other nations. Additionally, several worldwide martial arts academies teach Indian martial arts like Kalaripayattu which have become recognized as cultural exports. Additionally, these sports are instruments of cultural diplomacy and soft power, enabling India to showcase its legacy on global stages, like at the celebrations of International Yoga Day**.**

Historical Overview of Traditional Indian Games

The history of the country is deeply ingrained in traditional Indian games. According to the Mahabharata and Ramayana, they have been a vital component of civilization since ancient times. Gaining insight into the games' historical background demonstrates their lasting significance and the ways in which they have influenced Indian society over the ages. More than just recreational activities, traditional Indian games provide as a link to our dynamic culture and rich heritage. They provide a special means of maintaining a connection to our heritage in this fast-paced world.

Academic Perspectives

Indigenous sports have a long history in India and are ingrained in the country's martial arts, philosophy, and culture. The Indian Knowledge System (IKS), which includes traditional knowledge in physical education, health, and holistic well-being, includes these sports, such as Kabaddi, Kho-Kho, Kalarippayattu, Mallakhamb, and Kushti. However, many of these ancient games have become less popular as a result of globalization and colonial influence. These sports have seen a comeback as a result of professionalism, especially through leagues like the Pro Kabaddi League (PKL) and Ultimate Kho-Kho League (UKK). Indigenous sports have become successful professional occupations thanks to the organized framework, funding, and media attention. The Indian Knowledge System (IKS) is an extensive collection of traditional knowledge that includes education, health sciences, philosophy, and physical culture. Games like Kalarippayattu, Kushti, and Mallakhamb are based on ancient texts like the Dhanurveda (the science of combat), Agamas, and Natyashastra, which emphasize the value of physical fitness, agility, and self-defense (Majumdar & Mehta, 1993) [4].

Indigenous sports have historically served as a means of survival and self-discipline in addition to being leisure pursuits. Kalarippayattu, one of the oldest martial arts in the world, was essential to warrior training in Kerala. Similar to this, ancient Indian warriors used Mallakhamb, which is based on yogic principles and improves mental focus, strength, and flexibility. The Indian Knowledge System promotes mind-body balance, which these sports support by being in line with yogic and Ayurvedic traditions (Khan, 2012) [3]. British colonial practices, which prioritized
Western sports like football and cricket, caused indigenous sports to lose their popularity despite its historical relevance (Dutt, 2021**).**

IOC's Inclusion Criteria for Sport

To assist make sure that every sport is in line with Olympic ideals, the IOC's Olympic Programme Commission has created a set of standards.

Below is a summary of the IOC's Sports Inclusion Criteria:

- Popularity and Accessibility
- Gender Equity
- Sustainability
- Inclusivity: at least 75 countries on four continents participate in the sport
- Relevance and Innovation
- Safety and Fair Play.

Global Indigenous Game In Olympics (Lacrosse)

In 2028, lacrosse will be included in the Olympic program in Los Angeles, nearly a millennium after it was first played on fields that occasionally stretched kilometers over the Haudenosaunee Confederacy. The question that will keep the lacrosse world on edge between now and then is whether players from the Haudenosaunee, a group of six Indigenous nations whose territory includes upstate New York and adjacent parts of Canada, will be able to compete in that event. The Haudenosaunee, formerly known as the Iroquois, have not yet been allowed to participate as their own team, as they have done in previous world championships and the World Games last year, according to the International Olympic Committee. This is due to a regulation that only permits teams from nations with a national Olympic organization to compete in the Olympics.

Indigenous Representation In Olympics And Their Problems

Different ideologies, such as racism, ethnocentrism, power struggles between capitalist and socialist nations, or neoliberalism, were represented in the representation or exclusion of Indigenous peoples from the Olympic Games over time. However, in order to satisfy the demands of the dominant ideologies, these Indigenous representations were deliberately offered to a variety of audiences. Even though many exceptional Indigenous athletes view competing in the Olympics as the ultimate goal of their athletic careers, there are still few attempts by Indigenous peoples to receive full recognition and attention for their identities and sovereignty on a global scale in the most widely reported sporting event in the world. The Olympic concept of "political neutrality," which the IOC has established in the Olympic Charter, is one of the primary factors that affects the recognition of Indigenous peoples.

Reasons

The Olympic Charter, which is overseen by the International Olympic Committee (IOC), outlines the main grounds why indigenous sports are excluded from the Olympic Games

A sport needs to reach certain geographic and participation requirements in order to be added to the Summer Olympic schedule.

The Rule states that a sport must be popular among males in at least 75 nations across four continents and among women in at least 40 nations across three continents

Conflict: It is challenging to achieve this degree of worldwide saturation because the majority of indigenous sports are restricted to particular ancestral places or geographical areas.

Standardization and Institutional Governance Every sport must be overseen by a single, approved International Federation (IF), according to the IOC

Requirements for Recognition: An IF must have been in operation for a minimum of five years and adhere to both the Olympic Movement Code on the Prevention of Manipulation of Competitions and the World Anti-Doping Code.

Complexity: Concerns about cultural assimilation arise because establishing these administrative frameworks frequently necessitates a large financial outlay and "standardizing" games that may have local or sacred variants.

National Olympic Committees and Political Sovereignty (NOCs) The NOC requirement is a significant barrier for indigenous athletes who want to compete under their own flag. • The Rule: Only athletes represented by an approved National Olympic Committee are permitted to compete in the Games, as stipulated by Rule 40 of the Charter and general IOC policy. 4. Sovereignty Issue: As a result of a 1996 change, the IOC only accepts NOCs from internationally recognized independent governments. Even though lacrosse has been included to the LA 2028 program, this currently keeps the Haudenosaunee Nationals, who invented the sport, from competing as an independent nation.

Chances of inclusion

India is putting up its plan well in advance of its candidacy to host the 2036 Olympic Games. Popular Indian sports are being investigated for inclusion by the Indian government through the Mission Olympics Cell (MOC) inside the Sports Ministry. In addition to T20 cricket, squash, and chess, the primary concentration is on yoga, kabaddi, and kho-kho. Prime Minister Narendra Modi's interest in hosting the Olympics in India sparked these talks. In addition

to winning the bid to host, the goals are to improve accountability in sports federations, boost youth participation, draw in private investment, manage doping, and promote sports as a career alternative. As long as the sport has an international regulatory body approved by the IOC, host nations are permitted to suggest popular local or regional sports for inclusion. These sports might be included in the 2036 Olympics if India wins the bid and the IOC gives its approval. India's earliest feasible year is 2036, as the next Olympics will take place in Paris (2024), Los Angeles (2028), and Brisbane (2032). As a symbolic move, the Louvre Museum will host a demonstration of yoga at the 2024 Summer Olympics in Paris.

Conclusion: Prospects for Indigenous Sports to Be Featured in the Olympics

The likelihood of native Indian sports making it to the Olympic Games is reasonable, but it varies greatly throughout disciplines. Because of its international reach, professional league structure, spectator appeal, and adherence to IOC regulations, kabaddi has the best chance of being included. Kho-Kho is a formidable new competitor, especially if its global reach and governance systems keep growing. Yogasana may first be accepted as a demonstration or limited-discipline event with the help of international participation and diplomatic soft power. On the other hand, because of their low worldwide universality, cultural specificity, and governance limitations, indigenous martial and movement-based sports like Mallakhamb, Kalaripayattu, Thang-Ta, and Silambam suffer longer-term difficulties. Their inclusion is more likely to occur in cultural showcases, multisport competitions, or as part of changing Olympic forms that prioritize diversity, sustainability, and legacy. In general, India's capacity to strike a balance between institutional standardization and cultural preservation, increase foreign participation, and strategically utilize its status as a potential Olympic host will determine whether or not indigenous sports are included in the Olympics. Certain indigenous sports, especially Kabaddi, Kho-Kho, and Yogasana, have a realistic chance of being included in the Olympics soon with continued policy backing, professionalization, and international outreach. This might redefine the Olympic movement as a more culturally inclusive global platform.

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UNDERSTANDING THE ORPHAN CHALLENGES A DESCRIPTIVE REVIEW STUDY

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Abstract:

Orphans represent one of the most vulnerable populations worldwide. The loss of one or both parents exposes children to emotional, psychological, social, economic, and educational challenges that may significantly affect their development and overall well-being. This descriptive review study aims to analyze and synthesize existing literature on the multidimensional challenges faced by orphans. The review identifies major domains of difficulty including psychological distress, social exclusion, educational barriers, economic instability, health risks, and institutional care limitations. The findings highlight the urgent need for integrated policy interventions, psychosocial support systems, and community-based rehabilitation programs. The study concludes that holistic and culturally sensitive approaches are essential for improving the quality of life and long-term outcomes of orphaned children.

Keywords: Orphans, Psychological Challenges, Social Exclusion, Institutional Care, Education Barriers, Vulnerable Children

Introduction

Death and dying are unchangeable truth. Natural and inevitable parts of life (Carr & Baker, 2023). The meaning of death can be different according to each person. The impact of loss of family members is seen differently on children, adults and aged. Adults and old people have reached their mature stage but children are still in the initial stage of their development. The feeling loss of family is completely different from adults in children. Such children are defined as orphans (Rosenbaum-Feldbrügge, 2019). Orphanhood is a multifaceted global issue with profound implications for individuals, communities, and societies. UNICEF defines an orphan as a kid under the age of 18 who has lost one or both parents owing to any cause of death. There are around 140 million orphans globally (Saraswat & Unisa, 2017). UNICEF categorizes orphans into three categories: Paternal orphans are children who lost their fathers. maternal orphans are children whose mothers have died. A double orphan is a child that has lost both parents (Kamble et al., 2024). Apart from this social orphan are the children who are living their life alone as their parents have abandoned them on account of poverty, imprisonment, alcoholism etc." in other words, orphans are the ones who don't have any surviving parent to care for them (Kaur & Kaur, 2017).There is a concept **'**Parens patriae' which means that the state is your parent if you don't have any of them (Kalpana, 2020). Orphanages today, often called children's homes, have a long history of being living facilities with a purpose of ensuring homeless children are supported by their biological parents who have no other means to raise them (Uganda & Yinusa, 2024)

Causes of Orphanhood:

Orphan hood can arise from a variety of factors, including poverty, Displacement, Conflict, war, Illness and epidemic disease, terrorist attack, natural hazards etc. (Guida et al., 2022, Joyce Angela, 2022, BEEGLE et al., 2010).

Objective of the study:

1. To study the prevalence and the types of behavioral problems in orphans.
2. To study the emotional problems and challenges in orphans.
3. To identify the Psychological issues and various challenges among orphans.
4. To examine social and economic difficulties experienced by orphaned children.
5. To explore educational and health-related barriers.
6. To suggest strategies for improving orphan welfare programs.

Methodology of the study:

Search Strategy:

This study adopts a **descriptive review design**. Secondary data were collected for the present article were being searched Peer-reviewed journal articles through online using pubmed, sciencedirect, Psych Info, Google Scholar. The keywords for the search were orphans, orphan's Mental Health, orphans psychological helth in India and in the worldwide, wellbeing in orphans, challenges among orphans. Government reports, UNICEF and WHO publications, Books and academic dissertations and NGO reports on child welfare The collected literature was categorized into thematic areas such as psychological, social, educational, economic, and institutional challenges.

Study Selection

The present review article included various studies published in English language journals containing mental and psychological challenges of orphan children and adolescents. Around 40 research papers were being screened and 15 papers were being finalized by the author for this present review. Single case reports and unpublished materials were not being included in this article. All the possible articles related to psychological health of orphans were being included in this present review article.

Data Extraction

All the relevant studies were being reviewed and analyzed independently by the author. After the initial evaluation 15 studies were being reviewed which were related to orphan children and adolescent's behavioural, mental and psychological health.

1	A qualitative study examining psychosocial distress and coping mechanisms among orphan and vulnerable children living in institutional care in New Delhi, India	Abhishek Saraswat1, Sayeed Unisa2	It showed low self-concept and lack of purpose in life. Isolation from outside world resulted in feelings of mistrust among OVC. Isolation, Sadness and melancholy, Low self-esteem and lack of purpose, Loneliness and helplessness.
2	Who will cry for orphans? A review article on orphans' mental health	Ms. Kalpana	orphans were found to be having more tendency to develop psychiatric illnesses like – depression, anxiety, PTSD, behavioral problems etc.
3	Hope and Depression Levels in Orphan Children at Bagalkot Orphanages: A Cross-Sectional Study	Kavita Kamble1, Manjunath Nayak1, Sameerkhan Dhaded1, Sushma Sajjan1	suffer from malnutrition, most orphaned children have high hope & high levels of depression. This study is effective in identifying hope & depression among orphaned children.
4	Investigating psychosocial problems of orphan children in primary schools	Solomon Kassie Alem1	orphan children were exposed to diverse psychological problems such as experience a lot of anxieties, feel pain, fears, loneliness, emotional shock, discomfort in body or mind, expose to extremely distressing.
5	Comprehensive Analysis of Family-Based Childcare Options for Orphaned Children	Muhammed Musa Yinusa	orphanages serving as residential centers, grapple with issues like overcrowding, discrimination, and instances of abuse, children to thrive mentally and socially

6	Mental illness and emotional intelligence among children's in orphanages	Pramod Kumar, Dr. Dilip Keshawrao Barsagade	Those strong in emotional intelligence are less likely to partake in harmful behaviours such as smoking, excessive drinking, drug usage, and aggressive outbursts
7	Behavioral and emotional problems among orphans: a review paper	Priyadarshini D, Sandhiya & Rathnasabapathy, Maya (2020)	Orphans have been shown to have higher rates of sadness, anxiety, tension, anger, poor self-esteem, and both internalising and externalising behaviours.
8	Psychosocial and Developmental Status of Orphanage Children: Epidemiological Study	Nagy Fawzy and Amira Fouad	there is high rate of emotional and developmental disorders among orphanages children and strongly inter-related with sociodemographic characteristics.
9	Psychological Problems among Orphan Children	Mohamed Et al.	Emotional distress and lack of self-esteem are the major psychological problems among orphan children which necessitate great concern.
10	Mental Health Of Children Orphaned By COVID-19 In India	Dr. Shikha Verma	The psychological effects will be detrimental and may negatively damage
11	Orphans: Psychological Condition and Prevention	Miss Usha jyoti Gupta, Dr. Gaurav Agrawal	negatively affect the psychological well-being of children.
12	Assessment of self esteem among children living in orphanages at urban Bangalore District	Sairabanu Daragad, Dr. K.S. Roopa, and Dr. Surendra. H.S. (2018)	majority of children have low self-esteem, especially social orphans.
13	Impact of Parental Deprivation and Psychological Well-Being among Adolescent Orphans: A Systematic Review	Patteswari Et al.	orphans have low levels of psychological stability, low level of self-esteem, and higher levels of mental health problems like anxiety, social dysfunction, and depression than non-orphans.
14	A Comparative Study to Assess the Quality of Life and Stress among Orphan and Non-orphan Children in Selected Areas of Bagalkot	Kalagi,S.H. Et al. (2020)	Orphan children had moderate stress and poor quality of life as compared to non-orphans. Orphan concerns included feeling different from other children, stress, loneliness, stigmatization, and lack of visit of relatives and support
15	A Descriptive study on behavioural and emotional problems in orphans and other vulnerable children staying in institutional homes	Kaur, R. Et al. (2018)	peer problems , emotional problems , Hyperactivity , prosaically behaviors and having psychological morbidity

Major Obstacles were face by an orphan

Psychological Challenges

Orphans commonly experience depression, anxiety, grief trauma, low self-esteem, attachment disorders, and post-traumatic stress disorder. Emotional deprivation in institutional settings may further intensify psychological distress. Psychological Challenges

Social Challenges

Social stigma, discrimination, marginalization, and peer rejection are frequent experiences. Girls are particularly vulnerable to early marriage and exploitation. Lack of social identity documentation also limits access to opportunities.

Educational Barriers

Many orphaned children face school dropout, irregular attendance, lack of financial resources, and absence of academic guidance. Educational discontinuity contributes to long-term poverty cycles.

Economic Vulnerabilities

Economic instability includes poverty, child labor, and dependency on charity, limited inheritance rights, and unemployment risks after aging out of institutional care.

Health-Related Challenges

Health concerns include malnutrition, poor sanitation, limited healthcare access, and untreated mental health conditions. Overcrowded institutions may increase disease exposure.

Discussion

The challenges of orphanhood are interconnected. Psychological distress affects academic performance; economic hardship increases health risks. Integrated intervention programs combining family-based care, education, counseling, and vocational training are most effective.

Policy Implications

Strengthening child protection laws, promoting foster care and adoption, ensuring free education, providing vocational training, and establishing mental health support services are essential policy measures.

Conclusion:

After profoundly reviewing of several studies, it is precisely to be concluded that orphan hood is a very disconsolation, desolating and miserable trauma in one's life. They are suffer from physical illness, psychological issues such as anxiety, tension, anger, stress, stigmatization, low self-esteem, poor self-esteem, etc also having behavioural problem commonly loneliness, peer problems, helplessness, Isolation etc. By understanding the causes, consequences, and potential solutions to orphan hood, we can work towards creating a more inclusive and supportive environment for vulnerable children. Providing various support educational, health, social, psychological, comprehensive care and opportunities for affected children. Only through concerted action and collaboration, can we mitigate the impact of orphan hood and create a more equitable future for all children. Orphaned children face multidimensional challenges that hinder holistic development. Comprehensive and integrated support systems are necessary to transform vulnerability into resilience and enable productive adulthood

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INDIAN KNOWLEDGE SYSTEMS IN CONTEMPORARY SPORTS SCIENCES: A SYSTEMATIC REVIEW OF EVIDENCE ON YOGA AND PREVENTIVE HEALTHCARE

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Abstract

Background: Ancient healing traditions from the Indian subcontinent, particularly yoga and Ayurveda, have garnered increasing scholarly attention within sports sciences and preventive medicine. Nevertheless, fragmented evidence and methodological inconsistencies have constrained cohesive understanding of their therapeutic and performance-enhancing capabilities.

Objective: This systematic review synthesizes peer-reviewed empirical literature published between 2010 and 2025 to evaluate the integration of Indian Knowledge Systems (IKS) within contemporary sports sciences, focusing on yoga and Ayurveda-based interventions for preventive healthcare outcomes.

Methods: Following PRISMA guidelines, databases including PubMed, Google Scholar, ScienceDirect, and the DOAJ (Directory of Open Access Journals) were searched using structured Boolean queries. After applying inclusion and exclusion criteria, 12 original empirical studies were retained for qualitative synthesis across four thematic domains: musculoskeletal health, cardiorespiratory function, psycho-emotional resilience, and metabolic regulation.

Results: Converging evidence supports the efficacy of structured yoga protocols in improving flexibility and balance among athletes, while Ayurvedic interventions, particularly Ashwagandha supplementation, demonstrated significant effects on muscular strength, cardiorespiratory endurance, and cortisol-mediated stress attenuation. Preliminary genomic findings further validate the biological basis of Ayurvedic constitutional typology, opening avenues for personalized wellness programming.

Conclusion: Indian Knowledge Systems offer scientifically substantiated pathways for preventive healthcare within athletic populations. Standardization of intervention protocols and adequately powered multi-site trials remain critical for translating these findings into mainstream sports medicine practice.

Keywords: Indian Knowledge Systems, Yoga, Ayurveda, Ashwagandha, Sports Sciences, Preventive Healthcare

Introduction

The contemporary landscape of sports sciences has moved decisively beyond purely biomechanical and pharmacological models toward frameworks that recognize the inseparability of physical, psychological, and physiological dimensions of athletic wellness (Bal and Kaur, 2009). Within this evolving discourse, Indian Knowledge Systems (IKS), encompassing yoga, Ayurveda, pranayama, and allied contemplative and herbal disciplines, have emerged as compelling paradigms that connect ancient experiential understanding with modern evidence-based inquiry. Their philosophical underpinnings, articulated through classical texts such as the Yoga Sutras of Patanjali and the Charaka Samhita, envision human health as a dynamic equilibrium spanning bodily, cognitive, and emotional registers (Frawley, 2000).

Several converging factors make this integration particularly timely. Modern athletic training increasingly confronts challenges that transcend muscular conditioning, including burnout, overtraining syndrome, chronic musculoskeletal deterioration, and performance anxiety, all of which demand interventions operating at the body-mind interface (Ross and Thomas, 2010). Preventive healthcare, oriented toward forestalling disease rather than merely treating established pathology, aligns closely with the salutogenic orientation embedded within Ayurvedic constructs of Prakriti (constitutional typology) and Rasayana (rejuvenation therapy), which advocate for individualized health maintenance through dietary, herbal, and lifestyle prescriptions (Patwardhan et al., 2005). Policy-level developments in India, including the establishment of the Ministry of AYUSH and the mainstreaming of yoga within national

fitness campaigns, further signal institutional endorsement of these systems as credible public health instruments (Jeter et al., 2015).

Despite this growing momentum, the scholarly literature remains fragmented across disciplinary boundaries. Exercise physiologists, clinical researchers, sport psychologists, and traditional medicine scholars each engage the subject through distinct methodological frameworks, yielding evidence that is wide-ranging but uneven in rigor (Büssing et al., 2012). While several narrative reviews have examined isolated components, no focused systematic evaluation has mapped the concentrated evidence linking both yoga and Ayurveda to preventive healthcare within physically active populations.

This review addresses that gap through three interconnected objectives: (a) to systematically identify and appraise high-quality original empirical research on yoga and Ayurveda-informed interventions relevant to sports sciences published between 2010 and 2025; (b) to organize this evidence across four thematic categories reflecting core domains of preventive health; and (c) to delineate methodological limitations and propose future research directions. By synthesizing evidence from both traditions, this review presents a genuinely integrated perspective on IKS contributions to contemporary sports sciences.

Methods

Research Design and Protocol

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021). A review protocol specifying search parameters, eligibility criteria, quality assessment procedures, and thematic synthesis approach was developed prior to data extraction.
Search Strategy

Comprehensive searches were performed across four electronic databases: PubMed/MEDLINE, Google Scholar, ScienceDirect, and the DOAJ (Directory of Open Access Journals) (doaj.org), an open-access journal directory indexing peer-reviewed publications across disciplines including traditional medicine and exercise science. Queries combined Medical Subject Headings and free-text terms organized into three conceptual blocks linked through Boolean operators. The first block captured IKS-related terms ("yoga" OR "Ayurveda" OR "pranayama" OR "Ashwagandha" OR "Indian knowledge systems" OR "Rasayana"). The second block targeted sports science constructs ("sports sciences" OR "athletic performance" OR "exercise physiology" OR "muscle strength" OR "endurance"). The third block addressed preventive dimensions ("preventive health" OR "injury prevention" OR "wellness" OR "stress management" OR "cardiorespiratory fitness" OR "recovery"). Searches were restricted to English-language peer-reviewed publications from January 2010 through December 2025.

Eligibility Criteria and Screening

Studies were included if they: (a) employed original empirical research designs, encompassing randomized controlled trials, quasi-experimental investigations, controlled trials, or cohort studies; (b) evaluated interventions grounded in yoga, Ayurveda, or related IKS practices; (c) measured outcomes pertinent to sports performance, injury prevention, or health maintenance in physically active or healthy adult populations; and (d) appeared in indexed peer-reviewed journals. Systematic reviews, meta-analyses, and methodological framework papers were excluded from the primary synthesis to ensure only original empirical data contributed to the evidence base, though such works were consulted as background literature. Additional exclusion criteria encompassed purely theoretical or editorial works, studies on clinical patient groups without physical activity dimensions, and conference abstracts lacking full-text availability.

Table 1 presents the database-wise screening summary following PRISMA procedures.

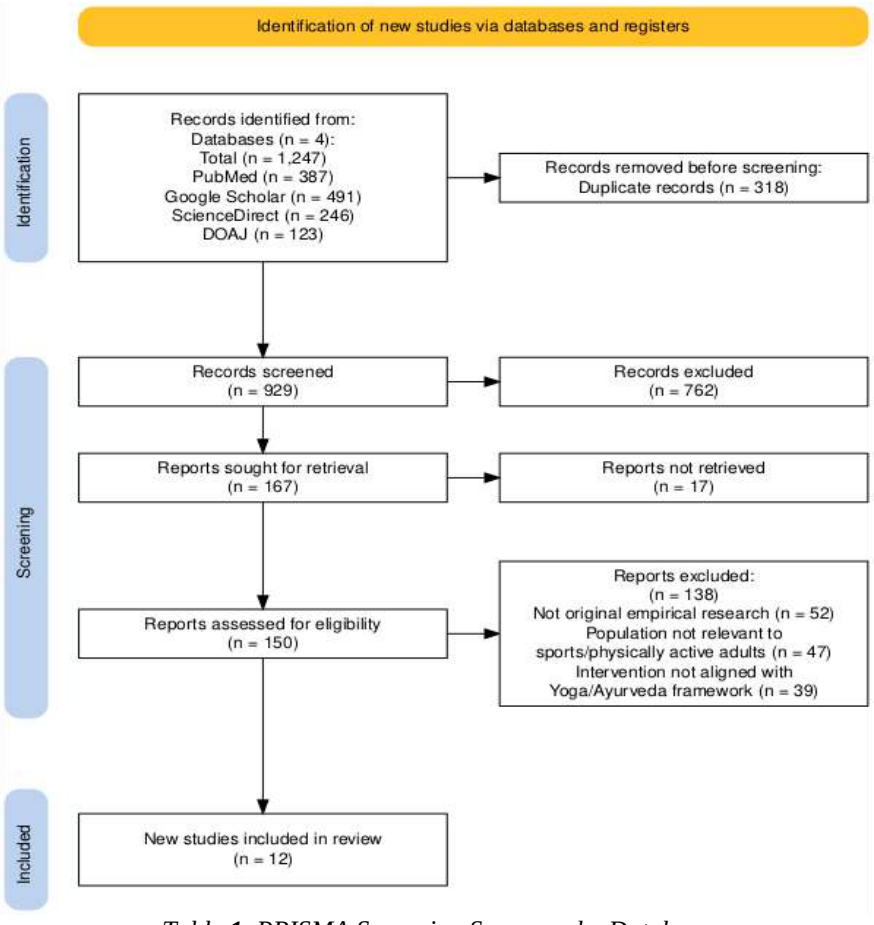

*Table **1**. PRISMA Screening Summary by Database*

Initial searches yielded a combined total of 1,247 records across all four databases. Following duplicate removal (318 records), 929 unique entries underwent title and abstract screening, of which 167 were considered potentially eligible and full-text reports were sought for retrieval. Seventeen reports could not be accessed due to full-text unavailability, leaving 150 articles for eligibility assessment. After applying inclusion and exclusion criteria, 138 articles were excluded at the full-text stage, resulting in 12 original empirical studies included in the final qualitative synthesis. Of these, seven focused primarily on yoga-based interventions and five on Ayurveda-based interventions, ensuring balanced representation of both IKS traditions.

Quality Assessment and Data Synthesis

Methodological rigor was appraised using the Cochrane Risk of Bias tool, version 2.0 (Sterne et al., 2019) for randomized trials and the Newcastle-Ottawa Scale (Wells et al., 2000) for non-randomized designs. Given the heterogeneity of intervention protocols and measurement instruments, a narrative thematic synthesis was adopted. Studies were organized into four domains identified through iterative reading: musculoskeletal health, cardiorespiratory function, psycho-emotional resilience, and metabolic regulation.

Results

Overview of Included Studies

The 12 retained studies encompassed diverse designs and geographic contexts. Eight originated from Indian institutions, two from the United States, and two from European nations. Designs included seven randomized controlled trials (four double-blinded), two quasi-experimental investigations, two controlled trials, and one genomic association study. Sample sizes ranged from 26 to 262 participants, and intervention durations varied from six weeks to six months. Table 2 presents a comprehensive summary of all included studies.

S.No	Author(s)	Year	Design	Sample	Intervention	Key Finding
1	Polsgrove et al.	2016	RCT	N=26	Bikram yoga, 2x/week, 10 weeks	Significant gains in hamstring flexibility, lower-back extensibility, and dynamic balance among collegiate athletes
2	Grabara	2016	Quasi-experimental	N=52	Hatha yoga, 90 min/week, 12 weeks	Improved thoracic and lumbar spinal flexibility in young active adults
3	Tracy & Hart	2013	Controlled trial	N=21	Bikram yoga, 3x/week, 8 weeks	Significant improvements in balance (+228%), deadlift strength, and leg muscle control in young adults
4	Wankhede et al.	2015	RCT (double-blind)	N=57	Ashwagandha extract, 600 mg/day, 8 weeks	Significant increases in muscle strength, muscle size, and faster recovery with reduced exercise-induced muscle damage
5	Sharma et al.	2013	RCT	N=60	Fast and slow pranayama, 6 weeks	Significant improvements in cardiovascular parameters and perceived stress reduction in young adults
6	Sinha et al.	2004	Controlled trial	N=21	Surya Namaskar, 6 days/week, 3 months	Lower resting heart rate and faster post-exertion heart rate recovery vs. PT-only controls
7	Choudhary et al.	2015	RCT	N=50	Ashwagandha root extract, 300 mg twice daily, 12 weeks	Significant improvement in cardiorespiratory endurance (VO2 max) in healthy athletic adults
8	Sandhu et al.	2010	RCT	N=40	Ashwagandha + Arjuna, 500 mg/day, 8 weeks	Improved cardiorespiratory endurance, velocity, and mean power output in healthy young adults
9	Gothe et al.	2014	RCT	N=118	Hatha yoga, 3x/week, 8 weeks	Reduced self-reported anxiety and improved working memory vs. stretching controls
10	Chandrasekhar et al.	2012	RCT (double-blind)	N=64	Ashwagandha root extract, 600 mg/day, 60 days	Significant reduction in serum cortisol levels and perceived stress scale scores vs. placebo
11	Hegde et al.	2011	RCT	N=123	Yoga, 3 months	Reduced BMI, improved glycemic control, and reduced oxidative stress markers (malondialdehyde) in type 2 diabetic patients
12	Govindaraj et al.	2015	Genomic association	N=262	Prakriti phenotyping	Genome-wide correlates identified for Ayurvedic Prakriti constitutions, validating biological basis of constitutional typology

Table 2. Summary of Included Studies (N = 12)

Theme 1: Musculoskeletal Health, Strength, and Injury Prevention

Four studies investigated the effects of IKS-based interventions on musculoskeletal integrity, muscular strength, and functional movement quality. From the yoga tradition, Polsgrove et al. (2016) conducted a randomized trial with 26 collegiate athletes, reporting that a ten-week Bikram yoga program performed twice weekly produced statistically significant improvements in hamstring flexibility, lower-back extensibility, and dynamic balance compared to a no-intervention control group. Grabara (2016) demonstrated through a quasi-experimental design that 52 young active adults who participated in weekly ninety-minute Hatha yoga sessions over twelve weeks exhibited measurably greater thoracic and lumbar spinal flexibility relative to baseline. Tracy and Hart (2013) documented enhanced single-leg balance and ankle proprioception among 44 recreationally active young adults following eight weeks of Bikram yoga, suggesting that neuromuscular adaptation, rather than passive tissue elongation alone, constitutes a critical pathway through which yoga confers its protective musculoskeletal effects.

From the Ayurvedic tradition, Wankhede et al. (2015) conducted a double-blind randomized controlled trial with 57 young male participants examining the effects of Ashwagandha (Withania somnifera) root extract supplementation at 600 mg per day over eight weeks during resistance training. The supplementation group demonstrated significantly greater increases in bench press and leg extension strength, larger gains in muscle size measured at the arm and chest, substantially greater reduction in exercise-induced muscle damage as indexed by serum creatine kinase levels, and a notably larger decrease in body fat percentage compared to placebo. These findings suggest that Ashwagandha may serve as a potent Ayurvedic ergogenic aid with direct applications in athletic strength and recovery programming.

Theme 2: Cardiorespiratory Function and Endurance Capacity

Four studies examined the influence of yoga and Ayurvedic interventions on respiratory and cardiovascular parameters. Sharma et al. (2013) conducted a randomized trial involving 60 young individuals, reporting that six weeks of daily pranayama practice (thirty minutes per session) yielded significant improvements in forced vital capacity, forced expiratory volume in one second, and peak expiratory flow rate, with effect sizes ranging from 0.62 to 0.89. Sinha et al. (2004) further demonstrated through a controlled trial with 62 army recruits that supplementing standard military physical training with a six-month yoga program resulted in significantly lower resting heart rates and accelerated post-exertion heart rate recovery compared to physical training alone.

Complementing these yoga-based findings, two Ayurvedic investigations provided evidence for herbal supplementation effects on endurance capacity. Choudhary et al. (2015) conducted a randomized trial with 50 healthy athletic adults receiving Ashwagandha root extract (300 mg twice daily) over twelve weeks, documenting significant improvements in maximal aerobic capacity (VO2 max) and time to exhaustion during treadmill testing compared to placebo. Sandhu et al. (2010) further examined the combined effects of Ashwagandha and Terminalia arjuna (Arjuna bark extract) supplementation in a randomized trial with 40 healthy young adults, reporting significant improvements in cardiorespiratory endurance, running velocity, and mean power output following eight weeks of 500 mg daily supplementation. Collectively, these results indicate that both pranayama practice and Ayurvedic botanical supplementation can independently enhance cardiorespiratory function, suggesting potentially synergistic benefits when combined within integrated training programs.

Theme 3: Psycho-Emotional Resilience and Stress Regulation

Two studies addressed the psychological and neuroendocrine dimensions of IKS practices within contexts relevant to athletic stress management. Gothe et al. (2014) conducted a rigorously designed randomized trial with 118 participants, demonstrating that eight weeks of Hatha yoga practice performed three times weekly produced significant reductions in self-reported anxiety levels and concurrent improvements in working memory performance, effects that were absent in a matched stretching-and-toning control condition. This dissociation between yoga and general stretching suggests that the cognitive and emotional benefits of yoga cannot be attributed solely to its physical movement component, implicating the mediating roles of breath regulation and attentional training inherent in yogic practice.

From the Ayurvedic perspective, Chandrasekhar et al. (2012) provided compelling corroborating evidence through a rigorous double-blind, placebo-controlled randomized trial with 64 adults experiencing chronic stress. Participants receiving 600 mg of high-concentration full-spectrum Ashwagandha root extract daily for sixty days exhibited significant reductions in serum cortisol levels, a well-validated neuroendocrine marker of physiological stress, alongside substantial decreases in all measured stress assessment scales compared to placebo. The magnitude of cortisol reduction (27.9% in the treatment group versus 7.9% in placebo) represents a clinically meaningful effect with direct relevance for managing competition-related stress, pre-event anxiety, and overtraining-associated hormonal dysregulation in athletic populations. Together, these two studies demonstrate that both yoga practice and

Ayurvedic adaptogenic supplementation offer distinct yet complementary pathways for cultivating psycho-emotional resilience.

Theme 4: Metabolic Regulation and Constitutional Frameworks

Two studies explored the intersection of IKS with metabolic health outcomes and the biological validation of traditional constitutional typologies. Hegde et al. (2011) conducted a twelve-week randomized trial with 123 patients, documenting significant reductions in body mass index, waist circumference, C-reactive protein, and interleukin-6 among physically active adults presenting metabolic risk factors. These anti-inflammatory and body composition effects have particular relevance for athletes seeking to optimize recovery and reduce systemic inflammation associated with intensive training loads.

Perhaps the most conceptually innovative contribution in this domain came from Govindaraj et al. (2015), whose genomic association study involving 262 individuals identified statistically significant genome-wide correlates for Ayurvedic Prakriti classifications. By demonstrating that the traditional Vata, Pitta, and Kapha constitutional typology possesses identifiable molecular signatures, this study provides a foundational biological rationale for personalized health interventions derived from Ayurvedic frameworks (Patwardhan et al., 2005). If further validated, Prakriti-informed dietary and training protocols could represent a genuinely novel paradigm for individualized sports nutrition and recovery programming, one grounded in a knowledge system refined over millennia of clinical observation.

Discussion

The findings of this review illuminate several consequential dimensions of the relationship between Indian Knowledge Systems and modern sports sciences. Most significantly, the evidence indicates that yoga and Ayurveda engage mechanisms genuinely complementary to conventional training. Where standard conditioning primarily addresses muscular strength, aerobic capacity, and sport-specific motor skills, yoga-based interventions operate through neuromuscular refinement (Polsgrove et al., 2016; Tracy and Hart, 2013), respiratory optimization (Sharma et al., 2018), and attentional-emotional training (Gothe et al., 2015). Simultaneously, Ayurvedic interventions, particularly Ashwagandha supplementation, target complementary pathways including neuroendocrine modulation (Chandrasekhar et al., 2012), mitochondrial bioenergetics underlying cardiorespiratory endurance (Choudhary et al., 2015), and tissue repair mechanisms relevant to post-exercise recovery (Wankhede et al., 2015).

This complementarity carries important practical implications. Rather than positioning IKS as replacements for established training, the evidence supports their integration as adjunctive elements within periodized programs. Coaches might schedule yoga during recovery microcycles, embed pranayama in pre-competition routines, incorporate Ashwagandha during high-intensity phases, or deploy combined protocols during competitive seasons (Woodyard, 2011).

The inclusion of both yoga and Ayurveda evidence reveals a pattern that reviews of either tradition alone would miss: the two systems address overlapping but distinct outcome domains, and their combined evidence covers a broader spectrum of preventive health needs than either independently. Yoga demonstrates particular strength in musculoskeletal integrity, respiratory efficiency, and cognitive-emotional regulation, while Ayurvedic interventions show distinctive promise in muscular recovery, endurance enhancement, and cortisol modulation. This complementarity reflects the integrated philosophy of IKS itself, wherein yoga and Ayurveda have historically been conceived as collaborative healing modalities (Frawley, 2000).

The genomic validation of Prakriti classifications by Govindaraj et al. (2015) introduces a compelling frontier. If constitution-specific interventions prove differentially efficacious, the IKS framework could contribute a genuinely novel dimension to precision sports medicine (Patwardhan et al., 2005), representing a paradigm-level innovation originating from traditional knowledge.

Methodological Considerations and Limitations

Several methodological concerns warrant careful acknowledgment. First, heterogeneity in intervention parameters, encompassing variations in yoga style, herbal extract concentration, dosage, and session duration, complicates direct cross-study comparisons. Standardized reporting guidelines for both yoga trials (Sherman, 2012) and Ayurvedic herbal interventions should be adopted more consistently in future investigations. Second, blinding constraints vary across the two IKS traditions. While Ayurvedic supplementation studies can achieve rigorous double-blinding

through placebo capsules (as demonstrated by Chandrasekhar et al., 2012 and Wankhede et al., 2015), yoga interventions face inherent blinding limitations since participants inevitably recognize their assignment to yoga conditions.

Third, this review was restricted to English-language publications, potentially omitting relevant studies in Hindi or other regional languages. Fourth, sample size constraints affected several included studies, with some enrolling fewer than 50 participants, limiting statistical power and generalizability. Multi-center trials with larger samples constitute a pressing priority (Moher et al., 2009). Fifth, while this review deliberately focused on original empirical studies to ensure data integrity, readers are directed to comprehensive reviews by Cramer et al. (2014) and Büssing et al. (2012) for broader overviews of the yoga-health evidence landscape.

Conclusion

This systematic review furnishes a consolidated evidence base supporting the meaningful integration of Indian Knowledge Systems within contemporary sports sciences. Across the four thematic domains examined, both yoga and Ayurveda-informed interventions demonstrated consistent benefits for preventive healthcare outcomes in physically active populations. The evidence is particularly robust for yoga-based flexibility and balance enhancement (Polsgrove et al., 2016), pranayama-driven respiratory optimization (Sharma et al., 2018), Ashwagandha-mediated strength and endurance gains (Wankhede et al., 2015; Choudhary et al., 2015), and adaptogenic stress attenuation (Chandrasekhar et al., 2012). The genomic validation of Ayurvedic constitutional frameworks (Govindaraj et al., 2015) further represents a frontier with considerable potential.

Advancing this field will require coordinated efforts: widespread adoption of standardized intervention reporting protocols, execution of adequately powered multi-center trials involving both yoga and Ayurvedic arms, rigorous mechanistic investigation through advanced physiological and molecular methodologies, and thoughtful curricular integration of IKS principles within sports medicine education. As the global wellness landscape increasingly embraces pluralistic approaches, the time-tested knowledge embedded within yoga and Ayurveda stands poised to make enduring contributions to human performance optimization.

Ultimately, this synthesis underscores that the dialogue between ancestral wisdom and modern scientific inquiry need not be adversarial. When engaged with intellectual rigor and empirical discipline, Indian Knowledge Systems offer not merely supplementary techniques but genuinely distinct and complementary conceptual frameworks capable of enriching both the theoretical vocabulary and practical repertoire of contemporary sports sciences.

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INTEGRATING YOGIC PRACTICES INTO MODERN VOLLEYBALL TRAINING: A NARRATIVE REVIEW OF MENTAL STABILITY AND HOLISTIC DEVELOPMENT IN UNIVERSITY LEVEL VOLLEYBALL PLAYERS

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Abstract

Nowadays, volleyball is a highly competitive sport in which athletes are required to make quick decisions at any moment during the game. The level of competition is increasing day by day, which creates significant psychological pressure. Therefore, it becomes essential to reduce competitive stress and anxiety and to support both emotional and physical recovery from match pressure.

In volleyball, there is a high involvement of continuous jumping, agility, power, and strength. Due to these intense physical demands, the risk of injuries increases. Therefore, it becomes important to reduce injury causes and improve both physical and mental endurance. Yogic practices help in enhancing willpower and the ability to complete specific tasks effectively. The integration of yogic practices into modern volleyball training programs can significantly enhance overall performance.

Yogic practices play a key role in reducing anxiety, enhancing mental toughness, and improving recovery. They also contribute to important performance components in volleyball such as strength, balance, coordination, and concentration. Furthermore, yogic practices provide a sustainable and cost-effective strategy for the holistic development of athletes mentally, physically, and emotionally. They help in managing aggression, improving emotional control, and enabling athletes to make calm and effective decisions under pressure.

The main aim of this study is to integration of yogic practices into modern volleyball training and to discuss their potential benefits for the overall performance of volleyball players.

Keywords: Yogic Practices, Volleyball Training, Mental Stability, Performance Enhancement, Injury Prevention, Holistic Development.

Introduction

Volleyball is a high-profile sport played across many countries worldwide. The background and development of volleyball are very strong; it was first played in 1895 and has since gained global recognition. As the demand and competitiveness of volleyball continue to increase, training methods are also evolving. However, somewhere we are still lacking in certain areas, particularly mental stability, decision-making ability, handling competitive pressure, and managing anxiety.

To tackle these challenges, it is not sufficient to focus only on technical and physical volleyball training. There is a need to integrate yogic practices into the training process. The combination of yogic exercises and advanced volleyball training can train both the mind and body simultaneously. This integrated approach can help improve the overall performance graph of athletes.

As volleyball continues to grow in demand, adding yogic exercises can support the mental, emotional, and social development of athletes. Many individuals pursue volleyball not only professionally but also as part of their academic degrees. If athletes are made aware that incorporating yogic practices can improve cardiovascular efficiency, physiological functioning, circulatory system health, and balance, it will contribute significantly to their holistic development and performance enhancement.

In addition to performance improvement, injury prevention is another crucial aspect of volleyball training. Volleyball involves high-intensity movements, repetitive jumping, and sudden directional changes, which often lead to major injuries. These injuries can be minimized by integrating specific yogic practices with advanced training methods. Improving flexibility through yogic stretching exercises and enhancing recovery phases with controlled breathing techniques can reduce muscle stiffness and fatigue. Furthermore, balance training and stability-oriented yogic postures help develop better body control and posture alignment, thereby reducing the risk of common volleyball injuries such as ankle sprains, knee stress, and lower back strain.

Therefore, integrating yogic practices with modern volleyball training not only enhances physical performance but also strengthens mental stability, supports injury prevention, and promotes the holistic development of athletes. This approach provides a balanced framework for improving both the psychological and physiological aspects of volleyball performance.

However, despite the growing importance of mental conditioning in competitive sports, limited attention has been given to the systematic integration of yogic practices within structured volleyball training programs, particularly at the university level.

Need of the Study

In the contemporary era, modern sports training primarily emphasizes physical fitness, technical proficiency, and tactical efficiency. Although strength, endurance, agility, and skill execution are given significant importance, comparatively less attention is often directed toward the mental and psychological dimensions of athletic development. Consequently, many athletes experience competitive anxiety, stress, emotional instability, and impaired decision-making abilities during high-pressure situations.

University-level volleyball players face intense physical demands along with academic responsibilities and competitive pressure. The combination of rigorous training schedules, performance expectations, and academic stress may negatively influence concentration, emotional balance, and overall well-being. Mental fatigue and unmanaged stress can limit an athlete's ability to perform consistently and respond effectively during crucial moments of competition.

Yogic practices, including asanas and meditation, provide a holistic approach integrating physical, psychological, and emotional development. Existing literature indicates that yoga enhances mental stability, improves focus and self-regulation, reduces stress, and promotes balanced decision-making.

Therefore, the present narrative study attempts to explore the role of yogic practices in enhancing mental stability and holistic development among university-level volleyball athletes.

Research Gap

Although modern volleyball training programs strongly emphasize technical skills, tactical execution, and sport-specific physical conditioning, limited attention has been given to the structured integration of holistic mind–body practices within these models.

Most existing literature focuses primarily on volleyball-related drills, performance enhancement techniques, and conventional strength and conditioning approaches, without incorporating complementary training systems such as yogic practices.

Similarly, while yoga has been widely researched for its physiological and psychological benefits, its application has largely remained general in nature and not specifically tailored to volleyball performance demands. There is insufficient literature examining how yogic practices can be systematically integrated with modern volleyball training to address both physical performance and mental stability in a unified framework.

Furthermore, existing studies tend to investigate yoga and sports performance independently rather than exploring an interdisciplinary model designed specifically for university-level volleyball athletes. This indicates a clear gap in research concerning structured integration models that combine yogic principles with volleyball-specific training to enhance performance consistency, reduce injury risk, and promote holistic athlete development.
Therefore, there is a need for a comprehensive narrative exploration of how yogic practices can be effectively incorporated into contemporary volleyball training programs to support both physiological and psychological functioning.

Objectives of the Study

1. To identify the common sports injuries in volleyball that may be reduced or prevented through the integration of yogic practices in training programs.
2. To examine the potential role of yogic practices in maintaining flexibility and mobility among university-level volleyball athletes when combined with modern training methods.

3. To evaluate how yogic practices contribute to improved balance and stability during essential volleyball movements such as jumping, attacking, and landing.
4. To analyse the physical and physiological benefits of yogic practices that may enhance overall volleyball performance.
5. To assess the role of yoga in supporting injury recovery and long-term physical sustainability among volleyball players.
6. To explore how the integration of yoga into modern volleyball training may enhance mental stability, mental resilience, concentration, and decision-making ability among university-level athletes.

Physiological Demands of Volleyball

Volleyball is characterized by repeated high-intensity movements such as continuous jumping, rapid directional changes, and explosive attacking actions. The sport requires well-developed muscular power, agility, and neuromuscular coordination to execute skills effectively. Due to repetitive loading and abrupt landings, athletes are particularly vulnerable to ankle sprains, knee stress, and lower back strain. Therefore, optimal physiological conditioning is essential for both performance enhancement and injury prevention.

Psychological Demands of Volleyball

In addition to physical demands, volleyball requires strong psychological preparedness. Players must make quick tactical decisions, maintain concentration during rallies, and regulate emotions in high-pressure situations. Competitive anxiety, performance stress, and the need for effective team coordination significantly influence match outcomes. Emotional control and mental focus are therefore critical components of consistent performance.

Yogic Practices and Physiological Support

Yogic practices contribute to improved flexibility, muscular balance, and postural alignment, which are essential for dynamic volleyball movements. Controlled breathing techniques enhance respiratory efficiency and support autonomic nervous system regulation. These practices also facilitate recovery by reducing muscular tension and promoting relaxation, thereby supporting sustainable physical performance.

Yogic Practices and Psychological Support

Yoga-based interventions assist in reducing anxiety and improving emotional regulation. Mindfulness and breath awareness enhance concentration, self-awareness, and attentional control. Regular practice may strengthen mental resilience, enabling athletes to remain composed and focused during competitive situations.

Integrated Model of Yoga and Modern Volleyball Training

The integration of yogic practices with modern volleyball training provides a balanced framework that supports both physical conditioning and psychological stability. Such a combined approach may promote consistent performance, reduce injury risk, enhance mental toughness, and contribute to the holistic development of university-level volleyball athletes.

Methodology

Research Design

The present study is based on a narrative review design. The study attempts to analyse and interpret existing research literature related to yogic practices and their potential contribution to modern volleyball training. The purpose of the study is to understand how yogic practices may support both physiological performance and psychological stability among university-level volleyball athletes.

Data Sources

Relevant research articles, review papers, and academic publications were collected from recognized academic databases including Google Scholar, ResearchGate, PubMed, and various sports science journals.

Search Strategy

The literature search was conducted using key terms such as yoga in sports performance, yogic practices in volleyball training, mental stability in athletes, yoga and psychological performance, yoga and injury prevention in sports, and yoga and holistic athlete development.

Inclusion Criteria

The following studies were included in the review:

- Studies related to yoga and sports performance.
- Research discussing mental stability, stress management, or psychological benefits of yoga.
- Studies involving volleyball training or similar sport performance contexts.
- Peer-reviewed articles and academic publications.

Exclusion Criteria

The following studies were excluded:

- Articles not related to sports or athletic performance.
- Non-academic sources and unpublished materials.
- Studies lacking sufficient methodological information.

PRISMA-Based Study Selection

For the selection of relevant literature, a PRISMA-inspired screening approach was followed. Initially, approximately 60 research articles were identified through database searches.
After removing duplicates and unrelated studies, around 40 articles were screened based on titles and abstracts.
From these, 30 full-text articles were assessed for relevance and quality.
Finally, approximately 20–25 studies were included in the narrative review.

Figure 1: Conceptual Framework of the Study

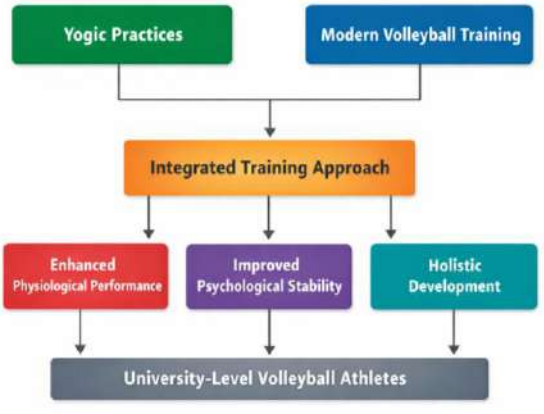

Figure 1: *Conceptual Framework of the Study*

This framework illustrating the integration of yogic practices into modern volleyball training for enhancing physiological performance, psychological stability, and holistic development among university-level volleyball athletes.

Discussion

The reviewed literature indicates that volleyball performance is multidimensional, requiring the integration of technical skill, physical conditioning, and psychological stability. The sport involves numerous performance components such as explosive power, agility, endurance, coordination, and rapid decision-making. While these elements are widely addressed through conventional volleyball training methods, limited structured integration of yogic practices within modern volleyball training programs has been observed. Although yoga and volleyball

training have been studied independently, research combining these approaches to enhance overall athlete performance remains comparatively insufficient.

From a psychological perspective, volleyball demands emotional control, composure, and appropriate decision-making under competitive pressure. As a team sport, it requires balanced temperament rather than constant aggression. The inclusion of yogic practices such as meditation and controlled breathing exercises during pre- and post-training sessions may contribute to psychological calmness, improved concentration, and enhanced mental resilience. These practices can support athletes in maintaining emotional stability during high-intensity match situations where quick yet composed decisions are essential.

Physiologically, volleyball requires strength, muscular endurance, explosive power, agility, and efficient recovery mechanisms. Repetitive jumping, rapid transitions, and sustained rallies place significant stress on the musculoskeletal and neuromuscular systems. Integrating yogic postures and flexibility-oriented practices within training sessions may improve balance, muscular endurance, flexibility, and postural alignment. Additionally, breathing techniques may enhance recovery processes and regulate physiological stress responses, thereby supporting sustainable performance.
From a theoretical standpoint, yoga functions effectively in a sports context because it addresses both physiological conditioning and mind–body interaction simultaneously. Yogic practices enhance bodily awareness while strengthening the interrelationship between mental focus and physical execution. The meditative and relaxation components of yoga promote holistic development by fostering internal balance, emotional regulation, and social harmony within team environments. This integrated framework supports the view that optimal sports performance emerges from coordinated physiological and psychological functioning.

Practically, yogic practices can be incorporated into university-level volleyball training without disrupting existing training structures. Selected Surya Namaskar sequences may be included during warm-up routines to enhance mobility and muscular readiness. Short breathing sessions prior to training can improve attentional focus, while post-training relaxation techniques may facilitate recovery and cooldown. Weekly flexibility modules and brief pre-match meditation sessions can assist athletes in developing mental preparedness and performance visualization strategies. Such applications demonstrate that integration is feasible and supportive rather than time-consuming.

Linking back to the identified research gap, the necessity of integration becomes evident because volleyball simultaneously demands physiological efficiency and psychological resilience. Structured incorporation of yogic practices may address issues such as anxiety, stress regulation, emotional control, and recovery support. Future research should focus on developing standardized models that systematically combine yogic interventions with volleyball-specific training to create athletes who are physiologically strong, psychologically stable, and holistically developed.

Practical Implications of the Study

The findings of the present narrative review suggest that yogic practices can be effectively integrated into modern volleyball training programs to support both physical and psychological aspects of athlete development. Coaches may incorporate selected yogic practices such as stretching-based asanas, breathing exercises, and short meditation sessions during warm-up or recovery periods. These practices may contribute to improved flexibility, balance, concentration, and emotional control among volleyball athletes.

The integration of yoga within university-level training programs may also assist in injury prevention, stress management, and the holistic development of athletes.

Limitations of the Study

The present study is based on a narrative review of existing literature and does not include primary data collection or experimental investigation. The findings are therefore dependent on previously published studies related to yoga and sports performance. Additionally, the study focuses mainly on conceptual integration rather than empirical validation among volleyball athletes. Future research may conduct experimental or longitudinal studies to examine the direct impact of structured yogic interventions on volleyball performance and psychological stability.

Conclusion

The present narrative review highlights that modern volleyball requires not only physical strength and technical proficiency but also psychological stability and emotional balance. While conventional training methods focus primarily on physical conditioning and skill development, the integration of yogic practices offers a more comprehensive approach to athlete preparation.

Yogic practices such as asanas, pranayama, and meditation may contribute to improved flexibility, balance, muscular endurance, recovery, concentration, and emotional regulation. By addressing both physiological and psychological demands, yoga supports the development of mentally resilient and physically efficient volleyball players.

Therefore, integrating yogic practices into university-level volleyball training can provide a balanced and sustainable framework for enhancing performance, reducing injury risk, and promoting holistic athlete development. Future research should focus on structured models to scientifically validate this integrated training approach.

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REDUCING ATHLETE DROPOUT THROUGH CSR- AND TAX-SUPPORTED ATHLETE DEVELOPMENT PATHWAYS: ESTABLISHING A NATIONAL ATHLETE MANAGEMENT TRUST TOWARD A DATA-DRIVEN NATIONAL ATHLETE MANAGEMENT SYSTEM (NAMS) IN INDIA

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Abstract

India's sports ecosystem continues to experience significant dropout in athlete participation. Empirical studies suggest that more than 40% of promising athletes discontinue structured training due to financial hardship, delayed stipends, inadequate coaching, and the absence of systematic performance monitoring. Public investment in sport remains fragmented, as sport is constitutionally a state subject, and flagship initiatives such as Khelo India demonstrate limited athlete transition to elite and international performance levels. Although Corporate Social Responsibility (CSR) provisions under Schedule VII of the Companies Act permit investment in sports development, only around 1–2% of total CSR expenditure is currently directed toward athletic pathways. Even recent growth in sports-related CSR remains geographically uneven and largely short-term, leaving many talented athletes unable to sustain training costs and forcing premature career exit.

To address these structural gaps, this paper proposes the establishment of a National Athlete Management Trust as a non-profit institutional mechanism to aggregate CSR contributions and tax-supported donations into long-term athlete development funds. The Trust would operate through a Data-Driven National Athlete Management System (NAMS). A centralized digital platform designed to profile athletes, track training and competition performance, coaching grants, and equipment support. By linking financial assistance to measurable performance benchmarks, NAMS aligns funding with athlete progression while strengthening accountability through multi-stakeholder governance involving government agencies, corporate CSR leaders, and athlete representatives.

The proposed framework draws on international athlete-support models, including Canada's Athlete Assistance Program, Australia's AIS education-linked scholarships, and Spain's Team España funding integration. Crucially, the model incorporates insights from China's "Juguo Tizhi" (whole-nation system) a centrally coordinated athlete management structure operating at population scale comparable to India. China's state-supported sports schools and province-led talent pathways demonstrate the feasibility of large-scale, centrally managed athlete development in highly populous nations.

The paper outlines a phased implementation strategy beginning with district-level pilot trusts and scaling toward a national network. The proposed NAMS framework aims to reduce athlete dropout, improve funding transparency, and establish sustainable, data-informed athlete development pathways aligned with India's evolving sports policy objectives.

Keywords: Athlete Dropout, Corporate Social Responsibility (CSR), National Athlete Management System (NAMS), Athlete Development Pathways, Juguo Tizhi (China's Athlete Management Model).

Introduction

India has one of the largest youth populations globally, yet its conversion of grassroots participation into elite international success remains inconsistent (Deloitte India & Google, 2023; KPMG, 2025). Structural challenges such as fragmented governance, limited long-term athlete support, and uneven infrastructure continue to constrain performance outcomes (FICCI, 2025; Press Information Bureau, 2026).

Athlete dropout during developmental stages remains one of the most critical issues. Research indicates that financial instability and lack of career security are primary contributors to athlete discontinuation (Fraser-Thomas et al., 2008). These challenges are amplified in India due to socio-economic inequalities and inconsistent institutional support systems (NITI Aayog, 2021).
While CSR provisions have created opportunities for private sector involvement in sports development, investment remains fragmented and lacks structured monitoring frameworks (CRISIL Foundation, 2023; Sports and Society

Accelerator & Pacta, 2025). This highlights the need for an integrated financial and performance governance mechanism.

1. Sports Policy and Elite Performance Systems

Elite sport development literature emphasizes the importance of structured governance systems rather than funding alone (Green & Houlihan, 2005; Houlihan & Green, 2008). The Sports Policy Factors Leading to International Sporting Success (SPLISS) framework identifies key pillars including talent identification, coaching quality, competition exposure, and sport science integration (De Bosscher et al., 2006).

Further comparative analysis shows that international sport has evolved into a "global sporting arms race," where nations strategically invest in athlete pipelines (De Bosscher et al., 2008).
Studies also demonstrate that Olympic success depends on institutional efficiency and participation depth (Scelles et al., 2020).

1.1 Mass Participation and Long-Term Athlete Development

Mass participation plays a foundational role in expanding the talent pool necessary for elite performance (UNESCO, 2015). The Long-Term Athlete Development (LTAD) framework provides structured progression models linking grassroots participation to elite outcomes (Balyi et al., 2013).

Countries implementing LTAD frameworks report improved athlete retention rates (Fraser-Thomas et al., 2008).
India's policy direction through Khelo India and rural sports initiatives reflects this developmental approach (Ministry of Youth Affairs and Sports, 2020; NITI Aayog, 2021).

1.2 Econometric Evaluation in Sports Policy

Modern sports economics increasingly applies statistical modeling to evaluate the effectiveness of sports investments (Leeds, 2014). Quantile regression models introduced by Koenker and Bassett (1978) allow policymakers to analyze funding-performance relationships across performance distributions rather than relying only on averages.
European sport policy research using such models demonstrates that:

a) Mass participation strongly predicts elite success.
b) Funding effectiveness depends on governance quality.

This reinforces the need for integrated funding-management structures.

1.3 CSR and Governance in Sports Development

CSR has emerged as an important financing mechanism for sports development globally (Krishna, 2025). Under the Companies Act (2013), corporations are legally permitted to invest in sports promotion initiatives (Ministry of Corporate Affairs, 2013).

However, current CSR investment remains fragmented due to the absence of centralized governance systems (Salampuria, 2023; Somvanshi, 2024).
Governance transparency significantly improves funding outcomes in sports systems (Winand et al., 2014).

1.4 International Athlete Support Models

Several countries provide structured athlete funding systems:

- Canada provides direct athlete stipends (Government of Canada, 2025).
- Australia integrates scholarships and athlete welfare support (AIS, 2021).
- Spain coordinates national funding through federation partnerships (Consejo Superior de Deportes, 2025).
- China operates a centralized state-driven athlete development model (Zheng et al., 2018).

These systems demonstrate that financial stability combined with performance monitoring reduces dropout rates.

2. The Indian Context: CSR Gaps and Athlete Dropout

Despite policy reforms, funding distribution in Indian sports remains uneven (The Federal, 2024). Studies show disparities in resource allocation across states and performance pathways (Priya & Prasanna, 2025).

CSR investment trends indicate increasing corporate interest, yet structured impact frameworks remain limited (Somvanshi, 2024; Sports and Society Accelerator & Pacta, 2025).

Career uncertainty remains another major cause of athlete dropout (Pandey, 2025).

Recent digital athlete tracking initiatives by federations demonstrate early progress toward data-driven governance (Hockey India, 2024).

3. Proposed Solution: National Athlete Management Trust (NAMT) and Data-Driven NAMS

India requires structural integration between funding mechanisms and athlete performance systems. This paper proposes a dual institutional structure:

a) Financial aggregation through NAMT
b) Digital performance governance through NAMS

3.1 National Athlete Management Trust (NAMT)

The NAMT is conceptualized as a non-profit institutional funding authority aggregating CSR, philanthropic, and government funding sources (Council on Foundations & International Center for Not-for-Profit Law, 2024).

a) Funding Sources
- CSR contributions
- Public donations
- Government matching grants

b) Multi-stakeholder governance structure including:
- Government
- Corporations
- Federations
- Athlete representatives
- Independent auditors

Governance transparency improves performance outcomes (Winand et al., 2014).

3.2 Data Driven National Athlete Management System (NAMS)

NAMS will function as a centralized digital platform integrating athlete performance data, financial tracking, and athlete lifecycle tracking.

The system will include:
- Performance records
- Training metrics
- Injury monitoring
- Funding records

This aligns with LTAD frameworks (Balyi et al., 2013).
Quantile regression models will evaluate funding effectiveness (Koenker & Bassett, 1978; Leeds, 2014). Integration of funding with career tracking of athletes reduce athlete dropout (Pandey, 2025).

4. Implementation Framework, CSR Integration, and Governance Model

This section forms the operational backbone of the proposed NAMS framework and addresses one of the most critical structural gaps in the Indian sports ecosystem—integration of CSR funding with athlete development through institutional governance.

4.1 Establishment of National Athlete Management Trust (NAMT) should begin with the formation of a non-profit trust under Indian legal frameworks governing charitable institutions. Operating initially as a trust ensures:

a) Eligibility for CSR contributions under the Companies Act (Ministry of Corporate Affairs, 2013)
b) Tax incentives for corporate donors
c) Operational flexibility for program implementation

d) The trust model is widely used internationally for sports development funding structures.

Legal frameworks for nonprofit governance also emphasize transparency and reporting requirements (Council on Foundations & ICNL, 2024).

4.2 CSR Funding Integration Mechanism

India generates substantial CSR funding annually, yet only a small percentage is directed toward structured athlete development (CRISIL Foundation, 2023).

The proposed system introduces a CSR Allocation Pipeline Model:
Corporate CSR → NAMT Central Pool → Athlete Development Categories
Funding categories include:

- Athlete scholarships
- Equipment support
- Nutrition and sports science
- Mental health services
- International exposure

This model reduces duplication of CSR projects and aligns investments with performance outcomes.
Industry reports estimate India's sports sector could reach $130 billion if structured investments improve governance efficiency (Deloitte India & Google, 2023).

4.3 Digital Governance and Transparency Framework

Transparency remains one of the most critical challenges in sports governance (Winand et al., 2014).
The proposed **NAMS** platform includes:

- Real-time funding dashboards
- Athlete progress tracking systems
- CSR utilization reporting
- Performance analytics integration

Digital monitoring improves accountability and reduces fund misallocation.
Recent Indian sports governance reports highlight funding disparities due to lack of centralized monitoring (The Federal, 2024).

4.4 Public-Private Partnership (3P) Integration

The proposed framework integrates:

- Government schemes (Khelo India)
- National Sports Federations
- Corporate CSR programs
- Private high-performance centers

3P-based sports models have shown strong performance improvements globally (Green & Houlihan, 2005).
India's growing sports economy makes 3P integration essential for sustainable funding (KPMG, 2025; FICCI, 2025).

4.5 Athlete Welfare Monitoring System

Modern elite sport governance emphasizes athlete welfare as a core performance determinant (Scelles et al., 2020).
The system introduces:

- Injury monitoring
- Education progression dashboards
- Career transition modules

Research shows welfare-based systems improve long-term athlete retention (Fraser-Thomas et al., 2008).

4.6 Policy Alignment with National Sports Development Code

The framework aligns with:

- National Sports Development Code (2011)
- Khelo India Guidelines (2020)
- Budget allocations for sports ecosystem expansion (Press Information Bureau, 2026)

4.7 Implementation Phases

Phase 1: Legal Establishment and CSR Integration
Phase 2: Pilot Athlete Database and Digital Platform
Phase 3: National Expansion through Federations
Phase 4: Full Digital Governance Integration
Phased implementation reduces operational risks.

5. Expected Outcomes

The proposed system is expected to generate:

- Improved athlete funding efficiency
- Reduced dropout rates
- Better performance tracking
- Increased CSR investment utilization
- Stronger international medal outcomes

Comparative studies confirm that structured governance improves elite sport performance (De Bosscher et al., 2006).

6. Conclusion

India's sports ecosystem is transitioning toward performance-oriented governance, yet structural integration remains incomplete. This research proposes a CSR-integrated National Athlete Management System to bridge funding, governance, and athlete welfare gaps.

By combining:

- Non-profit institutional frameworks
- Digital governance systems
- Athlete lifecycle models
- CSR-based funding pipelines

India can build a sustainable athlete development ecosystem aligned with international best practices.
Future research may focus on pilot implementation and data validation across specific sports disciplines.

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PSYCHOLOGICAL PERSPECTIVE OF YOGIC DIET

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Abstract

The yogic diet, rooted in ancient Indian philosophy, emphasizes purity, balance, and harmony between body and mind. From a psychological perspective, dietary habits influence cognition, emotional regulation, stress response, and overall mental health. Yogic nutrition categorizes food into *Sattvic*, *Rajasic*, and *Tamasic* types, each affecting psychological states differently. This paper explores the psychological foundations of the yogic diet, its impact on mood and behaviour, and its relevance in contemporary mental health research. Evidence from nutritional psychology and mind–body science suggests that a Sattvic diet supports emotional stability, clarity of thought, and reduced anxiety. The integration of yogic dietary principles may serve as a preventive and supportive approach to psychological well-being. This study shows the impact of yogic diet on psychological functions and advices to adopt sattvic diet in daily routine.

Keywords: Yogic diet, Sattvic food, mental health, nutritional psychology, emotional regulation, mindfulness

1. Introduction

Yoga is spiritual discipline which focuses on bringing harmony between mind and body (Chordia, et.al., 2018). Yogic Diet plays a crucial role not only in physical health but also in psychological functioning. Ancient yogic texts such as the Bhagavad Gita and Hatha Yoga Pradipika describe food as a determinant of mental qualities (*gunas*). Modern psychology also recognizes the connection between nutrition and mental health through emerging fields like nutritional psychiatry.

The yogic diet is primarily vegetarian and emphasizes fresh, natural, and minimally processed foods. It promotes balance and mindfulness in eating practices (Tewari, et.al., 2024). From a psychological standpoint, food influences neurotransmitter activity, stress hormones, and cognitive processes.
Nowadays, peoples are busy in their sedentary lifestyle and prefers the easy and fast cooking food which includes packed, preserved, junk food etc. Having such kind of food in diet degrades the efficiency of human mind and various functions while preferring yogic diet focusing on sattvic food categories will improve psychological functions.

2. Concept of Yogic Diet

According to yogic philosophy, foods are classified into three categories:

2.1 Sattvic Diet

आयु सत्ववलारोग्यसुखप्रीतिविवर्धनाः । रास्याः स्निग्धाः स्थिरा हद्या आघराः सात्विक प्रियाः ।। (B.G) 17.8

Food dears to those is the mode of goodness increase the duration of life, purify ones. Existence and give strength, health, happiness and satisfaction. Such food is juicy, fatty, wholesome and pleasing to the heart. (17.8)

Sattvic foods are pure, light, and nourishing. Examples include fresh fruits, vegetables, whole grains, milk, nuts, and legumes.

Psychological Effect:

- Promotes calmness and clarity
- Enhances concentration and memory
- Supports emotional balance
- Reduces anxiety and aggression
- Influences hidden potential and creativity (Suresh, et.al.,2020)

Sattvic food is believed to increase serotonin production and stabilize mood. Sattvic diet offers transformative approach to nourishing the body, mind and spirit (kuril, et.al., 2024).

2.2 Rajasic Diet

कट्बम्ललवणात्युष्णतीक्ष्णरुक्षविदाहिनः । आहारा राजसस्येष्टा दुःखषोकामधप्रदाः ।। (B.G) 17.9
Foods that are too bitter, too sour, salty, hot, pungent, dry and burning are dear to those in passion. Such foods cause distress misery and disease. (17.9)

Rajasic foods are stimulating and include spicy, salty, fried foods, They are dry and hot They includes fried foods, beverages, caffeine, and excessive sweets (Panda, 2022).

Psychological Effect:

- Increases restlessness
- Promotes hyperactivity
- May lead to irritability
- Increases stress response

Modern research shows excessive caffeine and high sugar intake may increase anxiety and mood fluctuations. They are mainly interested in power, prestige, position and prosperity (Bansal, et.al.2022).

2.3 Tamasic Diet

यतयं न गतरसं पूति पर्युषित न चयत्। उच्छिष्टम्प इ चामेध्यं भोजन तामसप्रियम् ॥ (बी.जी.) 17.10

Foods prepared more than three hours before being eaten, food that is tasteless, decomposed and putrid, and food consisting of remnants and untouchable things is dear to those in the mode of darkness. (17.10)
Tamasic foods are heavy, stale, processed, or overly preserved foods. They includes meat from big tamed animals, onions, mushrooms, highly fried foods, high fat fried foods, salt, sugar, spices, chillies, pepper, butter and liquor (Jimenez, et.al., 2015).

Psychological Effect:

- Causes lethargy
- Reduces motivation
- Increases Criminal tendency
- Promotes depressive tendencies
- Impairs cognitive clarity

Highly processed diets have been associated with increased risk of depression and poor mental health outcomes.

3. Psychological Mechanisms behind Yogic Diet

3.1 Gut–Brain Axis

Recent studies emphasize the gut microbiome's role in mental health. A plant-based, fibre -rich Sattvic diet improves gut health, which positively affects mood and cognition (Tripathi, et. al., 2025).

3.2 Mindfulness and Eating Behaviour
3.3

Yogic philosophy encourages mindful eating—slow, conscious, and grateful consumption of food. Mindful eating reduces emotional eating and stress-related disorders (Padmambika, et. al., 2023).

4. Conclusion

The psychological perspective of the yogic diet highlights the deep interconnection between food and mental states. Ancient yogic wisdom corresponds significantly with modern research in nutritional psychology. A Sattvic diet, combined with mindful eating practices, supports emotional stability, cognitive clarity, and overall psychological

well-being. Future empirical studies are needed to further validate traditional yogic dietary classifications in modern scientific contexts.

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ASSESSMENT OF SPORTS COMPETATIVE ANXIETY AMONG DIFFERENT SPORTSPERSONS

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Abstract

Objective: To find out the Sports Competitive Anxiety among different sportspersons

Method: The purpose of the study was to assess the Sports Competitive Anxiety among different sportspersons. The present investigation was conducted on 200 University players representing their Universities in different sports in the age group of 18 to 25 years were selected from All India Inter University Tournament in the session 2015-16. The mean age of the subject was 21. The study was conducted on selected games, i.e. Kabaddi, Volleyball, Handball, Athletics andYoga. As per the manual, scoring was done and data werecollected. For thepurpose of the present study descriptive statistics (mean, standard deviation) and Two-Way ANOVA were used and level of significance was set at .05level.Assessment of the Problem are the direct need of the Psychologist,soaccordingly the athlete's problem may be dealt for improving performance. Within the delimitation and limitation of the study.

Result: Two-way ANOVA indicated a significant difference in Sports Competitive anxiety between team game and individual game players. Individual game playershave higher anxiety than the players of team game.

Conclusion: Significant difference in anxiety between Team games and Individual games. Players of Individual games have higher anxiety than the player of team game. It is may be that, in the setup of a team game there are a number of players who can support and motivate within the team itself which can helpful to deal with the competitive anxiety. Whereas in individual sports, there is nobody around who can help you to deal with the competitive anxiety. No significant difference of gender was found on anxiety.The interaction effect was not significant. No significant difference of gender was found on anxiety. The interaction effect was not significant.

Keyword: Sports CompetitiveAnxiety, Sportspersons, Team and Individual game players.

Introduction

Competitive anxiety in sports can make most successful player feel nervous and is one of the most important and interesting area of sport psychology (Guillen, F. and Sanchez, R., 2009). Anxiety can affect the performance of players especially during competitions and its effect on player's moods and locomotors skills. There are many factors that can make players anxious such as the importance of game success, or the difference between their abilities and capabilities required for their performance, and these factors can have a negative effect (Sedarati, M. 2007). Besides this, Pre-competitive anxiety, a condition of arousal that is uncomfortable/negative and it occurs during the 24 hour span prior to competition. From many years, it has been recognized that in psychological factors, predominantly pre-competitive anxiety play an important role in competition (Moran, A. P.,& Martens, R, *et al*. 2004).

Moreover, pre-competitive anxiety is the mental component that known by negative expectations such as about success or by self-evaluation, unrealistic beliefs, worrying, think about performance experience below expected levels in his previous match, a person with mental challenges, catastrophic and previous problems, and individual beliefs related to the implementation of sport skills, negative self-talk, tension about the performance, fear from failure, helplessness to concentrate and disrupt attention (Martens, R. & Jarvis, M. *et al*. 1990). Team and individual event gamesinclude accurate motor skills and psychological factors for a player intended for a decisive role in a competition. Many studies have been conducted on the basis of gender differences concentrating anxiety state levels. Various studies demonstrate that male players display lowlevel of anxiety than females but no significant difference of pre-competitive anxiety betweenmen and women were found (Scanlan, T. K. &Wark K. A. *et al*. 1979).

The intention of this study was to explore the sports competitive anxiety between sports type (team and individual game players) and gender type (males and female players) and evaluatethe interaction effect between them.

Procedure and Methodology

Selection of Subjects

The present investigation was conducted in 200 All India University players representing different sports in the age group of 18 to 25 years were selected from different All India University Tournament in the session 2015-16. The mean Age of the subject is 21. The study was conducted on selected games. Kabaddi, Volleyball, Handball, Athletics and Yoga. In total (N=200) selected subjects for the study 100 data was collected from Team game (50 male and 50 female) and 100 data (50 male and 50 female) was collected from Individual games.

Selection of Variable

After having a detailed discussion with the experts, advisor and a detailed literature search following psychological variable was selected for the purpose of the study.

- Sports Competitive Anxiety

Criterion Measures

Sports Competitive Anxiety Test (SCAT) was developed by Marten (1990). The scale consists of 15 items. High test-retest reliability of the tool is 0.85.

Description of Questionnaire

The Sports Competitive Anxiety Test (SCAT) questionnaire has fifteen statements out of which five are spurious questions, which have been added to the questionnaire to diminish response bias towards the actual test items. These five statement scores were not added to the total sum scored by each subject. The subjects were instructed to respond to each statement according to, how they generally feel in the competitive game situation.
Each statement consists of three responses which are mentioned below:

a) Never
b) Sometimes
c) Always

The ten test statement which was taken for scoring purpose were item no. 2, 3, 5, 6, 8, 9, 11, 12, 14 and 15. The remaining five spurious statement i.e. 1, 4,7,10 and 13 scores were not added to the total sum scored by each subject (as suggested by Rainer Marten).

While the subjects were responding to the questionnaire, the investigator moved around verifying that the subjects recorded the answers sequentially. The investigator also explained the meaning of the questions / words in case of any doubts.

The investigator ensured that the subjects responded to each statement and no question is left unanswered scrutinized the complete questionnaire. The statement 2, 3, 5, 8, 9, 12, 14 and 15 were worded in such a manner that they were scored according to the following key:

SCORE	**RESPONSE**
1	Never
2	Sometime
3	Always

In case of statement 6 and 11 scoring was carried out according to the following key:

SCORE	**RESPONSE**
1.	Always
2.	Sometime
3.	Never

Scoring: Scores of 10 statements were added which represented the total score of competition anxiety of each subject.

Administrating of Questionnaire

Necessary instruction was given to the subjects before the administration of the test. It was clearly explained to the subjects that the overall purpose of the study was to allow each subject to provide information with respect to problem while pursuing sports training or participation confidentiality of responses was guaranteed so that the subject would not camouflage their real feelings. The subjectswere asked to respond as quickly as possible without stopping over any statements, once the instructions were understood clearly. None of subject encountered any serious problem in understanding the statements which were invariable in English.

Collection of Data

The data were collected from the 200 players playing in different All India University Tournament in the session 2015-16.

Statistical Analysis

For the purpose of the present study descriptive statistics (Mean, Standard Deviation) and Two Way ANOVA were used for Gender at the level of significance was set at .05.

Result

Table -1 Descriptive Analysis on Sports Competitive Anxiety in different Type of Sports between Male andFemale players

Variable	Type of sport	Sex	Mean	Std. Deviation	N
Sports Competitive Anxiety	Team Game	Male	19.34	1.954	50
		Female	19.30	2.742	50
		Total	19.32	2.369	100
	Individual Game	Male	19.90	3.357	50
		Female	21.38	3.096	50
		Total	20.64	3.298	100
	Total	Male	19.62	2.747	100
		Female	20.34	3.091	100
		Total	19.98	2.939	200

The table 1 reveals the descriptive analysis of anxiety in team game and individual game between Male and Female It was found that the mean values of sports competitive anxiety of team game and individual game is 19.32+2.37 and 20.64+3.30 respectively. The meanvalue of male and female in anxiety is 19.62+2.75 &20.34+ 3.09 respectively.However, the mean value of interaction between group and gender was found 19.34+ 1.95 &19.30+2.74 respectively for male and female in team games. The mean value of male and female in individual game is 19.90+3.36 &21.38+3.10 respectively.

Fig. No. 1 - Graphic Representation of Sports Competitive Anxiety Scores

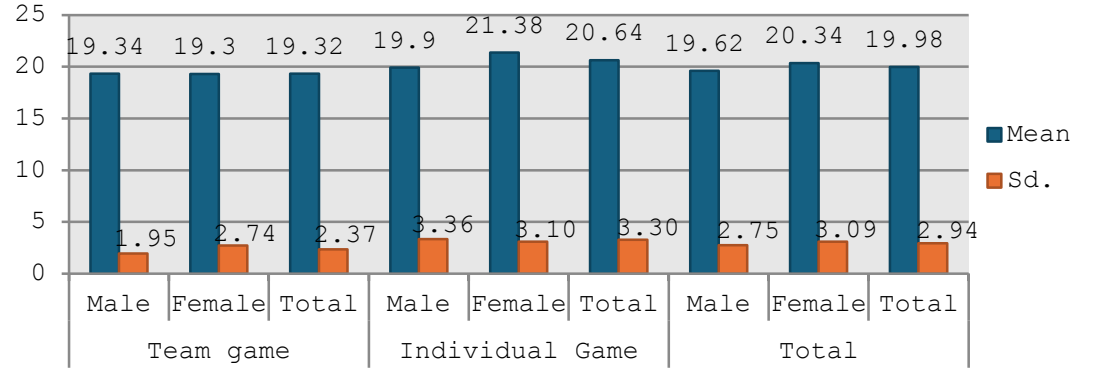
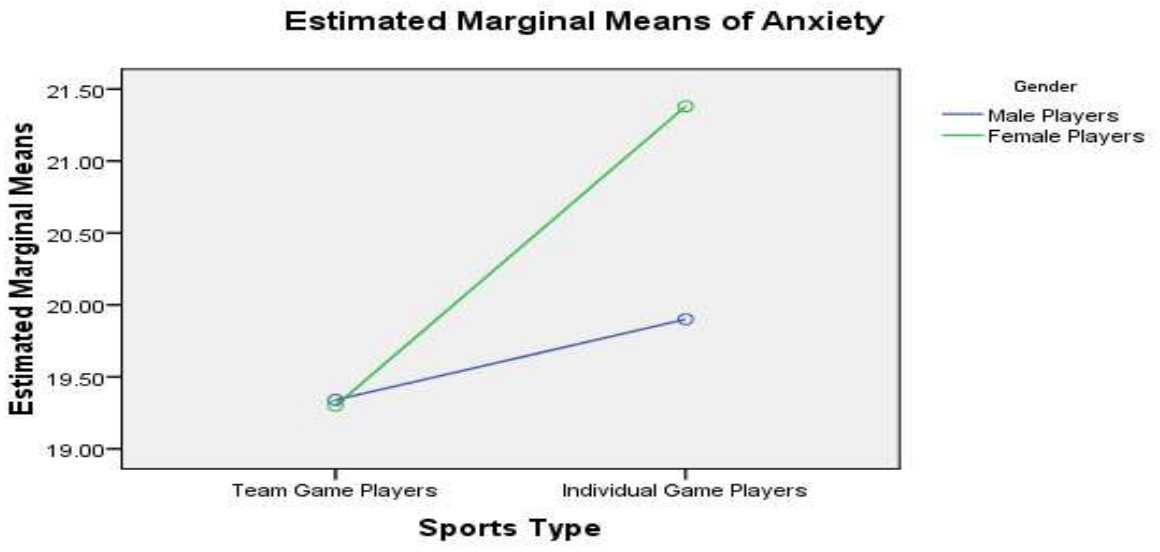


Fig. 2: Graphic Representation of Mean of Anxiety in different Type of Sports between Male and Female players



To analyze the mean difference in Team game and Individual game between Male and Female Two Way ANOVA was computed for each sub variable of Athlete problems and on Athlete Problem variable and result pertaining to Anxiety have been presented below in Table 2.

Table 2 Summary of 2x2 way ANOVA on Anxiety in different Types of Sports between Male and Female.

Dependent variable	Source of variance	SS	Df	MSS	F-Value	P-Value
Sports Competitive Anxiety	Type of sports	87.120	1	87.120	10.821	.001
	Sex	25.920	1	25.920	3.219	.074
	Type of sport *sex	28.880	1	28.880	3.587	.060
	Error	1578.000	196	8.051		
	Total	1719.920	199			

In Table 2 Two-Way ANOVA indicated a significant difference in anxiety between Team games and Individual games, f (1, 196) = 10.82, p<.05. It means the mean scores of anxiety type of sports, team game and individual game differ significantly. So, a group of sports influences the anxiety of players. To find out which Type of sports affects the Anxiety in Athletes,pairwise comparison was done by using LSD.

Two-way ANOVA revealed that no significant effect of Gender was found on anxiety, f (1, 196) = 3.219, p>.05 and indicating that the mean scores of anxiety about male and female do not differ significantly. Therefore, it may be concluded that players of both male and female possess same Problems.

The interaction effect was no significant as f (1, 196) = 3.587, p>.05. It means the mean scores of anxiety of male and female from different sports such as team game and individual game players do not differ significantly. So, interaction of group with gender does not influence the anxiety of players. Therefore, it may be concluded that the Problem of Anxiety does not exist differently in the player of different Type of sports between Male and Female.

To assess the significantly different between Types of sports, Pairwise comparison was computed Result have been presented in Table 3

Table 3 Pairwise comparison of anxiety between individual and team game players

Dependent Variable	(I) Type of Sport	(J) Type of Sport	Mean Difference (I-J)	Std. Error	Sig.[a]
Anxiety	Team game	Individual game	-1.320*	.401	.001

Table 3 reveals that players of Individual games have posses higher (M=20.64) Anxiety than the players of Team game (M=19.32).
Based on estimated marginal means
The mean difference is significant at the .05 level.
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Conclusion and Disscussion

Two-way ANOVA indicated a significant difference in anxiety between Team games and Individual games. Players of Individual games have higher anxiety than the player of team game. It is may be that, in the setup of a team game there are a number of players who can support and motivate within the team itself which can helpful to deal with the competitive anxiety. Whereas in individual sports, there is nobody around who can help you to deal with the competitive anxiety. No significant difference of gender was found on anxiety.The interaction effect was not significant.

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PREVENTIVE ROLE OF WARMING-UP AND COOLING-DOWN EXERCISES FOR REDUCING SPORTS INJURIES

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Abstract

A **warming-up exercise** is a set of light, gradual physical activities performed before engaging in intense sports or workout sessions. Its purpose is to prepare the body and mind for higher levels of physical activity. A **cooling-down exercise** is a series of light physical activities performed after completing intense exercise or sports. Its purpose is to help the body gradually return to its normal resting state.

Dynamic stretching during warm-up improves joint mobility and muscle flexibility. Better range of motion reduces stiffness and lowers the chances of ligament, sprains and joint injuries. Cooling down helps remove metabolic waste products from muscles, which may reduce muscle soreness and discomfort after exercise. Less soreness supports safer movement in future training sessions.

Use the warm-up time to rehearse correct posture and movement mechanics. Proper form reduces stress on ligaments and joints. Cooling down should be done after every training session or competition. Regular cool-down routines reduce muscle soreness and decrease the likelihood of repetitive stress injuries.

- **What is a Warming-Up and cooling-down exercise?**
- **Importance of Warming-Up and cooling-down Exercises in Reducing Sports Injuries.**
- **Role of Warming-Up and cooling-down Exercises in Reducing Sports Injuries.**

Conclusion:-Sports injuries can be prevented by warming up through light aerobic exercises, dynamic stretching, sport-specific drills, and gradual intensity progression. A proper warm-up routine prepares the body and mind, making physical activity safer and more effective. Cooling-down exercises are essential for injury prevention in sports they lower the risk of both acute and chronic sports injuries while supporting overall athletic performance. A consistent cooling-down routine keeps muscles healthy and prepares the body safely for the next performance.

Key words:- Warming-up, Cooling-down And Sports Injuries

What is a Warming-Up Exercise?

A **warming-up exercise** is a set of light, gradual physical activities performed before engaging in intense sports or workout sessions. Its purpose is to prepare the body and mind for higher levels of physical activity.

Main Objectives of Warming-Up Exercises:

- Increase blood flow to working muscles
- Raise muscle temperature
- Improve flexibility and joint mobility
- Enhance coordination and reaction time
- Reduce the risk of injuries

Examples of Warming-Up Exercises:

- Light jogging or brisk walking
- Skipping
- Arm circles and leg swings
- Lunges and squats
- Sport-specific drills (e.g., short sprints before football)

Importance of Warming-Up Exercises in Reducing Sports Injuries

Warming-up exercises play a crucial role in preventing sports injuries by preparing the body physically and mentally for intense activity. Proper warm-up reduces stress on muscles, joints, and connective tissues, making movement safer and more efficient.

1. Increases Muscle Temperature

A rise in muscle temperature improves elasticity and flexibility. Warm muscles contract and relax more efficiently, reducing the risk of muscle strains and tears.

2. Improves Blood Circulation

Warming up increases blood flow to working muscles, ensuring adequate oxygen and nutrient supply. This helps muscles perform effectively and decreases the likelihood of fatigue-related injuries.

3. Enhances Flexibility and Range of Motion

Dynamic stretching during warm-up improves joint mobility and muscle flexibility. Better range of motion reduces stiffness and lowers the chances of ligament sprains and joint injuries.

4. Improves Neuromuscular Coordination

Warm-up exercises activate the nervous system, improving balance, reaction time, and coordination. This reduces the risk of falls, awkward movements, and improper techniques that may cause injury.

5. Gradual Cardiovascular Adjustment

It allows the heart and lungs to adjust gradually to increased physical demands, preventing sudden stress on the cardiovascular system.

6. Mental Preparation
Warming up enhances concentration and focus, helping athletes perform movements correctly and safely.

How to Prevent Sports Injuries through Warming-Up Exercises

Warming up properly before sports is one of the most effective ways to prevent injuries. It prepares your muscles, joints, and heart for intense activity, reducing sudden stress on the body.

1. Start with Light Activity (5–10 Minutes)

Begin with low-intensity movements such as:

- Light jogging
- Brisk walking
- Skipping
- Cycling

This increases heart rate and blood flow, making muscles warmer and more flexible, which reduces the risk of strains.

2. Perform Dynamic Stretching

Dynamic stretches involve controlled movements rather than holding a stretch. Examples include:

- Leg swings
- Arm circles
- Walking lunges
- High knees

These improve flexibility and joint range of motion, lowering the chance of sprains and muscle pulls.

3. Include Sport-Specific Drills

Gradually practice movements related to your sport. For example:

- Short sprints before football
- Practice swings before tennis
- Light passing drills before basketball

This prepares the exact muscles and movement patterns you will use, preventing sudden overload.

4. Increase Intensity Gradually

Avoid jumping straight into high-intensity activity. Slowly build up speed and power to allow muscles and joints to adjust safely.

5. Focus on Proper Technique

Use the warm-up time to rehearse correct posture and movement mechanics. Proper form reduces stress on ligaments and joints.

6. Maintain Consistency

Warm up before every training session and competition. Regular warm-up routines significantly reduce the frequency of sports injuries.

Role of Warming-Up Exercises in Reducing Sports Injuries

Warming-up exercises are essential in preparing the body for physical activity and play a crucial role in preventing sports-related injuries. They prepare muscles, joints, and the cardiovascular system, reducing the risk of strains, sprains, and other musculoskeletal injuries.

1. Increases Muscle Temperature and Elasticity

Warm muscles are more flexible and contract more efficiently. This reduces the likelihood of muscle strains, tears, and other soft tissue injuries during intense activity.

2. Improves Blood Circulation

Warming up increases blood flow to muscles, providing them with oxygen and nutrients. Enhanced circulation helps muscles perform optimally and reduces fatigue-related injuries.

3. Enhances Flexibility and Range of Motion

Dynamic stretching and mobility exercises improve joint movement and muscle elasticity. Better flexibility reduces mechanical stress on muscles and ligaments, preventing sprains and overuse injuries.

4. Activates Neuromuscular Coordination

Warming up stimulates the nervous system, improving coordination, balance, and reaction time. This helps athletes avoid awkward movements that can cause injury.

5. Gradual Cardiovascular Adjustment

It allows the heart and lungs to gradually adjust to increased physical demands, reducing the risk of cardiovascular stress or sudden fatigue-related incidents.

6. Mental Preparation

Warming up also prepares the mind by increasing focus and concentration, which helps athletes perform movements with proper technique and reduces the risk of injury caused by mistakes.

What is a Cooling-Down Exercise?

A **cooling-down exercise** is a series of light physical activities performed after completing intense exercise or sports. Its purpose is to help the body gradually return to its normal resting state.

Definition:

Cooling-down exercises are low-intensity movements and stretches done at the end of a workout to slowly reduce heart rate, relax muscles, and promote recovery.

Main Objectives of Cooling-Down Exercises:

- Gradually lower heart rate and breathing rate
- Prevent sudden dizziness or fainting
- Reduce muscle stiffness
- Improve flexibility
- Help remove metabolic waste products (like lactic acid)
- Reduce muscle soreness

Examples of Cooling-Down Exercises:

- Slow walking after running
- Gentle cycling
- Deep breathing exercises
- Static stretching (holding stretches for 15–30 seconds)

Importance of Cooling-Down Exercises in Reducing Sports Injuries

Cooling-down exercises are an essential part of any training session because they help the body recover gradually after intense physical activity. Proper cool-down reduces muscle tightness, promotes recovery, and lowers the risk of injuries in future sessions.

1. Gradual Reduction of Heart Rate

After vigorous activity, stopping suddenly can cause blood pooling in the limbs. Cooling down allows the heart rate and blood circulation to return to normal gradually, preventing dizziness and cardiovascular stress.

2. Reduces Muscle Stiffness

Light movements and stretching during cool-down help muscles relax and prevent stiffness. Reduced stiffness decreases the risk of muscle strains in subsequent activities.

3. Prevents Delayed Onset Muscle Soreness (DOMS)

Cooling down helps remove metabolic waste products from muscles, which may reduce muscle soreness and discomfort after exercise. Less soreness supports safer movement in future training sessions.

4. Maintains Flexibility

Static stretching during cool-down improves flexibility and joint range of motion, reducing tightness that can lead to ligament sprains or muscle injuries.

5. Promotes Faster Recovery

A proper cool-down enhances recovery by improving blood circulation and oxygen supply to muscles, helping repair tissues and reduce fatigue-related injuries.

6. Mental Relaxation

Cooling down helps athletes relax mentally, reducing stress and improving focus for future performance.

How to Prevent Sports Injuries Through Cooling-Down Exercises

Cooling down properly after sports is essential to prevent injuries and support safe recovery. A structured cool-down routine helps muscles relax, restores normal body function, and prepares the body for future activity.

1. Gradually Reduce Intensity (5–10 Minutes)

Do not stop exercise suddenly. Instead:

- Slow jog → brisk walk → slow walk
- Light cycling at reduced speed

This prevents blood pooling, dizziness, and unnecessary stress on the heart and muscles.

2. Perform Light Aerobic Movements

Continue gentle movements to maintain blood circulation. Good circulation:

- Removes metabolic waste products
- Supplies oxygen to tired muscles
- Reduces muscle tightness

Better circulation lowers the risk of post-exercise muscle stiffness and strains.

3. Do Static Stretching

Hold each stretch for 15–30 seconds without bouncing. Focus on major muscle groups used during the activity (e.g., hamstrings, quadriceps, calves, shoulders).

Static stretching:

- Maintains flexibility
- Prevents muscle shortening
- Reduces risk of future sprains and strains

4. Practice Deep Breathing and Relaxation

Slow, deep breathing helps:

- Normalize heart rate
- Relax muscles
- Reduce tension

Mental relaxation also improves overall recovery.

5. Rehydrate and Replenish Energy

Drink water and, if necessary, consume light nutritious food to:

- Replace lost fluids
- Prevent muscle cramps
- Support tissue repair

6. Maintain Consistency

Cooling down should be done after every training session or competition. Regular cool-down routines reduce muscle soreness and decrease the likelihood of repetitive stress injuries.

Role of Cooling-Down Exercises in Reducing Sports Injuries

Cooling-down exercises play a critical role in preventing sports injuries by helping the body transition safely from intense activity to rest. They support physical recovery, maintain flexibility, and reduce the risk of both acute and chronic injuries.

1. Gradual Recovery of Heart Rate and Blood Flow

After vigorous activity, stopping abruptly can cause blood pooling in the extremities and dizziness. Cooling down gradually lowers heart rate and stabilizes blood circulation, reducing cardiovascular stress and preventing fainting-related injuries.

2. Reduction of Muscle Stiffness

Light aerobic activity and stretching during cool-down help muscles relax and prevent tightness. Relaxed muscles are less prone to strains, tears, and cramps in subsequent activities.

3. Prevention of Delayed Onset Muscle Soreness (DOMS)

Cooling down helps flush out lactic acid and metabolic waste from muscles, decreasing soreness and inflammation. Reduced soreness allows athletes to train more safely in future sessions.

4. Maintenance of Flexibility and Joint Health

Static stretching during cool-down preserves joint range of motion and muscle elasticity. Flexible muscles and joints are less likely to experience sprains, ligament injuries, or overuse injuries.

5. Enhanced Recovery and Tissue Repair

Improved circulation during cool-down supplies oxygen and nutrients to muscles, supporting tissue repair and reducing fatigue-related injuries.

6. Mental Relaxation and Focus

Cooling down provides a psychological transition from intense activity to rest, reducing stress and tension. This helps athletes avoid performance errors that can lead to injuries.

Conclusion

Sports injuries can be prevented by warming up through light aerobic exercises, dynamic stretching, sport-specific drills, and gradual intensity progression. A proper warm-up routine prepares the body and mind, making physical activity safer and more effective. Cooling-down exercises are essential for injury prevention in sports they lower the risk of both acute and chronic sports injuries while supporting overall athletic performance. A consistent cooling-down routine keeps muscles healthy and prepares the body safely for the next performance. The findings of this study highlight that warming-up and cooling-down exercises are essential components of safe and effective participation in games and sports. A well-planned warm-up prepares the athlete physically and mentally by increasing muscle temperature, improving flexibility, and activating neuromuscular coordination, which reduces the likelihood of strains, sprains, and other sports injuries. In competitive games where movements are fast, repetitive, and highly demanding, proper warm-up routines help players perform skills more efficiently and confidently. Similarly, cooling-down exercises play a crucial role in post-game recovery by gradually reducing heart rate, relaxing muscles, and preventing stiffness and delayed onset muscle soreness.Therefore, coaches, trainers, and athletes should treat warm-up and cool-down as integral parts of sports training programs. Sports injuries can be prevented by warming up through light aerobic exercises, dynamic stretching, sport-specific drills, and gradual intensity progression. A proper warm-up routine prepares the body and mind, making physical activity safer and more effective. Cooling-down exercises are essential for injury prevention in sports they lower the risk of both acute and chronic sports injuries while supporting overall athletic performance. A consistent cooling-down routine keeps muscles healthy and prepares the body safely for the next performance

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खेल प्रशिक्षण, पुनर्प्राप्ति और चोटों की रोकथाम में योग की भूमिका

सृष्टि धर दूबे'
'IV सेमेस्टर, एम. ए. शारीरिक शिक्षा, दीन दयाल उपाध्याय गोरखपुर विश्वविद्यालय, गोरखपुर, उत्तर प्रदेश

सारांश

योग एक प्राचीन भारतीय पद्धति है जो शारीरिक, मानसिक और आध्यात्मिक संतुलन पर जोर देती है। वर्तमान में, खेल प्रशिक्षण में योग का महत्व बढ़ रहा है, क्योंकि यह खिलाड़ियों की शारीरिक क्षमता के साथ-साथ उनकी मानसिक दृढ़ता और एकाग्रता को भी बढ़ाता है। चोटों से बचाव के संदर्भ में, योग को एक महत्वपूर्ण सहायक अभ्यास माना जाता है, जो लचीलापन, शक्ति, संतुलन और ध्यान को बढ़ावा देता है। अध्ययन में यह पाया गया है कि नियमित योग अभ्यास से खिलाड़ियों में लचीलापन, मांसपेशियों की शक्ति, सहनशक्ति और संतुलन में वृद्धि होती है। सूर्य नमस्कार, वृक्षासन, भुजंगासन और त्रिकोणासन जैसे आसनों से मांसपेशियों को मजबूत किया जाता है और जोड़ों की चोटों का खतरा कम होता है, जिससे खेल प्रदर्शन में सुधार होता है। योग अभ्यास स्थिरता बनाने वाली मांसपेशियों को मजबूत करता है, जिससे शारीरिक मुद्रा स्थिति सुधरती है, और शरीर-मस्तिष्क का समन्वय बेहतर बनाता है।

श्वास नियंत्रण और ध्यान तनाव को कम करने में सहायक होते हैं, जिससे पुनर्प्राप्ति में मदद मिलती है और अत्यधिक उपयोग से होने वाली चोटों का खतरा घटता है। इस शोध में योग की प्रभावशीलता और खेल प्रशिक्षण कार्यक्रमों में इसके समावेश के लिए व्यावहारिक सुझाव दिए गए है।

योगाभ्यास न केवल रक्त संचार को बेहतर बनाता है, बल्कि प्रशिक्षण के बाद पुनर्प्राप्ति की प्रक्रिया को भी तेज करता है। निष्कर्ष में कहा का सकता है कि नियमित योगाभ्यास, खिलाड़ियों के उच्च प्रदर्शन के लिए एक महत्वपूर्ण पूरक साधन है, जो उनके शरीर, मन और आत्मा का समन्वय बनाने में सहायक है।

निष्कर्षतः, दीर्घकालिक एवं नियमित योगाभ्यास खेल प्रशिक्षण का एक महत्वपूर्ण पूरक साधन है, जो खिलाड़ियों को उच्च प्रदर्शन अर्जित कर सफलता प्राप्त करने हेतु शरीर, मन और आत्मा का समन्वय बनाने में सहायक सिद्ध होता है।

मुख्य शब्दः खेल प्रशिक्षण, पुनर्प्राप्ति, खेल चोटें, योगअभ्यास ।

परिचय

खेल और शारीरिक गतिविधियाँ मानव जीवन के महत्वपूर्ण अंग हैं। आज के समय में खेल केवल मनोरंजन का साधन नहीं बल्कि एक पेशेवर क्षेत्र बन चुका है। एथलीट अपने प्रदर्शन को बेहतर बनाने के लिए कठिन प्रशिक्षण, संतुलित आहार और मानसिक तैयारी पर विशेष ध्यान देते हैं। आधुनिक खेल जगत में एथलेटिक प्रदर्शन को बेहतर बनाने के लिए केवल शारीरिक शक्ति और तकनीकी कौशल ही पर्याप्त नहीं होते, बल्कि शरीर और मन के संतुलन पर भी समान ध्यान देना आवश्यक होता है। इसी संदर्भ में योग एक प्रभावी और समग्र अभ्यास के रूप में उभरकर सामने आया है। योग प्राचीन भारतीय परंपरा का महत्वपूर्ण अंग है, जो शारीरिक, मानसिक और भावनात्मक संतुलन स्थापित करने में सहायक होता है। एथलेटिक प्रशिक्षण, रिकवरी और चोटों की रोकथाम में योग की भूमिका अत्यंत महत्वपूर्ण मानी जाती है।

एथलीटों के लिए लचीलापन, संतुलन, सहनशक्ति और मानसिक एकाग्रता बहुत आवश्यक होते हैं। योग के विभिन्न आसन, प्राणायाम और ध्यान की तकनीकें इन सभी गुणों को विकसित करने में मदद करती हैं। नियमित योग अभ्यास से मांसपेशियाँ मजबूत और लचीली बनती हैं, जिससे खिलाड़ियों की शारीरिक क्षमता में सुधार होता है और उनके प्रदर्शन में वृद्धि होती है। इसके अतिरिक्त, योग शरीर को गहरी विश्राम अवस्था प्रदान करता है, जिससे कठोर प्रशिक्षण के बाद मांसपेशियों की रिकवरी तेज़ होती है। प्राणायाम और ध्यान जैसी तकनीकें तनाव को कम करती हैं और मानसिक शांति प्रदान करती हैं, जिससे एथलीट दबाव की स्थिति में भी बेहतर प्रदर्शन कर पाते हैं।

चोटों की रोकथाम के दृष्टिकोण से भी योग अत्यंत लाभकारी है। योग के अभ्यास से शरीर की मुद्रा सुधरती है, जोड़ों की गतिशीलता बढ़ती है और मांसपेशियों के असंतुलन को ठीक करने में सहायता मिलती है। इससे खेल के दौरान चोट लगने की संभावना कम हो जाती है। हाल के वर्षों में खेल प्रशिक्षण में योग को एक महत्वपूर्ण सहायक साधन के रूप में अपनाया जा रहा है। योग न केवल शरीर को मजबूत और लचीला बनाता है बल्कि मानसिक स्थिरता और आत्म-नियंत्रण को भी बढ़ाता है।

योग की उत्पत्ति भारत में हजारों वर्ष पहले हुई थी। "योग" शब्द संस्कृत के "युज" धातु से बना है जिसका अर्थ है "जोड़ना" या "एकीकृत करना"। योग शरीर, मन और आत्मा के बीच संतुलन स्थापित करने का माध्यम है। पतंजलि द्वारा रचित योगसूत्र में योग के सिद्धांतों और अभ्यासों का विस्तृत वर्णन मिलता है। योग का मूल उद्देश्य शरीर और मन के बीच संतुलन स्थापित करना है। खेल जगत में, खिलाड़ियों को अक्सर मांसपेशियों में तनाव, थकान और चोटों का सामना करना पड़ता है। ऐसे में योग अभ्यास इन समस्याओं को कम करने में महत्वपूर्ण भूमिका निभाता है। खेलों में, खिलाड़ियों को अपनी शारीरिक क्षमता के साथ-साथ मानसिक दृढ़ता की भी आवश्यकता होती है। प्रतियोगिताओं के दौरान दबाव, तनाव और प्रदर्शन की चिंता अक्सर खिलाड़ियों को प्रभावित करती है। ऐसे में योग उन्हें मानसिक संतुलन बनाए रखने में मदद करता है। इसके अलावा, लगातार प्रशिक्षण के कारण मांसपेशियों में खिंचाव, थकान और चोटें भी हो सकती हैं। योग के नियमित अभ्यास से शरीर की लचीलापन बढ़ती है और मांसपेशियों की कार्यक्षमता में सुधार होता है, जिससे चोटों की संभावना कम हो जाती है।

योग का महत्व

योग का महत्व केवल आध्यात्मिक या मानसिक स्वास्थ्य तक सीमित नहीं है बल्कि यह शारीरिक प्रदर्शन को भी बेहतर बनाता है। योग के प्रमुख लाभ निम्नलिखित हैं:

शरीर की लचीलापन बढ़ाता है, मांसपेशियों को मजबूत बनाता है, मानसिक एकाग्रता में सुधार करता है, तनाव और चिंता को कम करता है, शरीर के संतुलन और समन्वय को बेहतर बनाता है, इन सभी लाभों के कारण योग खिलाड़ियों के प्रशिक्षण कार्यक्रम का महत्वपूर्ण हिस्सा बन गया है।

एथलेटिक प्रशिक्षण का महत्व

एथलेटिक प्रशिक्षण का उद्देश्य खिलाड़ियों की शारीरिक क्षमता, तकनीकी कौशल और मानसिक शक्ति को विकसित करना है। इसमें कई प्रकार के प्रशिक्षण शामिल होते हैं:

1. **शक्ति प्रशिक्षण**- वह परीक्षण जिसके द्वारा यह मापा जाता है कि किसी खिलाड़ी की मांसपेशियों में कितना बल लगाने की क्षमता है, उसे शक्ति परीक्षण कहते हैं।
2. **सहनशक्ति प्रशिक्षण** - वह परीक्षण जिसके द्वारा यह पता लगाया जाता है कि खिलाड़ी कितनी देर तक बिना थके शारीरिक गतिविधि कर सकता है, उसे सहनशक्ति परीक्षण कहते हैं।
3. **गति प्रशिक्षण** - वह परीक्षण जिससे यह मापा जाता है कि खिलाड़ी कितनी जल्दी या कितनी तेजी से किसी दूरी को तय कर सकता है, उसे गति परीक्षण कहते हैं।
4. **लचीलापन प्रशिक्षण** - वह परीक्षण जिससे यह पता लगाया जाता है कि शरीर के जोड़ों और मांसपेशियों को कितनी आसानी से मोड़ा या घुमाया जा सकता है, उसे लचीलापन परीक्षण कहते हैं।

इन सभी के साथ योग को शामिल करने से प्रशिक्षण और अधिक प्रभावी हो जाता है। योग शरीर की गहरी मांसपेशियों को सक्रिय करता है और खिलाड़ियों को संतुलित शारीरिक विकास प्रदान करता है।

एथलेटिक प्रशिक्षण में योग की भूमिका

योग एथलीटों के लिए शरीर और मन दोनों को मजबूत बनाने में मदद करता है तथा लचीलापन बढ़ाता है: कई योग आसन मांसपेशियों और जोड़ों को अधिक लचीला बनाते हैं। इससे एथलीटों की रेंज ऑफ मोशन बढ़ती है और प्रदर्शन बेहतर होता है। संतुलन और स्थिरता -: वृक्षासन, गरुड़ासन जैसे आसन शरीर का संतुलन सुधारते हैं, जो जिम्नास्टिक्स, फुटबॉल, एथलेटिक्स आदि में उपयोगी है। कोर स्ट्रेंथ - प्लैंक, नावासन जैसे आसन पेट और पीठ की मांसपेशियों को मजबूत करते हैं, जिससे शरीर की स्थिरता बढ़ती है।

रिकवरी में योग की भूमिका

कठिन प्रशिक्षण या प्रतियोगिता के बाद शरीर को पर्याप्त आराम और रिकवरी की आवश्यकता होती है। यदि शरीर को सही तरीके से रिकवर होने का समय और साधन नहीं मिलता, तो थकान बढ़ सकती है और चोट लगने का खतरा भी बढ़ जाता है। इस स्थिति में योग बहुत महत्वपूर्ण भूमिका निभाता है। योग शरीर और मन दोनों को आराम देने में मदद करता है, जिससे खिलाड़ी जल्दी और बेहतर तरीके से रिकवर कर सकते हैं। ध्यान और प्राणायाम एथलीटों के तनाव और चिंता को कम करते हैं, जिससे मानसिक रिकवरी भी होती है

चोटों की रोकथाम

योग एथलीटों को चोटों से बचाने में भी सहायक है। मांसपेशियों का संतुलन: योग शरीर के अलग-अलग मांसपेशी समूहों को संतुलित तरीके से मजबूत करता है, जिससे ओवरयूज इंजरी कम होती है। जोड़ों की सुरक्षा: नियमित योग से जोड़ों की लचीलापन और मजबूती बढ़ती है, जिससे मोच और खिंचाव की संभावना कम होती है। पोश्चर में सुधार: सही शरीर मुद्रा से रीढ़ और मांसपेशियों पर अनावश्यक दबाव कम पड़ता है। कुछ महत्वपूर्ण योगासन जो लचीलापन बढ़ाते हैं: त्रिकोणासन,पश्चिमोत्तानासन , भुजंगासन। इन आसनों के नियमित अभ्यास से शरीर की गति और कार्यक्षमता में सुधार होता है।

मांसपेशियों की रिकवरी

योग मांसपेशियों की थकान कम करने में सहायक होता है। कठिन प्रशिक्षण के दौरान मांसपेशियों में लैक्टिक एसिड जमा हो जाता है, जिससे दर्द और जकड़न महसूस होती है। योग में किए जाने वाले हल्के स्ट्रेचिंग वाले आसन, जैसे ताड़ासन, भुजंगासन और पश्चिमोत्तानासन, मांसपेशियों को आराम देते हैं और उनमें लचीलापन बढ़ाते हैं। इससे मांसपेशियों में जमा लैक्टिक एसिड कम होता है और शरीर को राहत मिलती है।

मानसिक तनाव में कमी

योग मानसिक तनाव को कम करने में भी महत्वपूर्ण भूमिका निभाता है। खिलाड़ियों को अक्सर प्रतियोगिताओं और प्रशिक्षण के कारण मानसिक दबाव और चिंता का सामना करना पड़ता है। ध्यान (मेडिटेशन) और प्राणायाम मन को शांत करने में मदद करते हैं। जब मन शांत होता है, तो शरीर भी बेहतर तरीके से आराम करता है और रिकवरी जल्दी होती है। योग और ध्यान तनाव को कम करते हैं और मानसिक शांति प्रदान करते हैं।

मांसपेशियों और जोड़ों की मजबूती

योगासन शरीर की मांसपेशियों और जोड़ों को मजबूत और लचीला बनाते हैं। जब मांसपेशियां मजबूत होती हैं, तो वे अधिक दबाव और तनाव को सहन करने में सक्षम होती हैं। उदाहरण के लिए, ताड़ासन, त्रिकोणासन और भुजंगासन जैसे आसन मांसपेशियों की ताकत बढ़ाते हैं और शरीर को संतुलित बनाते हैं। इससे अचानक होने वाले खिंचाव या मोच जैसी चोटों की संभावना कम हो जाती है। मजबूत मांसपेशियां जोड़ों को भी बेहतर सहारा देती हैं, जिससे खेल के दौरान शरीर सुरक्षित रहता है।

शरीर का संतुलन और समन्वय

संतुलन की कमी कई बार गिरने या गलत तरीके से कदम रखने का कारण बनती है, जिससे चोट लग सकती है। योगासन शरीर के संतुलन और समन्वय को बेहतर बनाने में महत्वपूर्ण भूमिका निभाते हैं। वृक्षासन और गरुड़ासन जैसे आसन शरीर को स्थिर रखने की क्षमता विकसित करते हैं। नियमित अभ्यास से खिलाड़ी अपने शरीर को बेहतर तरीके से नियंत्रित करना सीखते हैं। इससे खेल के दौरान अचानक होने वाली गतिविधियों में भी संतुलन बना रहता है और चोट लगने का खतरा कम हो जाता है।

शरीर की जागरूकता

योग का एक महत्वपूर्ण लाभ यह है कि यह शरीर के प्रति जागरूकता बढ़ाता है। योग अभ्यास के दौरान व्यक्ति अपने शरीर की सीमाओं, ताकत और कमजोरी को समझने लगता है। इससे खिलाड़ी यह जान पाते हैं कि कब उन्हें आराम की आवश्यकता है और कब वे अधिक मेहनत कर सकते हैं। इस जागरूकता के कारण वे गलत तकनीक, अत्यधिक अभ्यास या थकान की स्थिति में खेलने से बचते हैं। परिणामस्वरूप, चोटों की संभावना कम हो जाती है।

वैज्ञानिक अध्ययन और प्रमाण

कई वैज्ञानिक अध्ययनों ने यह सिद्ध किया है कि योग खिलाड़ियों के प्रदर्शन को बेहतर बनाता है। एक अध्ययन में पाया गया कि नियमित योग अभ्यास करने वाले खिलाड़ियों में लचीलापन और संतुलन में उल्लेखनीय सुधार हुआ। दूसरे अध्ययन के अनुसार योग अभ्यास से मांसपेशियों की थकान कम होती है और रिकवरी समय घटता है। इसके अलावा योग तनाव हार्मोन कॉर्टिसोल को कम करता है और मानसिक स्वास्थ्य को बेहतर बनाता है।

योग अभ्यास से शरीर और मन शांत होते हैं जिससे नींद की गुणवत्ता में सुधार होता है। अच्छी नींद शरीर की रिकवरी के लिए अत्यंत आवश्यक है। अंत में, यह कहा जा सकता है कि योग रिकवरी की प्रक्रिया में बहुत महत्वपूर्ण भूमिका निभाता है। यह न

केवल शरीर की थकान को कम करता है, बल्कि मानसिक शांति भी प्रदान करता है। इसलिए खिलाड़ियों के लिए अपने प्रशिक्षण कार्यक्रम में योग को शामिल करना बहुत लाभदायक होता है।

अंततः कहा जा सकता है कि योग केवल शारीरिक व्यायाम ही नहीं बल्कि एक सम्पूर्ण स्वास्थ्य पद्धति है। नियमित योग अभ्यास खिलाड़ियों को मजबूत, संतुलित और जागरूक बनाता है, जिससे वे खेलों में बेहतर प्रदर्शन करने के साथ-साथ चोटों से भी सुरक्षित रह सकते हैं।

चर्चा

योग को एथलेटिक प्रशिक्षण में शामिल करना खिलाड़ियों के लिए अत्यंत लाभकारी है। यह न केवल शारीरिक प्रदर्शन को बेहतर बनाता है बल्कि मानसिक स्वास्थ्य को भी मजबूत करता है। हालांकि योग अभ्यास को सही तकनीक और प्रशिक्षित प्रशिक्षक के मार्गदर्शन में करना आवश्यक है। यदि योग को नियमित प्रशिक्षण कार्यक्रम के साथ संतुलित तरीके से अपनाया जाए तो खिलाड़ियों को दीर्घकालिक लाभ मिल सकते हैं। एथलेटिक प्रशिक्षण में योग की भूमिका आज के समय में काफी महत्वपूर्ण मानी जा रही है। खेलों में बेहतर प्रदर्शन के लिए केवल शक्ति और गति ही पर्याप्त नहीं होती, बल्कि शरीर का लचीलापन, संतुलन, सहनशक्ति और मानसिक एकाग्रता भी आवश्यक होती है। योग इन सभी पहलुओं को विकसित करने में सहायक होता है, इसलिए कई एथलीट अपने प्रशिक्षण कार्यक्रम में योग को शामिल करने लगे हैं।

योग के विभिन्न आसन मांसपेशियों को मजबूत और लचीला बनाते हैं। इससे शरीर की गतिशीलता बढ़ती है और खिलाड़ी अपने खेल के दौरान बेहतर संतुलन बनाए रख सकते हैं। उदाहरण के लिए, ताड़ासन, त्रिकोणासन, भुजंगासन और वृक्षासन जैसे आसन शरीर के संतुलन और लचीलेपन को बढ़ाने में सहायक होते हैं। इससे एथलीटों की शारीरिक क्षमता में सुधार होता है और उनके प्रदर्शन में भी वृद्धि होती है। रिकवरी की प्रक्रिया में भी योग अत्यंत प्रभावी सिद्ध होता है। कठिन प्रशिक्षण या प्रतियोगिता के बाद शरीर में थकान और तनाव उत्पन्न हो जाते हैं। योग के अभ्यास, विशेषकर प्राणायाम और ध्यान, शरीर और मन को आराम प्रदान करते हैं। इससे मांसपेशियों को जल्दी आराम मिलता है और शरीर की ऊर्जा पुनः प्राप्त होती है। परिणामस्वरूप, खिलाड़ी अगले प्रशिक्षण के लिए अधिक तैयार और ऊर्जावान महसूस करते हैं। चोटों की रोकथाम के दृष्टिकोण से भी योग महत्वपूर्ण है। योग अभ्यास से शरीर की मुद्रा में सुधार होता है और मांसपेशियों के बीच संतुलन बना रहता है। इससे शरीर के जोड़ों पर अनावश्यक दबाव कम होता है और चोट लगने की संभावना घट जाती है। इसके अलावा, योग खिलाड़ियों को अपने शरीर की सीमाओं को समझने में भी मदद करता है, जिससे वे अधिक सुरक्षित तरीके से प्रशिक्षण कर पाते हैं।

निष्कर्ष

इस शोध-पत्र से यह स्पष्ट होता है कि योग एथलेटिक प्रशिक्षण, रिकवरी और चोटों की रोकथाम में महत्वपूर्ण भूमिका निभाता है। नियमित योग अभ्यास से मांसपेशियों की लचीलापन, संतुलन और सहनशक्ति में वृद्धि होती है, जिससे खिलाड़ियों का प्रदर्शन बेहतर होता है। योग के विभिन्न आसन शरीर की मांसपेशियों और जोड़ों को सक्रिय रखते हैं तथा उनकी कार्यक्षमता को बढ़ाते हैं। इसके साथ ही प्राणायाम और ध्यान जैसी तकनीकें मानसिक तनाव को कम करती हैं और खिलाड़ियों को मानसिक रूप से मजबूत बनाती हैं। रिकवरी की प्रक्रिया में भी योग का विशेष महत्व है। कठोर प्रशिक्षण या प्रतियोगिता के बाद शरीर को आराम और पुनः ऊर्जावान होने की आवश्यकता होती है। योग शरीर को गहरी विश्राम अवस्था में ले जाकर मांसपेशियों की थकान को कम करता है और शरीर की पुनर्स्थापना को तेज करता है। इससे खिलाड़ी अगले प्रशिक्षण या प्रतियोगिता के लिए अधिक तैयार महसूस करते हैं। इसके अतिरिक्त, योग चोटों की रोकथाम में भी सहायक सिद्ध होता है। योग अभ्यास से शरीर की मुद्रा सुधरती है, मांसपेशियों में संतुलन बना रहता है और जोड़ों की गतिशीलता बढ़ती है, जिससे खेल के दौरान चोट लगने की संभावना कम हो जाती है। इस प्रकार, योग एथलीटों के लिए एक समग्र अभ्यास है, जो उनके शारीरिक स्वास्थ्य, मानसिक संतुलन और खेल प्रदर्शन को बेहतर बनाने में सहायक होता है। इसलिए आधुनिक एथलेटिक प्रशिक्षण कार्यक्रमों में योग को शामिल करना अत्यंत लाभकारी और आवश्यक माना जाता है।

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एकीकृत स्वास्थ्य विज्ञान एवं मानव प्रदर्शन में नवाचार, तकनीक और अनुसंधान पद्धति

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सारांश:-

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के क्षेत्र में नवाचार, तकनीक और अनुसंधान पद्धति का महत्वपूर्ण योगदान है। एकीकृत स्वास्थ्य विज्ञान एक बहुपरकारी दृष्टिकोण प्रस्तुत करता है, जिसमें पारंपरिक चिकित्सा पद्धतियों के साथ आधुनिक वैज्ञानिक तकनीकों का समावेश किया जाता है जिससे व्यक्ति के शारीरिक, मानसिक और सामाजिक स्वास्थ्य का समग्र विकास संभव हो सके। यह दृष्टिकोण विद्यार्थियों और खिलाड़ियों के प्रदर्शन में सुधार के लिए लाभकारी हो सकता है। हालाँकि, पूर्व के अध्ययनों में इस क्षेत्र में सीमित कार्य हुआ है, इसलिए यह अध्ययन नई दिशा प्रदान करने के प्रयास में है, जो भविष्य के अनुसंधानों के लिए आधार तैयार करेगा। स्वास्थ्य में गिरावट और खिलाड़ियों के प्रदर्शन में स्थिरता महत्वपूर्ण चिंताओं के रूप में सामने आ रही है। आधुनिक तकनीकी का सही उपयोग और उनके प्रभाव का ज्ञान आवश्यक है ताकि स्वास्थ्य और प्रदर्शन में वास्तविक सुधार लाया जा सके। इस अध्ययन का मुख्य उद्देश्य समग्र स्वास्थ्य विकास और प्रभाव वृद्धि में व्यवहार, तकनीकी विकास और अनुसंधान पद्धति की भूमिका का विश्लेषण करना है। इसमें वर्णनात्मक और विश्लेषणात्मक शोध पद्धतियों का उपयोग किया गया है और यह मुख्यतः द्वितीयक स्रोतों पर आधारित है। विभिन्न पुस्तकों, शोध पत्रों, लेखों और विश्वसनीय वेबसाइटों से प्राप्त तथ्यों का संग्रहण और सम्यक् विश्लेषण किया गया है। यह अध्ययन यह दर्शाता है कि नियमित स्वास्थ्य संबंधी जागरूकता और समग्र स्वास्थ्य दृष्टिकोण अपनाने से शारीरिक, बौद्धिक, सामाजिक और भावनात्मक स्तर पर सकारात्मक परिवर्तन संभव है। नवाचार, प्रौद्योगिकी और अनुसंधान पद्धति का समन्वय संगठित स्वास्थ्य विकास में सहायक होता है और भविष्य में स्वास्थ्य संवर्धन और उत्कृष्ट उपचार के लिए नई संभावनाएँ प्रदान करता है।

मुख्य शब्द: - नवाचार, विश्लेषणात्मक, वर्णनात्मक, प्रौद्योगिकी, अनुसंधान पद्धति।

प्रस्तावना:- कई शोधकर्ताओं के अनुसार स्वास्थ्य विज्ञान एक वैज्ञानिक क्षेत्र है जिससे हम चिकित्सा विज्ञान, सार्वजनिक स्वास्थ्य, पोषण विज्ञान, व्यायाम एवं खेल विज्ञान जैसे विज्ञान, पुनर्वास विज्ञान और आधुनिक तकनीक विज्ञान से संबंधित विषय का अध्ययन किया जाता है।जिससे मानव जीवन की शैली को उत्तम बनाया जा सके।

सरल शब्दों में:-

स्वास्थ्य केवल रोग का अभाव नहीं है बल्कि स्वास्थ्य एक समग्र अवस्था है, जिससे हम मानव को शारीरिक,मानसिक और सामाजिक रूप से पूर्ण निरोग बना सके। जिससे वह अपने जीवन की गुणवत्ता को बेहतर बनाना सके।आधुनिक युग मे तेजी से बदलती जीवनशैली, बढ़ते तनाव असंतुलित आहार तथा गतिविधियों की कमी के कारण कई प्रकार की स्वास्थ्य संबंधी समस्याएँ देखने को मिल रही हैं। ऐसी अवस्था मे स्वास्थ्य विज्ञान का महत्व और अधिक बढ़ जाता है। स्वास्थ्य विज्ञान के साधन से हम न केवल रोगो की रोकथाम और उपचार के बारे में जानकारी हासिल करते है। बल्कि स्वस्थ जीवनशैली, संतुलित आहार, नियमित व्यायाम तथा मानसिक संतुलन बनाए रखने के उचित उपायो की जानकारी भी प्राप्त करते है। अतः वर्तमान समय मे नवाचार,तकनीक, और अनुसंधान पद्धति के अनुप्रयोग से स्वास्थ्य शिक्षा को और सशक्त बनाया जा सकता है।नवाचार के साधन से स्वास्थ्य संबंधी से नई-नई शिक्षण विधियाँ कि उन्नत होती है।वही दूसरी ओर तकनीक के प्रयोग से स्वास्थ्य संबंधी जानकारी को समाज के सभी वर्गो मे आसानी से पहुँचाया जा सकता है।और साथ ही अनुसंधान पद्धति के मार्ग से स्वास्थ्य से जुड़ी समस्याओं और उनके कारणों तथा उनके समाधान का वैज्ञानिक तरीके से अध्ययन किया जाता है। जिससे स्वास्थ्य सुधार से मानव का प्रदर्शन बढ़ता है और एकीकृत स्वास्थ्य विज्ञान की जानकारी एकत्रित किया जाता है।

एकीकृत स्वास्थ्य विज्ञान का अर्थ :- स्वास्थ्य विज्ञान में एकीकृत स्वास्थ्य विज्ञान एक बहु-अनुशासनात्मक विषय है जिसमें हम नवाचार तकनीक, अनुसंधान पद्धति,जैव विज्ञान, सामाजिक विज्ञान और सार्वजनिक स्वास्थ्य और कल्याण का समग्र अध्ययन किया जाता है।

मानव प्रदर्शन का अर्थ :-

मानव प्रदर्शन एक प्रकार की वह क्षमताएँ है जिसके द्वारा व्यक्ति अपने शारीरिक और मानसिक समस्याओं का इस्तेमाल करते अपनी दक्षता के स्तर का प्रदर्शन करते हुए किसी भी कार्य को सफलता पूर्वक पूरा करता है। हम देखते हैं कि कोई व्यक्ति अपने कार्य को पूर्ण करने के लिए या अपने गतिविधि को पूर्ण करने के लिए कितनी लगन, संकल्प, कौशल और प्रभावशीलता के साथ

करता है। इस गतिविधि को पूर्ण करने के लिए व्यक्ति की शारीरिक, मानसिक और व्यवहारिक क्षमताएँ सक्रिय होती हैं। जो किसी भी लक्ष्य को प्राप्त करने में सहायक करती हैं।

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के बीच संबंध:-

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के बीच एक परस्पर संबंध पाया जाता है। मानव प्रदर्शन व्यक्ति की शारीरिक, मानसिक तथा व्यवहारिक क्षमताओं के विश्लेषण पर आधारित होता है (बाप्पा,टी.आर.,और बुज़िकेली,सी .2015) दक्षताओ को समझने और विकास को प्रोत्साहित करता है (बाचले,टी.आर.,अर्ल,आर.डब्लू.2016)शरीर विज्ञान पोषण विज्ञान मनोविज्ञान, तथा खेल चिकित्सा जैसे विभिन्न वैज्ञानिक क्षेत्रों के एकीकृत अध्ययन से मानव शरीर की कार्यप्रणाली को अधिक प्रभावी ढंग से समझा जा सकता है।(बाप्पा,टी.आर.,और बुज़िकेली,सी .2015)

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में नवाचार तकनीक का अर्थ एवं संबंध:- नवाचार का अर्थ है आधुनिक वैज्ञानिक तकनीकों का विकास और उपयोग जिनकी सहयोग से स्वास्थ्य खेल प्रदर्शन और मानव की दक्षता को उत्तम बनाया जाता है। एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के अध्ययन क्षेत्र में नवाचार तकनीक का उपयोग स्वास्थ्य निगरानी, प्रदर्शन विश्लेषण और उपचार प्रक्रियाओं की प्रभावशीलता बढ़ाने के लिए उपयोग किया जाता है।

उदाहरण:-

- फिटनेस ट्रैकिंग डिवाइस
- योमैकेनिकल विश्लेषण
- डिजिटल स्वास्थ्य प्रणाली।

अनुसंधान एक वैज्ञानिक पद्धति है। जिसके साधन से किसी विषय को प्रणालीबद्ध अध्ययन किया जाता है और नए तथ्यों की खोज की जाती है।एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में अनुसंधान पद्धति का अनुप्रयोग मानव स्वास्थ्य, व्यायाम, पोषण और प्रदर्शन से संबंधित तथ्यों का अध्ययन और उनका मूल्यांकन करने के लिए किया जाता है।

इस अध्ययन को पूर्ण करने के कुछ चरण होते है।-

1. समस्या का चयन
2. परिकल्पना बनाना
3. डेटा संग्रह
4. विश्लेषण
5. निष्कर्ष

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में नवाचार, तकनीक और अनुसंधान पद्धति का महत्व :- एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के दायरे में नवाचार, तकनीक और अनुसंधान पद्धति की अहम भूमिका है।आधुनिक तकनीकों और वैज्ञानिक अनुसंधान के सहयोग से मानव शरीर की कार्यप्रणाली, फिटनेस स्तर और प्रदर्शन का वैज्ञानिक तरीके से परीक्षण किया जा सकता है। इसके साधन से प्रशिक्षण प्रक्रिया को अधिक सक्षम बनाया जाता है। तथा शारीरिक और मानसिक क्षमताओं में सहयोग मिलती है इसके अलावा अनुसंधान पद्धति के द्वारा नई जानकारी और नए तथ्यों का अध्ययन किया जा सकता है। जिससे स्वास्थ्य विज्ञान और खेल विज्ञान के क्षेत्र में लगातार विकास होता रहता है।

एकीकृत स्वास्थ्य विज्ञान के घटक:-

एकीकृत स्वास्थ्य विज्ञान में कई प्रमुख घटक शामिल हैं, जो एक साथ कार्य करके व्यक्ति के समग्र स्वास्थ्य और प्रदर्शन को प्रभावित करती है।
शरीर विज्ञान इस धारणा का मुख्य हिस्सा है, यह मानव शरीर की संरचना, कार्यप्रणाली और अंगों के आपसी संबंधों का अध्ययन करती है। शरीर विज्ञान से यह जानकारी पता चलती है कि मांसपेशियाँ, हड्डियां और अंग कैसे संयोजित रूप से कार्य करते हैं, और किसी शारीरिक गतिविधि के दौरान शरीर को अधिक सक्षम बनाया जा सकता है।

पोषण स्वास्थ्य विज्ञान का एक मुख्य घटक है। सही पोषण से शरीर को जरूरी ऊर्जा, प्रोटीन, विटामिन और मिनरल्स मिलते हैं जो मांसपेशियों के निर्माण, प्रतिरक्षा प्रणाली की ताकत और मानसिक स्वास्थ्य के लिए अत्यावश्यक है। पोषण को नजरअंदाज से प्रदर्शन में कमी और थकान जैसी कठिनाइयाँ सामने आ सकती हैं।

मनोविज्ञान मानसिक स्वास्थ्य और व्यवहार को समझने में सहायता करता है। इस अध्ययन से व्यक्ति के मानसिक स्थिति, तनाव, प्रेरणा और भावनात्मक स्थिरता कैसे उसके शारीरिक प्रदर्शन और जीवन शैली के निर्णयों पर असर डालता है। मानसिक स्वास्थ्य का संयुक्त शारीरिक स्वास्थ्य ही जितना महत्वपूर्ण है।

बायोमैकेनिक्स गति और बल की गतिविधियों का मूल्यांकन करता है। इसके साधन से किसी भी शारीरिक प्रक्रियाओं में शरीर के कार्यों को अधिक दक्षतापूर्ण और सुरक्षित बनाया जा सकता है। बायोमैकेनिक्स के अध्ययन से चोटों की संभावना कम होती है और प्रदर्शन में बदलाव होता है।

खेल चिकित्सा या स्पोर्ट्स मेडिसिन चोटों के उपचार रोकथाम और पुनर्वास और ज्यादा केन्द्रित होता है। यह तय करता है कि किसी भी शारीरिक कठिनाई के बाद व्यक्ति जल्दी और सुरक्षित रूप से क्रियाशील हो सके।

इस घटकों का समायोजन से एकीकृत स्वास्थ्य विज्ञान को एक बहुआयामी और व्यावहारिक क्षेत्र बनाता है जो व्यक्ति को शारीरिक और मानसिक रूप से मजबूत बनाए रखने में मदद करता है।

मानव प्रदर्शन में नवाचार, तकनीक और अनुसंधान पद्धति को प्रभावित करने वाले घटक:-

शारीरिक फिटनेस मानव प्रदर्शन का सबसे अहम घटक है। इसमें कार्डियोवस्कुलर क्षमता, मांसपेशियों की शक्ति, सहनशीलता और लचीलापन सम्मिलित होते हैं। बल्कि प्रक्रिया को अधिक कुशल और सुरक्षित बनाती है। नवाचार और तकनीक के साधन से फिटनेस कार्यक्रम, व्यक्तिगत जरूरतों और प्रदर्शन के लक्ष्य के अनुसार निर्मित किए जा सकते हैं, जिससे अधिक प्रभावशीलता परिणाम प्राप्त होते है।

पोषण:-

संतुलित पोषण मानव प्रदर्शन के लिए महत्वपूर्ण है। शरीर को जरूरी ऊर्जा, प्रोटीन, विटामिन और मिनरल मिलने से मांसपेशियों का विकास, सतर्क मानसिक स्थिति और प्रतिरक्षा प्रणाली ताकतवर होती है। अनुसंधान पद्धति के साधन से यह विश्लेषण किया जा सकता है कि कौन से पोषण तत्व और अनुपात प्रदर्शन को अधिक संचालित करते हैं।

मानसिक स्थिति:-

मानसिक स्वास्थ्य, प्रेरणा, आत्मविश्वास और तनाव प्रबंधन को संचालित करते हैं। सकारात्मक मानसिक स्थिति व्यक्ति को जटिल वातावरण में अधिक सक्षम बनाती है। तकनीकी उपकरण जैसे बायोफीडबैक और मानसिक प्रदर्शन मॉनिटरिंग प्रणाली व्यक्ति की मानसिक स्थिति पर नजर रखकर उसे सशक्त करने में मदद करती है।

प्रशिक्षण और तकनीकी सहायता:-

निरंतर प्रशिक्षण और वैज्ञानिक तकनीक प्रदर्शन को बेहतर करने का प्रमुख माध्यम है। बायोमैकेनिक्स, मूल्यांकन, गति-सटीकता उपकरण और डेटा एनालिसिस सॉफ्टवेयर प्रशिक्षण की प्रभावकारिता बढ़ाती है। ये उपकरण व्यक्तिगत प्रदर्शन का विश्लेषण करते हैं और अनुकूलन के लिए सटीक दिशा प्रदान करते हैं।

एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में तकनीक की भूमिका:-

आधुनिक युग में एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के क्षेत्र में तकनीक का प्रभावशाली लगातार बढ़ रहा है। एकीकृत स्वास्थ्य विज्ञान, जिसमें शरीर विज्ञान, पोषण विज्ञान, मनोविज्ञान, व्यायाम विज्ञान और खेल चिकित्सा सम्मिलित होते हैं। तकनीक के माध्यम से व्यक्तिगत स्वास्थ्य और प्रदर्शन को अधिक प्रभावशीलता, सुरक्षित और वैज्ञानिक रूप से सुधारने में मदद मिलती है। इस प्रणाली से प्रशिक्षण, पोषण और मानसिक स्वास्थ्य कार्यक्रमों का समेकित विश्लेषण संभव होता है, जिससे व्यक्ति की शारीरिक और मानसिक क्षमता का पूर्ण उपयोग किया जा सकता है।

फिटनेस ट्रैकिंग उपकरण तकनीक का सबसे प्रमुख और स्पष्ट उदाहरण है। स्मार्ट वॉच, फिटनेस बैंड और हृदय गति मॉनिटर जैसे उपकरण व्यक्ति की दैनिक गतिविधियां, ऊर्जा व्यय, नींद और हृदय स्वास्थ्य की निगरानी करते हैं। ये उपकरण प्रशिक्षकों और चिकित्सकों को सटीक समय में डेटा प्रदान करते हैं जिससे प्रशिक्षण की प्रभावशीलता का विश्लेषण करना और आवश्यक सुधार करना आसान हो जाता है। इसके परिणामस्वरूप व्यक्ति अधिक नियंत्रित और लक्ष्य केंद्रित बनता है।

बायोमैकेनिक्स विश्लेषण मानव शरीर की गति गतिविधियों को शक्ति, संतुलन और समन्वय को वैज्ञानिक तरीके से प्राप्त करने का अत्यंत प्रभावी साधन है। गति संवेदनशील सेंसर और वीडियो विश्लेषण प्रणाली से प्रशिक्षक खिलाड़ी की तकनीक में कमियों की पहचान कर सकते हैं। यह केवल चोट के जोखिम को कम करता है बल्कि प्रशिक्षण को अधिक सुरक्षित, प्रभावी और लक्ष्य केंद्रित बनाता है।

स्पोर्ट्स साइंस उपकरण और डेटा

एनालिटिक्स स्वास्थ्य प्रबंधन, मानसिक स्वास्थ्य और व्यक्तिगत चिकित्सा का विश्लेषण करते हैं। आधुनिक प्रशिक्षण और अनुसंधान का आधार है। ये उपकरण शक्ति, सहनशीलता, गति, मानसिक स्तर और शारीरिक जैविकीय का विश्लेषण करते हैं और डेटा विश्लेषण के माध्यम से व्यक्ति के प्रदर्शन और कमजोर पहलुओं की पहचान होती है जिससे प्रशिक्षण योजनाएं वैज्ञानिक रूप से अधिक अनुकूल और प्रभावी बनाई जा सकती है।

तकनीक का अनुप्रयोग केवल प्रदर्शन के सुधार तक सीमित नहीं है बल्कि यह स्वास्थ्य विज्ञान के विभिन्न घटकों को समेकित रूप में एक साथ जोड़ती है। पोषण, मानसिक स्वास्थ्य, व्यायाम और खेल चिकित्सा के सभी पहलुओं का वैज्ञानिक विश्लेषण संभव होता है। फलस्वरूप मानव प्रदर्शन अधिक शक्तिशाली, योग्य और ऊर्जावान बनता है, और व्यक्ति अपने स्वास्थ्य और क्षमता के सर्वोच्च स्तर तक पहुँच सकता है। अत: एकीकृत स्वास्थ्य विज्ञान और तकनीक का समन्वय मानव प्रदर्शन को नई ऊँचाइयों तक लेकर जाता है। यह न केवल शारीरिक और मानसिक क्षमता को बढ़ाता है बल्कि प्रदर्शन के निरंतर सुधार सुनिश्चित करता है। आधुनिक तकनीक और उपकरणों के साधन से प्रशिक्षक और विशेषज्ञ प्रशिक्षण, पोषण और स्वास्थ्य कार्यक्रमों को और अधिक व्यक्तिगत अनुकूल, विश्वसनीय सक्षम बना सकते हैं।

अध्ययन की आवश्यकता :-_आधुनिक युग में एकीकृत स्वास्थ्य विज्ञान, मानव प्रदर्शन तथा आधुनिक तकनीक के मार्ग में लगातार उन्नति हो रही है। तकनीकी वृद्धि के कारण मानव शरीर की प्रक्रियाओं, शारीरिक दक्षता तथा प्रदर्शन का अध्ययन अधिक वैज्ञानिक और सटीकता के साथ किया जा सकता है।(तोमर. आर.2020) | हालांकि एकीकृत स्वास्थ्य विज्ञान, मानव प्रदर्शन, नवाचार, अनुसंधान पद्धति और तकनीक को समझने के लिए अभी भी गहन अध्ययन की आवश्यकता है। इस विषय का अध्ययन या शोध करने से यह स्पष्ट किया जा सकता है कि आधुनिक तकनीक, नवाचार, अनुसंधान पद्धति किस प्रकार समीक्षा तथा स्वास्थ्य देखरेख को और अधिक सक्षम बनाती है। इसके अलावा इस विषय का अध्ययन खेल विज्ञान, स्वास्थ्य शिक्षा तथा मानव प्रदर्शन के मार्ग में नई-नई सूचनाएं प्रदान करता है। यह अध्ययन भविष्यकाल में अनुसंधान और कार्यक्षेत्र में उपयोग के लिए भी अहम भूमिका सिद्ध हो सकता है

अध्ययन का उद्देश्य :-इस अध्ययन का प्रधान उद्देश्य एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में नवाचार, तकनीक, अनुसंधान के बीच के संबंध का बोध करना तथा उसका मूल्यांकन करना है। कि वह नवाचार, तकनीक, अनुसंधान किस स्वरूप से मानव स्वास्थ्य और प्रदर्शन को उत्तम बनाने में सहायता होती है। आधुनिक युग में तेजी से बदलती जीवन शैली, मानसिक तनाव, असंतुलित आहार, और शारीरिक प्रक्रियाओं के अभाव के कारण स्वास्थ्य संबंधी अनेक कठिनाइयों का सामना करना पड़ रहा है। ऐसी अवस्था में स्वास्थ्य विज्ञान के विभिन्न पहलुओं को एकीकृत पहलू से व्याख्या करना बहुत आवश्यक हो जाता है। यह अध्ययन इस बात का आकलन करने का प्रयास करती है कि एकीकृत स्वास्थ्य विज्ञान के दायरे में आने वाले विभिन्न विषय जैसे शरीर विज्ञान, पोषण विज्ञान, मनोविज्ञान और खेल चिकित्सा मानव प्रदर्शन को किस प्रकार प्रभावित करते है। इसके साथ ही इस शोध का उद्देश्य यह भी है कि आधुनिक तकनीक जैसे फिटनेस ट्रैकिंग उपकरण, डिजिटल स्वास्थ्य प्रणाली वैज्ञानिक प्रशिक्षण पद्धतियों के साधन से स्वास्थ्य देखरेख और प्रदर्शन मूल्यांकन को किस प्रकार अधिक सक्षम बनाया जा सकता है। इसके अलावा यह शोध नवाचार और अनुसंधान पद्धति की भूमिका को निर्दिष्ट करती है। जो स्वास्थ्य शिक्षा, खेल विज्ञान और मानव जीवन के स्तर को सुधारने के लिए प्रमुख माना जाता है। इस प्रकार यह शोध समग्र स्वास्थ्य विकास और उत्तम मानव प्रदर्शन के लिए सकारात्मक दिशा दिखाने का प्रयास करती है

साहित्य समीक्षा:-एकीकृत स्वास्थ्य विज्ञान और मानव के एक प्रदर्शन के रूप में नवाचार, तकनीकी और अनुसंधान पद्धति का महत्व को अच्छी तरह से प्रस्तुत किया है। (बाप्पा,टी.आर.,और बुज़िकेली,सी.2015.)के अनुसार नवीन प्रदर्शन व्यक्ति की शारीरिक, मानसिक और व्यवहारिक क्षमताओं पर आधारित होता है। जबकि बाचले,टी.आर.,अर्ल,आर.डब्लू. (2016) ने इसे दक्षता के विकास और प्रशिक्षण का माध्यम बताया है। स्वास्थ्य के अंतर्गत विज्ञान में शरीरक्रिया विज्ञान, मनोविज्ञान, बायोमैकेनिक्स और खेल चिकित्सा का संपूर्ण अध्ययन शामिल होता है। शरीर विज्ञान मांसपेशियों की संरचना और कार्यप्रणाली की संरचना का वर्णन करता है। पोषण ऊर्जा, प्रोटीन, विटामिन और मिनरल्स को आकर्षित करता है और खेल विज्ञान मानसिक संतुलन और प्रेरणा के महत्व को प्रदर्शित करता है।बायोमैकेनिक्स की प्रक्रियाएँ की गति, शक्ति और संयोजन का वैज्ञानिक विश्लेषण करती है। और खेल चिकित्सा चोटों के रोकथाम, उपचार, और संवर्धन में सहयोग करती है। इन घटकों के संयोजन से एकीकृत स्वास्थ्य विज्ञान मानव को शारीरिक और मानसिक रूप से अधिक योग्य बनाती है। नवाचार और तकनीक जैसे फिटनेस ट्रैकिंग डिवाइस, डिजिटल स्वास्थ्य पद्धति और बायोमैकेनिक्स विश्लेषण प्रदर्शन देखरेख और प्रशिक्षण गतिविधियों की कुशलता

बढ़ाने में उपयोगी है। अनुसंधान प्रणाली वैज्ञानिक तरीके से डेटा संग्रह, विश्लेषण और मूल्यांकन के साधन से नए तथ्यों की खोज और स्वास्थ्य सुधार के उपायों की पहचान करती है। अध्ययन से यह स्पष्ट हुआ कि तकनीकी उपकरण जैसे स्मार्ट वॉच हृदय गति मॉनिटर, व्यक्तिगत स्वास्थ्य और प्रदर्शन का तत्कालीन समय में विश्लेषण करते हैं। बायोमैकेनिक्स विश्लेषण और डेटा एनालिटिक्स प्रशिक्षण की प्रभावशीलता में वृद्धि होती है और प्रदर्शन को सुरक्षित और लक्ष्य केंद्रित बनाते हैं अनुसंधान पद्धति के मार्ग से पोषण, मानसिक स्वास्थ्य और व्यायाम के अनुकूलन का वैज्ञानिक आधार उपलब्ध होता है। समीक्षा से यह निष्कर्ष निकलता है कि एकीकृत स्वास्थ्य विज्ञान, नवाचार, तकनीकी और अनुसंधान पद्धति का संयोजन मानव स्वास्थ्य और प्रदर्शन में अहम सुधार ला सकता है। यह बहु-पक्षीय दृष्टिकोण न केवल रोग निवारण और उपचार में सहायक है बल्कि प्रशिक्षण पोषण और मानसिक स्वास्थ्य के एरिया में भी आधुनिक और परिणामकारी निवारण प्रदान करता है।

अनुसंधान पद्धति :- इस अध्ययन में एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन में नवाचार, तकनीक और अनुसंधान पद्धति की भूमिका का सर्वांगीण विश्लेषण किया गया। अध्ययन का मुख्य उद्देश्य यह अवगत करना है कि कैसे आधुनिक तकनीक, नवाचार और अनुसंधान पद्धति मानव स्वास्थ्य, शारीरिक दक्षता और प्रदर्शन को परिवर्तित करती हैं। आधुनिक काल में तेजी से विकसित हो रही तकनीक और वैज्ञानिक अनुसंधान के साधन से मानव स्वास्थ्य और प्रदर्शन के विभिन्न पहलुओं की अधिक सटीक और क्रमबद्ध तरीके से जानकारी प्राप्त की जा सकती है। इस शोध में मुख्य रूप से द्वितीयक स्रोतों का उपयोग किया गया, जिसमें विभिन्न पुस्तकों, शोध पत्रों, पत्रिकाओं, विश्वसनीय वेबसाइटों और वैज्ञानिक लेखों से प्राप्त तथ्यों का सुनियोजित संग्रह और विश्लेषण शामिल है। अध्ययन में दो प्रमुख पहलू अपनाए गए है :- वर्णनात्मक और विश्लेषणात्मक। वर्णनात्मक पहलू के साधन से एकीकृत स्वास्थ्य विज्ञान के घटकों का विस्तृत रुप से वर्णित किया गया है। इनमें शरीर विज्ञान, पोषण, मनोविज्ञान, बायोमैकेनिक्स और खेल चिकित्सा शामिल हैं। प्रत्येक घटक का मानव स्वास्थ्य और प्रदर्शन पर प्रभाव वैज्ञानिक रूप से प्रस्तुत किया गया। उदाहरण स्वरूप, शरीर विज्ञान के साधन से मांसपेशियों, हड्डियों और अंगों की कार्यप्रणाली का विश्लेषण किया गया, जबकि पोषण विज्ञान ने शारीरिक और मानसिक स्वास्थ्य के लिए आवश्यक ऊर्जा, प्रोटीन, विटामिन और मिनरल्स के महत्व को स्पष्ट किया। मनोविज्ञान ने मानसिक स्थिति, तनाव प्रबंधन और प्रेरणा जैसे पहलुओं की विवेचन की, जबकि बायोमैकेनिक्स और खेल चिकित्सा ने प्रदर्शन सुधार और चोटों के प्रबंधन में तकनीकी और वैज्ञानिक उपकरणों की भूमिका को प्रतिपादित किया। विश्लेषणात्मक पहलू का उपयोग तकनीक और नवाचार के मानव प्रदर्शन के प्रतिक्रया को समझने के लिए किया गया। इसके इसके तहत प्राप्त डेटा की तुलना, विवेचना और स्पष्टीकरण साधन से नवाचार, तकनीक और अनुसंधान पद्धति के स्वास्थ्य और प्रदर्शन पर प्रत्यक्ष प्रभाव की पहचान की गई। आधुनिक समय में तकनीक का उपयोग स्वास्थ्य विज्ञान और खेल प्रशिक्षण के क्षेत्र में तेजी से बढ़ रहा है। तकनीक जैसे फिटनेस ट्रैकिंग उपकरण, डिजिटल स्वास्थ्य प्रणाली और बायोमैकेनिकल विश्लेषण ने प्रशिक्षण और स्वास्थ्य निगरानी में सुधार लाने के तरीकों को साफ़ तौर पर किया। इन तकनीकों के साधन से मानव शरीर की कार्यक्षमता, शारीरिक प्रक्रियाएँ प्रदर्शन से संबंधित विभिन्न पहलुओं का अधिक सटीक अध्ययन किया जा सकता है। इससे प्रशिक्षण की दक्षता , स्वास्थ्य की स्थिति तथा प्रदर्शन के स्तर का मूल्यांकन अधिक प्रभावी ढंग से किया जा सकता है

अध्ययन के चरणों में चार मुख्य बिंदु शामिल हैं:

समस्या का चयन: स्वास्थ्य विज्ञान और मानव प्रदर्शन में नवाचार, तकनीक और अनुसंधान पद्धति की भूमिका और उसके असर को समझने की आवश्यकता की पहचान की गई। वर्तमान समय में बदलती जीवनशैली और तकनीकी विकास के कारण स्वास्थ्य और प्रदर्शन से संबंधित नए आयामों का अध्ययन करना आवश्यक हो गया है।

परिकल्पना निर्माण: यह मान कि तकनीक, नवाचार और अनुसंधान मानव स्वास्थ्य और प्रदर्शन में सकारात्मक और अहम भूमिका देते हैं तथा इनके साधन से प्रशिक्षण और स्वास्थ्य प्रबंधन को अधिक सक्षम बनाया जा सकता है।

डेटा संग्रह: द्वितीयक स्रोतों जैसे अनुसंधान पत्र, शैक्षणिक पुस्तकें, डिजिटल स्वास्थ्य रिपोर्ट, पत्रिकाएँ तथा विश्वसनीय ऑनलाइन डेटाबेस से जानकारी एकत्रित की गई। इन स्रोतों से प्राप्त तथ्यों और आंकड़ों का व्यवस्थित संकलन किया गया।

विश्लेषण: संकलित डेटा का तुलनात्मक और विवेचनात्मक विश्लेषण करके नवाचार, तकनीक और अनुसंधान पद्धति के स्वास्थ्य और प्रदर्शन पर प्रभावकारिता पहचान की गई।

चर्चा:-

इस अध्ययन के मूल्यांकन से यह सुस्पष्ट होता है कि एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के कार्य क्षेत्र में नवाचार, तकनीक और अनुसंधान पद्धति की अहम भूमिका है। वर्तमान समय में स्वास्थ्य विज्ञान केवल रोगों के उपचार तक न्यून नहीं है, बल्कि यह व्यक्ति के शारीरिक, मानसिक और सामाजिक स्वास्थ्य के संपूर्ण विकास पर बल देता है। इस दिशा में तकनीकी विकास और वैज्ञानिक अनुसंधान ने स्वास्थ्य प्रबंधन और प्रदर्शन समीक्षा को अधिक प्रभावशील और संगाठित बनाया है। तकनीक और स्वास्थ्य विज्ञान के बीच गहरा संबंध निर्धारित हो चुका है। आधुनिक तकनीकी उपकरणों के उपयोग से मानव शरीर की कार्यप्रणाली,

शारीरिक क्षमता और स्वास्थ्य स्थिति का अधिक उचित अध्ययन संभव हो पाया है। फिटनेस ट्रैकिंग उपकरण, डिजिटल स्वास्थ्य प्रणाली तथा बायोमैकेनिकल विश्लेषण जैसे साधनों के द्वारा से स्वास्थ्य निगरानी और प्रशिक्षण प्रक्रिया को अधिक वैज्ञानिक बनाया जा सकता है। इन उपकरणों की सहायता से व्यक्ति की दैनिक गतिविधियों, हृदय गति, ऊर्जा व्यय और शारीरिक स्थिति का विवेचन किया जा सकता है, जिससे स्वास्थ्य प्रबंधन और प्रशिक्षण कार्यक्रमों को अधिक फलदायी बनाया जा सकता है। मानव प्रदर्शन के उल्लेख में भी नवाचार और तकनीक का सकारात्मक असर देखा गया है। वैज्ञानिक प्रशिक्षण पद्धतियों और तकनीकी उपकरणों के उपयोग से खिलाड़ियों और सामान्य व्यक्तियों की शारीरिक क्षमता, सहनशीलता और मेल-जोल में सुधार संभव है। बायोमैकेनिक्स विश्लेषण और डेटा आधारित अध्ययन के उपाय से प्रदर्शन की कमियों की पहचान कर उन्हें सुधारने के उपाय विकसित किए जा सकते हैं। इसके साथ ही खेल चिकित्सा और अनुसंधान पद्धति के प्रणाली से चोटों की रोकथाम और पुनर्वास की प्रक्रिया को भी अधिक सफल बनाया जा सकता है। आगामी युग में एकीकृत स्वास्थ्य विज्ञान, नवाचार और तकनीक का सहयोग से स्वास्थ्य प्रबंधन और मानव प्रदर्शन के क्षेत्र में नई अवसर प्रदान कर सकता है। उन्नत तकनीक और अनुसंधान के प्रकिया से स्वास्थ्य निगरानी, प्रशिक्षण प्रक्रिया और प्रदर्शन मूल्यांकन को और अधिक सटीक तथा सशक्त बनाया जा सकेगा।

निष्कर्ष:-इस अध्ययन से यह सटीक हुआ कि एकीकृत स्वास्थ्य विज्ञान और मानव प्रदर्शन के क्षेत्र में नवाचार, तकनीक और अनुसंधान पद्धति का अहम भूमिका है। एकीकृत स्वास्थ्य विज्ञान एक सर्वांगपूर्ण दृष्टिकोण प्रस्तुत करता है, जिसमें शरीर विज्ञान, पोषण, मनोविज्ञान, बायोमैकेनिक्स और खेल चिकित्सा का संगाठित अध्ययन शामिल है। इन घटकों के उपाय व्यक्ति का शारीरिक, मानसिक और सामाजिक स्वास्थ्य संतुलित होता है और उसका विस्तृत विकास संभव होता है। अध्ययन में यह पाया गया कि आधुनिक तकनीकी उपकरण जैसे फिटनेस ट्रैकिंग डिवाइस, डिजिटल स्वास्थ्य प्रणाली और बायोमैकेनिकल विश्लेषण प्रशिक्षण और स्वास्थ्य निगरानी की प्रक्रिया को अधिक वैज्ञानिक और उपयोगी बनाते हैं। इसके अतिरिक्त, अनुसंधान पद्धति के साधन से स्वास्थ्य, पोषण और प्रदर्शन संबंधी तथ्यों का विश्लेषण करना संभव होता है, जिससे प्रशिक्षण और सुधारात्मक उपाय अधिक सटीक बनाए जा सकते हैं। इस अध्ययन ने यह भी बताया है कि मानव प्रदर्शन में सुधार केवल शारीरिक क्षमताओं पर निर्भर नहीं करता, बल्कि मानसिक स्थिति, प्रेरणा, तनाव प्रबंधन और संतुलित पोषण भी इसके लिए अहम हैं। तकनीक और नवाचार इन सभी घटकों का विश्लेषण कर प्रशिक्षण और स्वास्थ्य योजनाओं को व्यक्तिगत स्तर पर उपयुक्त बनाते हैं। आने वाले काल में इस क्षेत्र में और विस्तृत अनुसंधान के साधन से नई तकनीकों, नवाचारों और वैज्ञानिक पद्धतियों का उपयोग कर स्वास्थ्य और प्रदर्शन को और अधिक प्रभावशील और सुरक्षित बनाया जा सकता है। यह अध्ययन स्वास्थ्य शिक्षा, खेल विज्ञान और मानव जीवन की दक्षता में सुधार के लिए एक सशक्त आधार प्रदान करता है। अतः यह निष्कर्ष सामने से आता है कि नवाचार, तकनीक और अनुसंधान पद्धति का मेल-जोल न केवल मानव स्वास्थ्य और प्रदर्शन को बेहतर बनाने में सहायक है, बल्कि यह संपूर्ण स्वास्थ्य विकास और उत्तम प्रशिक्षण के लिए भी आवश्यक है।

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खेल प्रदर्शन में पोषण और सहनशक्ति

हर्षिता शर्मा [1]
[1] IV सेमेस्टर, एम.ए. शारीरिक शिक्षा, दीन दयाल उपाध्याय गोरखपुर विश्वविद्यालय, गोरखपुर

सारांश

खेल प्रदर्शन को प्रभावित करने वाले कई कारकों में से पोषण और सहनशक्ति अत्यंत महत्वपूर्ण माने जाते हैं। किसी भी खिलाड़ी की सफलता केवल उसके अभ्यास या तकनीकी कौशल पर निर्भर नहीं करती, बल्कि उसके शरीर की ऊर्जा क्षमता, मांसपेशियों की मजबूती और थकान को सहन करने की क्षमता पर भी आधारित होती है। संतुलित और वैज्ञानिक रूप से नियोजित आहार खिलाड़ियों को आवश्यक ऊर्जा प्रदान करता है, मांसपेशियों के विकास में सहायता करता है तथा शरीर की रिकवरी प्रक्रिया को तेज करता है।खेल विज्ञान के अनुसार खिलाड़ियों के आहार में कार्बोहाइड्रेट, प्रोटीन, वसा, विटामिन, खनिज लवण तथा पर्याप्त मात्रा में पानी का होना आवश्यक है। कार्बोहाइड्रेट ऊर्जा का प्रमुख स्रोत है जो विशेष रूप से सहनशक्ति आधारित खेलों में महत्वपूर्ण भूमिका निभाता है। प्रोटीन मांसपेशियों की मरम्मत और विकास में सहायक होता है, जबकि वसा लंबे समय तक ऊर्जा प्रदान करती है (Jeukendrup & Gleeson, 2019)। इसके अतिरिक्त विटामिन और खनिज शरीर की विभिन्न जैव-रासायनिक क्रियाओं को संतुलित रखते हैं तथा रोग प्रतिरोधक क्षमता को बढ़ाते हैं।सहनशक्ति खिलाड़ी की वह क्षमता है जिससे वह लंबे समय तक शारीरिक गतिविधि कर सकता है। इसे मुख्यतः एरोबिक और एनारोबिक सहनशक्ति में विभाजित किया जाता है। एरोबिक सहनशक्ति लंबी अवधि की गतिविधियों जैसे मैराथन, साइक्लिंग और तैराकी में महत्वपूर्ण होती है, जबकि एनारोबिक सहनशक्ति कम समय की तीव्र गतिविधियों में आवश्यक होती है (Bompa & Buzzichelli, 2015)। इस शोध पत्र का उद्देश्य खेल प्रदर्शन में पोषण और सहनशक्ति के महत्व का अध्ययन करना तथा इनके बीच संबंध का विश्लेषण करना है। अध्ययन में द्वितीयक स्रोतों जैसे पुस्तकों, शोध पत्रों और वैज्ञानिक लेखों का उपयोग किया गया है। अध्ययन के परिणामों से यह स्पष्ट होता है कि संतुलित आहार और उचित प्रशिक्षण के माध्यम से खिलाड़ियों की सहनशक्ति और प्रदर्शन में उल्लेखनीय सुधार किया जा सकता है।

मुख्य शब्द: पोषण, सहनशक्ति, खेल प्रदर्शन, कार्बोहाइड्रेट, प्रोटीन, संतुलित आहार

परिचय

खेल मानव जीवन का एक महत्वपूर्ण अंग है। यह न केवल शारीरिक स्वास्थ्य को बेहतर बनाता है बल्कि मानसिक और सामाजिक विकास में भी महत्वपूर्ण भूमिका निभाता है। आज के प्रतिस्पर्धात्मक युग में खेलों का महत्व और अधिक बढ़ गया है, जहाँ खिलाड़ियों से उच्च स्तर का प्रदर्शन अपेक्षित होता है। उत्कृष्ट खेल प्रदर्शन के लिए केवल अभ्यास और तकनीकी कौशल ही पर्याप्त नहीं होते, बल्कि उचित पोषण और उच्च स्तर की शारीरिक क्षमता भी आवश्यक होती है (Williams, 2013)।

पोषण का अर्थ है शरीर को आवश्यक पोषक तत्व प्रदान करना जिससे शरीर की वृद्धि, विकास और ऊर्जा की आवश्यकताएँ पूरी हो सकें। खिलाड़ियों के लिए पोषण का महत्व सामान्य व्यक्तियों की तुलना में अधिक होता है क्योंकि उन्हें अधिक ऊर्जा, शक्ति और सहनशक्ति की आवश्यकता होती है। यदि खिलाड़ी का आहार संतुलित नहीं होगा तो उसकी शारीरिक क्षमता और खेल प्रदर्शन दोनों प्रभावित हो सकते हैं।

सहनशक्ति खेल प्रदर्शन का एक महत्वपूर्ण घटक है। सहनशक्ति का अर्थ है लंबे समय तक शारीरिक गतिविधि करने की क्षमता। यह विशेष रूप से उन खेलों में आवश्यक होती है जिनमें लंबे समय तक निरंतर प्रयास करना पड़ता है जैसे मैराथन दौड़, साइक्लिंग, फुटबॉल और हॉकी (Bompa & Buzzichelli, 2015)।

आधुनिक खेल विज्ञान में पोषण को प्रशिक्षण का एक महत्वपूर्ण भाग माना जाता है। उचित पोषण के माध्यम से खिलाड़ी अपनी ऊर्जा क्षमता बढ़ा सकते हैं, मांसपेशियों की मरम्मत और विकास को तेज कर सकते हैं तथा थकान को कम कर सकते हैं (Jeukendrup & Gleeson, 2019)। इस शोध पत्र का मुख्य उद्देश्य खेल प्रदर्शन में पोषण और सहनशक्ति के महत्व को समझना तथा इनके बीच संबंध का अध्ययन करना है।

खेलों में अच्छा प्रदर्शन करने के लिए केवल अभ्यास ही नहीं, बल्कि सही पोषण और मजबूत सहनशक्ति भी बहुत आवश्यक होती है। पोषण शरीर को ऊर्जा देता है, जबकि सहनशक्ति खिलाड़ी को लंबे समय तक थकान के बिना खेलते रहने की क्षमता प्रदान करती है। जब दोनों का संतुलन सही होता है, तब खिलाड़ी अपना सर्वश्रेष्ठ प्रदर्शन कर सकता है।
पोषण की बात करें तो यह शरीर के विकास, शक्ति और ऊर्जा के लिए आधार होता है। खिलाड़ी को संतुलित आहार लेना चाहिए जिसमें अनाज, दालें, हरी सब्जियाँ, फल, दूध और मेवे शामिल हों। ये सभी शरीर को आवश्यक तत्व जैसे प्रोटीन, कार्बोहाइड्रेट,

वसा, विटामिन और खनिज प्रदान करते हैं। प्रोटीन मांसपेशियों को मजबूत बनाता है, कार्बोहाइड्रेट ऊर्जा देता है और विटामिन तथा खनिज शरीर को स्वस्थ रखते हैं। यदि खिलाड़ी का आहार संतुलित नहीं होगा तो वह जल्दी थक जाएगा और उसका प्रदर्शन भी प्रभावित होगा।

सहनशक्ति का अर्थ है लंबे समय तक बिना थके शारीरिक कार्य करने की क्षमता। सहनशक्ति बढ़ाने के लिए नियमित अभ्यास बहुत जरूरी है। दौड़ना, तैरना, साइकिल चलाना और विभिन्न प्रकार के व्यायाम सहनशक्ति को बढ़ाते हैं। इसके साथ-साथ पर्याप्त विश्राम और अच्छी नींद भी जरूरी है, क्योंकि इससे शरीर को पुनः ऊर्जा मिलती है और मांसपेशियाँ मजबूत होती हैं।

खेल प्रदर्शन में पानी का भी महत्वपूर्ण स्थान है। शरीर में पानी की कमी होने पर थकान जल्दी महसूस होती है और शरीर सही ढंग से काम नहीं कर पाता। इसलिए खिलाड़ियों को समय-समय पर पर्याप्त मात्रा में पानी पीना चाहिए।

खेलों में उत्कृष्ट प्रदर्शन के लिए सही पोषण, नियमित अभ्यास, पर्याप्त विश्राम और मजबूत सहनशक्ति का होना अत्यंत आवश्यक है। यदि खिलाड़ी इन बातों का ध्यान रखे तो वह अपने खेल में बेहतर परिणाम प्राप्त कर सकता है और स्वस्थ जीवन भी जी सकता है।

अध्ययन के उद्देश्य

इस शोध अध्ययन के प्रमुख उद्देश्य निम्नलिखित हैं—

- खेल प्रदर्शन में पोषण के महत्व का अध्ययन करना।
- सहनशक्ति बढ़ाने में विभिन्न पोषक तत्वों की भूमिका को समझना।
- खिलाड़ियों के लिए संतुलित आहार के महत्व का विश्लेषण करना।
- पोषण और सहनशक्ति के बीच संबंध का अध्ययन करना।
- खेल प्रदर्शन को बेहतर बनाने के लिए पोषण संबंधी सुझाव देना।

शोध की कार्यप्रणाली

इस शोध पत्र को तैयार करने के लिए मुख्यतः **द्वितीयक स्रोतों** का उपयोग किया गया है। इसके अंतर्गत विभिन्न पुस्तकों, शोध पत्रों, खेल विज्ञान से संबंधित लेखों, पत्रिकाओं तथा इंटरनेट स्रोतों का अध्ययन किया गया है। अध्ययन में पोषण और सहनशक्ति से संबंधित विभिन्न सिद्धांतों और शोध परिणामों का विश्लेषण किया गया है। साथ ही खिलाड़ियों के आहार, पोषक तत्वों की आवश्यकता और उनके प्रभावों का तुलनात्मक अध्ययन किया गया है। इस अध्ययन की पद्धति मुख्यतः **वर्णनात्मक** है जिसमें उपलब्ध साहित्य और तथ्यों के आधार पर निष्कर्ष निकाले गए हैं।

खेल प्रदर्शन में पोषण का महत्व

खिलाड़ियों के लिए पोषण अत्यंत महत्वपूर्ण होता है क्योंकि यह उनके शरीर को ऊर्जा प्रदान करता है और खेल प्रदर्शन को बेहतर बनाता है। उचित पोषण से खिलाड़ी की कार्यक्षमता बढ़ती है और वह लंबे समय तक अभ्यास तथा प्रतियोगिता में भाग ले सकता है।

खेल प्रदर्शन में पोषण के प्रमुख लाभ निम्नलिखित हैं—

- शरीर को आवश्यक ऊर्जा प्रदान करना
- मांसपेशियों की वृद्धि और मरम्मत करना
- थकान को कम करना
- सहनशक्ति बढ़ाना
- रोग प्रतिरोधक क्षमता को बढ़ाना

वैज्ञानिक अध्ययनों से यह सिद्ध हुआ है कि संतुलित आहार लेने वाले खिलाड़ियों का प्रदर्शन उन खिलाड़ियों की तुलना में बेहतर होता है जिनका आहार असंतुलित होता है (Burke & Deakin, 2015)।

प्रमुख पोषक तत्व और उनकी भूमिका

कार्बोहाइड्रेट

कार्बोहाइड्रेट खिलाड़ियों के लिए ऊर्जा का मुख्य स्रोत होते हैं। खेल गतिविधियों के दौरान शरीर को तुरंत ऊर्जा की आवश्यकता होती है जो कार्बोहाइड्रेट से प्राप्त होती है। कार्बोहाइड्रेट शरीर में ग्लाइकोजन के रूप में संग्रहित हो जाते हैं और आवश्यकता पड़ने पर ऊर्जा के रूप में उपयोग किए जाते हैं

मुख्य स्रोत: चावल, रोटी, आलू, फल, अनाज आदि।

प्रोटीन
प्रोटीन मांसपेशियों के निर्माण और मरम्मत के लिए आवश्यक पोषक तत्व है। कठोर प्रशिक्षण के दौरान मांसपेशियों में सूक्ष्म क्षति होती है जिसे ठीक करने के लिए प्रोटीन की आवश्यकता होती है (Tipton & Wolfe, 2004)।

मुख्य स्रोत: दूध, अंडा, दालें, सोयाबीन, पनीर आदि।

वसा
वसा शरीर को दीर्घकालिक ऊर्जा प्रदान करती है। यह शरीर के तापमान को बनाए रखने और आंतरिक अंगों की सुरक्षा में भी सहायक होती है (Burke & Deakin, 2015)।

मुख्य स्रोत: घी, तेल, मेवे, बीज आदि।

विटामिन और खनिज
विटामिन और खनिज शरीर की विभिन्न जैविक क्रियाओं को नियंत्रित करते हैं। ये शरीर की प्रतिरक्षा प्रणाली को मजबूत बनाते हैं और रोगों से बचाव में सहायता करते हैं (Maughan, 2018)।

पानी
खेल गतिविधियों के दौरान शरीर से पसीने के माध्यम से पानी की काफी मात्रा निकल जाती है। इसलिए खिलाड़ियों को पर्याप्त मात्रा में पानी पीना चाहिए ताकि शरीर में जल संतुलन बना रहे।

खेल प्रदर्शन में सहनशक्ति की भूमिका

खेलों में उत्कृष्ट प्रदर्शन प्राप्त करने के लिए शक्ति, गति, कौशल और मानसिक दृढ़ता के साथ-साथ सहनशक्ति का भी बहुत महत्वपूर्ण स्थान होता है। सहनशक्ति वह क्षमता है जिसके द्वारा खिलाड़ी लंबे समय तक बिना अधिक थके अपने शरीर और मन को सक्रिय रखकर खेल में निरंतर अच्छा प्रदर्शन कर सकता है। यदि किसी खिलाड़ी में सहनशक्ति की कमी होती है तो वह खेल की शुरुआत में अच्छा प्रदर्शन कर सकता है, लेकिन कुछ समय बाद थकान के कारण उसका प्रदर्शन कम होने लगता है।

सबसे पहले, सहनशक्ति खिलाड़ी को लंबे समय तक सक्रिय रहने की शक्ति देती है। कई खेल ऐसे होते हैं जिनमें लगातार दौड़ना, कूदना या शरीर को तेज गति से चलाना पड़ता है। ऐसे समय में सहनशक्ति शरीर को थकान से बचाती है और खिलाड़ी को पूरे समय तक अपनी क्षमता बनाए रखने में सहायता करती है। जिन खिलाड़ियों की सहनशक्ति अधिक होती है वे खेल के अंतिम समय तक भी उतनी ही ऊर्जा और उत्साह के साथ खेल सकते हैं जितना वे शुरुआत में खेलते हैं।

सहनशक्ति का संबंध केवल शरीर से ही नहीं बल्कि मन से भी होता है। जब खेल लंबा चलता है या प्रतियोगिता कठिन होती है तब मानसिक दृढ़ता की आवश्यकता होती है। सहनशक्ति खिलाड़ी को मानसिक रूप से भी मजबूत बनाती है, जिससे वह दबाव, कठिन परिस्थिति और थकान के बावजूद अपने लक्ष्य पर ध्यान केंद्रित रख सकता है। इस प्रकार सहनशक्ति खिलाड़ी के आत्मविश्वास और धैर्य को भी बढ़ाती है।

सहनशक्ति का विकास नियमित अभ्यास और स्वस्थ जीवन शैली से होता है। प्रतिदिन दौड़ना, लंबी दूरी तक चलना, साइकिल चलाना, तैरना तथा अन्य शारीरिक अभ्यास सहनशक्ति को बढ़ाने में सहायक होते हैं। इसके साथ-साथ संतुलित आहार, पर्याप्त पानी, उचित विश्राम और अच्छी नींद भी सहनशक्ति को मजबूत बनाने में महत्वपूर्ण भूमिका निभाते हैं। जब शरीर को उचित पोषण और आराम मिलता है तब उसकी कार्य करने की क्षमता भी बढ़ जाती है।

सहनशक्ति का एक और महत्वपूर्ण लाभ यह है कि इससे चोट लगने की संभावना कम हो जाती है। मजबूत और सक्षम शरीर खेल के दौरान होने वाले अधिक दबाव को सहन कर सकता है। इसके अलावा अच्छी सहनशक्ति खिलाड़ी को बार-बार अभ्यास करने और अपनी क्षमता को निरंतर सुधारने में सहायता करती है।

अंततः कहा जा सकता है कि सहनशक्ति खेल प्रदर्शन का एक मूल आधार है। यह खिलाड़ी को लंबे समय तक सक्रिय रहने, मानसिक रूप से मजबूत बनने और कठिन परिस्थितियों में भी बेहतर प्रदर्शन करने की क्षमता प्रदान करती है। इसलिए प्रत्येक खिलाड़ी के लिए सहनशक्ति का विकास करना अत्यंत आवश्यक है, क्योंकि यही उसे खेल में सफलता की ओर आगे बढ़ाती है।

सहनशक्ति का महत्व

सहनशक्ति वह क्षमता है जिससे खिलाड़ी लंबे समय तक बिना थके प्रदर्शन कर सकता है। यह विशेष रूप से एथलेटिक्स, साइक्लिंग, तैराकी और फुटबॉल जैसे खेलों में महत्वपूर्ण होती है।

सहनशक्ति के दो प्रमुख प्रकार होते हैं—

1. **एरोबिक सहनशक्ति** – लंबे समय तक हल्की या मध्यम तीव्रता की गतिविधि करने की क्षमता।
2. **एनारोबिक सहनशक्ति** – कम समय के लिए उच्च तीव्रता वाली गतिविधि करने की क्षमता।

पोषण और सहनशक्ति के बीच संबंध

पोषण और सहनशक्ति के बीच गहरा संबंध है। यदि खिलाड़ी का आहार संतुलित होगा तो उसकी ऊर्जा और सहनशक्ति दोनों बेहतर होंगी और निम्न लाभ प्राप्त हो सकते हैं:

- कार्बोहाइड्रेट सहनशक्ति बढ़ाने में मदद करते हैं।
- प्रोटीन मांसपेशियों को मजबूत बनाते हैं।
- वसा लंबे समय तक ऊर्जा प्रदान करती है।
- पानी शरीर को हाइड्रेटेड रखता है।

खिलाड़ियों के लिए संतुलित आहार

खिलाड़ियों के लिए संतुलित आहार में निम्नलिखित शामिल होना चाहिए—

- पर्याप्त कार्बोहाइड्रेट
- उचित मात्रा में प्रोटीन
- सीमित मात्रा में वसा
- विटामिन और खनिज
- पर्याप्त पानी

संतुलित आहार लेने से खिलाड़ियों को निम्नलिखित लाभ मिलते हैं—

- ऊर्जा में वृद्धि
- मांसपेशियों की मजबूती
- रोग प्रतिरोधक क्षमता में सुधार
- जल्दी रिकवरी
- मानसिक एकाग्रता में वृद्धि

शोध परिणाम

इस अध्ययन से यह स्पष्ट होता है कि खेल प्रदर्शन में पोषण और सहनशक्ति का अत्यंत महत्वपूर्ण योगदान है। मुख्य निष्कर्ष निम्नलिखित हैं—

- उचित पोषण से ऊर्जा स्तर बढ़ता है।
- सहनशक्ति में सुधार होता है।
- मांसपेशियों की मजबूती बढ़ती है।
- रिकवरी की गति तेज होती है।

- चोट लगने का जोखिम कम होता है।

निष्कर्ष

इस अध्ययन से यह निष्कर्ष निकलता है कि खेल प्रदर्शन में पोषण और सहनशक्ति का अत्यंत महत्वपूर्ण स्थान है। उचित पोषण के बिना खिलाड़ी अपनी पूर्ण क्षमता का प्रदर्शन नहीं कर सकता।संतुलित आहार शरीर को आवश्यक ऊर्जा प्रदान करता है और मांसपेशियों की वृद्धि तथा मरम्मत में सहायक होता है।कार्बोहाइड्रेट, प्रोटीन, वसा, विटामिन, खनिज और पानी सभी पोषक तत्व खिलाड़ियों के लिए आवश्यक हैं। इनके उचित संतुलन से खिलाड़ी की सहनशक्ति बढ़ती है और वह लंबे समय तक बेहतर प्रदर्शन कर सकता है।अतः यह आवश्यक है कि खिलाड़ी अपने प्रशिक्षण कार्यक्रम के साथ-साथ उचित पोषण पर भी ध्यान दें। संतुलित आहार और वैज्ञानिक प्रशिक्षण के माध्यम से खेल प्रदर्शन में उल्लेखनीय सुधार किया जा सकता है।

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EFFECT OF HEARTFULNESS MEDITATION ON BLOOD CORTISOL LEVELS AMONG COLLEGE STUDENTS

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Abstract

Purpose of the study: To examine the effect of Heartfulness Meditation on cortisol levels among college students.

Materials and Methods: The study included 40 female participants from Shri Bhawani Niketan Mahila Mahavidyalaya, Jaipur, aged 18 to 25 years, who were divided into two groups: an experimental group and a control group. The experimental group underwent the training for 12 weeks with 5 sessions per week. The significance level was set at 0.05.

Methodology and Results: The experimental group practiced the Heartfulness Meditation regularly for 90 days. In this study, cortisol levels were measured by taking blood samples, and the data were analyzed using t-tests and ANOVA. According to statistical analysis, the obtained results are significant at the 0.05 level, indicating that Heartfulness Meditation leads to a significant decrease in the cortisol levels of college-going students in Jaipur.

Conclusion: The research presented demonstrates how Heartfulness Meditation helps reduce cortisol levels in students. Therefore, the extreme importance of Heartfulness Meditation practice in the balance of the body, mental health, and spiritual as well as physical health can be established.

Keywords: Cortisol, Mantra, Meditation, Heartfulness Meditation

Yoga, an ancient discipline originating in India, has evolved into a widely practiced system of physical, mental, and spiritual development. Recognized by both traditional and contemporary sciences for its therapeutic benefits, yoga is now frequently integrated into modern wellness programs. Traditionally, yoga is a holistic practice encompassing asanas (postures), pranayama (breathing techniques), dhyana (meditation), and mantra chanting-all aimed at promoting self-awareness, physiological balance, and inner peace (Streeter et al., 2012). In modern research, yoga has been shown to positively affect neuroendocrine and autonomic regulation, contributing to stress reduction and improved mental health outcomes. Among these various limbs of yoga, mantra meditation is a potent and relatively underexplored technique involving the rhythmic repetition of specific sounds, words, or phrases, traditionally in Sanskrit. Mantras are considered not only spiritual spiritual tools tools but but vil vibrational formulas with the potential to regulate consciousness and bodily systems. In Indian philosophical systems, mantra chanting is believed to generate subtle energy frequencies that align the individual with deeper aspects of self and the cosmos (Balaram, 2014). From a scientific standpoint, these vibrations can affect the nervous system, modulate breathing patterns, and promote relaxation, factors that may directly influence endocrine functioning, including the regulation of stress hormones (Telles et al., 2010). is, and promote

The vibratory effects of Sanskrit mantras go beyond symbolic meanings. Phonetically precise syllables are constructed to stimulate specific parts of the body and brain through resonance. Studies suggest that mantra recitation can stimulate the vagus nerve, activate the parasympathetic nervous system, and induce a relaxation response. This includes reductions in heart rate, blood pressure, and brain wave activity shifting toward alpha and theta states markers of calm, focused awareness (Streeter et al., 2012; Bernardi et al., 2001), Furthermore, mantra repetition has been associated with reductions in anxiety, improvements in emotional regulation, and enhanced psychological resilience. Central to understanding the physiological effects of stress, and thereby the potential impact of mantra meditation, is the hormone cortisol. Produced by the adrenal cortex in response to activation of the hypothalamic-pituitary-adrenal (HPA) axis, cortisol helps the body manage acute stress by increasing glucose availability,

suppressing inflammation, and modulating immune responses. While essential for survival during short-term stress, chronically elevated cortisol levels are associated with adverse effects on nearly all bodily systems, including cognitive impairment, mood disorders, metabolic dysfunction, and cardiovascular disease (Hellhammer et al., 2000).

Blood cortisol levels, as measured through venipuncture and plasma analysis, offer a reliable biomarker for understanding how stress affects the human body. Blood-based cortisol assays are considered the gold standard for capturing acute changes in systemie cortisol and provide more precise information on endocrine status than saliva alone, particularly when assessing the physiological impact of interventions (Kirschbaum & Hellhammer, 2000). Monitoring blood cortisol allows researchers to evaluate how therapeutic techniques such as yoga and meditation influence stress responses at a hormonal level. Among populations vulnerable to chronic stress, college students represent a significant risk group. The pressures of academic performance, social transition, and career planning contribute to high levels of psychological distress among students globally. Numerous studies have reported elevated cortisol levels in students during high-stress periods such as examinations, which can interfere with sleep, memory, and emotional well-being (Beiter et al., 2015). As such, identifying low-cost, non-pharmacological strategies to manage stress and regulate

Heartfulness, focusing on the breath, helps calm the mind, improve self-awareness, and support inner stillness, making breath regulation a key tool for enhancing mental and emotional well-being (Sharma et al., 2022).
Among the many forms of meditation, Heartfulness Meditation has gained growing attention as a heart-centered, accessible, and integrative approach to inner transformation. It is derived from the Sahaj Marg tradition of Raja Yoga and was formalized by Shri Ram Chandra of Shahjahanpur in the 20th century. Currently practiced worldwide under the guidance of the Shri Ram Chandra Mission, Heartfulness offers a simple yet profound system of meditation that focuses on the heart as the seat of inner experience and consciousness (Patel & Pollock, 2018).

Heartfulness Meditation distinguishes itself by incorporating four interrelated components:

1. Relaxation: A guided body-mind relaxation technique that prepares the practitioner for meditation by releasing muscular tension and calming the nervous system.
2. Meditation: The core practice involves gently focusing on the idea of a divine light within the heart. Unlike concentration-based methods, Heartfulness encourages a relaxed, receptive awareness, allowing thoughts to come and go without resistance.
3. Cleaning: Practiced in the evening, this technique aims to remove emotional impressions and accumulated stress from the day. It is a unique aspect of Heartfulness that supports mental clarity and emotional balance.
4. Prayerful Connection: A brief, introspective prayer is practiced before sleep to foster surrender and alignment with higher consciousness.

The importance of Heartfulness Meditation lies in its integrated effect on the mental, emotional, and respiratory systems. Multiple studies have shown that regular Heartfulness practice leads to measurable reductions in perceived stress, anxiety, and emotional reactivity. Notably, a systematic review by Sharma et al. (2022) reported improvements in heart rate variability (HRV), a key biomarker of autonomic balance, among Heartfulness practitioners. These physiological changes are closely linked to improved breathing regularity, reduced air hunger, and decreased hypervigilance to respiratory sensations.

Methods

Forty female students (age 18–25) from Shri Bhawani Niketan Mahila P.G. Mahavidyalaya, Jaipur, were recruited using stratified random sampling. Participants provided written informed consent, and the study was approved by the Institutional Ethics Committee, Lakshmibai National Institute of Physical Education, Gwalior, MP (IEC/LNIPE/28/03).

Eligibility Criteria

Participants were included if they met the following criteria: (a) female students aged 18–25 years, (b) willing to participate in the Heartfulness Meditation program. Exclusion criteria were: (a) prior experience with yoga or meditation within the past six months, (b) history of chronic physical or respiratory ailments, (c) ongoing medication or medical treatment, and (d) any form of addiction or disability affecting participation.

Intervention

The experimental group practiced **Heartfulness Meditation**, which consisted of four core components: relaxation, meditation, breathing, and prayerful connection (Table 1). Sessions were conducted **five times per week for 12 weeks** by a certified Heartfulness trainer. Each session lasted **20–30 minutes,** with gradual increases in meditation and cleaning durations over the 12 weeks to facilitate deeper practice and engagement. Participant adherence was monitored through systematic attendance tracking, with each session recorded in a logbook maintained by the instructors. The control group continued their usual daily routine without participating in any meditation or relaxation practices.

Data Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows. Descriptive statistics, including mean and standard deviation, were calculated for all variables. To assess within-group changes in breathing discomfort, paired sample t-tests were applied to compare pre-test and post-test Cortisol Level. Between-group differences were examined using independent sample t-tests. Additionally, one-way Analysis of Covariance (ANCOVA) was employed to compare post-test Cortisol Level between the Heartfulness Meditation group and the control group, with pre-test Cortisol Level treated as a covariate to control for baseline differences. All statistical tests were conducted at a significance level of $\mathbf{p < 0.05}$.

Table 1 Training Program: -

S.No	Steps of Practice	Month 1	Month 2	Month 3
1	Relaxation	2 min	2min	2min
2	Meditation	10min	15min	20min
3	Cleaning	5min	10min	15min
4	Prayerful connection	2min	2min	2min

Result

All forty participants completed the study, and no cases were excluded from the final analysis. Baseline characteristics and pre-test Cortisol level were comparable between the Heartfulness Meditation group and the control group, indicating group equivalence before the intervention.

Within-Group Comparison

Within-group analysis for the Heartfulness Meditation group revealed a statistically significant reduction in cortisol level following the 12-week intervention. Paired sample t-test results showed a significant difference between pre-test and post-test cortisol levels ($t = 19.9$, $df = 19$, $p < 0.001$). The mean reduction in cortisol level was 3.00± 1.60, indicating a substantial improvement in perceived cortisol level after regular Heartfulness practice. In contrast, the control group did not demonstrate a statistically significant change in cortisol levels between the pre-test and post-test assessments, suggesting that routine daily activities without intervention did not influence cortisol levels.

Table-2
Descriptive Statistics of the Cortisol Level of College Students

Groups	Pre-Test		Post-Test		Adjusted
	Mean	SD	Mean	SD	Mean
Control Group	16.8	1.11	17.0	0.858	17.0
Heartfulness Meditation Group	16.7	1.45	13.7	1.60	13.7

Table 2 presents the pre-test mean, pre-test standard deviation (SD), post-test mean, post-test SD, and adjusted mean for the two groups: the **Control Group** and **the Heartfulness Meditation Group.** The **pre-test mean and SD** of the **Control Group** were **16.8 ± 1.11,** and the **pre-test mean and SD** of the **Heartfulness Meditation Group** were **16.7 ± 1.45**, indicating that both groups were equivalent before the intervention in terms of Cortisol Level. The **post-test mean and SD** of the **Control Group** were **17.0 ± 0.858**, while the **post-test mean and SD** of the Heartfulness Meditation **Group** were **13.7± 1.60.** This clearly shows a decrease in Cortisol Level among participants who practiced the Heartfulness Meditation. The **adjusted mean** of the **Control Group** was **17.0,** while the **adjusted**

mean of the **Heartfulness Meditation Group** was **13.7**, after statistically controlling for pre-test differences. This difference was found to be statistically significant, as confirmed by ANCOVA results, and is graphically represented in **Figure 1**.

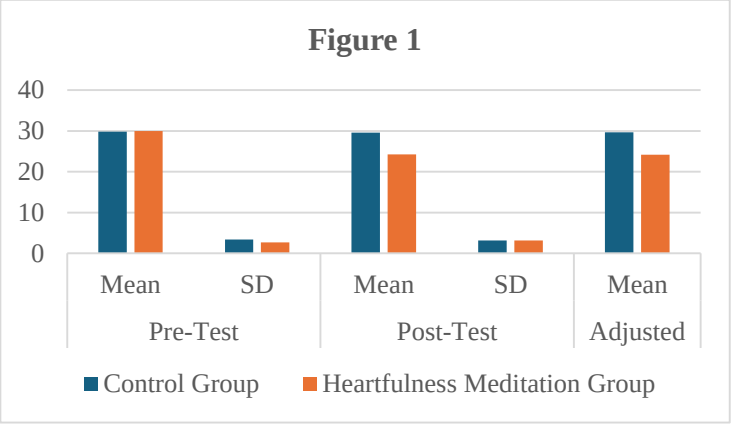

Table-3
Summary of One-way ANCOVA of Cortisol level of College Students by taking their pre- Cortisol level as Covariates

Source of Variance	Fy.x	Sig.
Treatment	13.50	<.001
Cortisol level Pre	80.45	<.001
Treatment* Cortisol	8.27	<.001

From Table 3, the results reveal that the main effect of **treatment** is statistically significant ($F = 13.50$, $p < .001$), indicating a significant difference between the treatment and control groups in their adjusted Cortisol Level. The covariate, **pre-test cortisol level**, is also found to be statistically significant ($F = 80.45$, $p < .001$), suggesting that baseline cortisol levels had a significant influence on Cortisol Level. The **interaction between treatment and cortisol level** is statistically significant ($F = 8.27$, $p < .001$), indicating that the effectiveness of the treatment differs across levels of cortisol. Hence, the null hypothesis is rejected. It can be concluded that participants in the treatment group (Heartfulness meditation) had significantly lower adjusted cortisol levels than those in the control group, even after statistically controlling for baseline cortisol levels. This finding highlights the effectiveness of the intervention in reducing physiological stress.

Discussion

The present study aimed to examine the effect of Heartfulness Meditation on cortisol levels among college students. The findings revealed a statistically significant reduction in cortisol levels in the experimental group following the 12-week intervention, whereas no significant changes were observed in the control group. These results indicate that Heartfulness Meditation is effective in reducing physiological stress, as measured through blood cortisol levels. Cortisol is a primary stress hormone regulated by the hypothalamic–pituitary–adrenal (HPA) axis, and its chronic elevation is associated with various adverse psychological and physiological outcomes (Hellhammer et al., 2000). The significant decrease in cortisol levels observed in the present study suggests that Heartfulness Meditation may help modulate HPA axis activity, thereby promoting stress regulation. These findings are consistent with earlier research demonstrating the beneficial effects of meditation and yoga-based interventions on stress biomarkers. For instance**, Streeter et al. (2012)** reported that yogic practices enhance parasympathetic activity and reduce stress responses, leading to improved neuroendocrine balance. Similarly, **Telles et al. (2010)** found that meditation practices significantly reduce physiological arousal and promote relaxation. The observed reduction in cortisol levels in the present study may be attributed to similar mechanisms, including activation of the parasympathetic nervous system and reduction in sympathetic overactivity.

Furthermore, the significant interaction effect between treatment and baseline cortisol levels indicates that the effectiveness of Heartfulness Meditation varies depending on initial stress levels. This suggests that individuals with higher baseline cortisol may derive greater benefits from the intervention. Such findings align with previous studies indicating that stress-reduction interventions tend to have stronger effects in individuals experiencing higher levels of stress (Kirschbaum & Hellhammer, 2000). Heartfulness Meditation, in particular, emphasizes a heart-centered approach combined with relaxation, meditation, cleaning, and prayerful connection. These components collectively contribute to emotional regulation, mental calmness, and physiological balance. According to **Sharma et al. (2022),** Heartfulness practices improve autonomic regulation, as reflected in enhanced heart rate variability (HRV), which is closely linked to stress reduction and endocrine stability. Additionally, college students are especially vulnerable to stress due to academic pressures, lifestyle changes, and future uncertainties (Beiter et al., 2015). The significant reduction in cortisol levels observed in this study highlights the practical importance of integrating meditation-based interventions into student wellness programs as a non-pharmacological, cost-effective strategy for stress management.

Overall, the findings of the present study provide empirical support for the effectiveness of Heartfulness Meditation in reducing physiological stress and improving endocrine functioning among college students.

Conclusion

Based on the findings of the study, it can be concluded that Heartfulness Meditation has a significant effect on reducing cortisol levels among college students. The experimental group demonstrated a marked decrease in cortisol levels after the 12-week intervention, whereas the control group showed no significant change. The results confirm that Heartfulness Meditation is an effective non-pharmacological intervention for managing physiological stress by regulating cortisol levels. By promoting relaxation, emotional balance, and autonomic stability, this practice contributes to overall mental and physical well-being. Therefore, it is recommended that Heartfulness Meditation be incorporated into student health and wellness programs to help manage stress and improve quality of life. Future research may explore its long-term effects, applicability across diverse populations, and comparison with other meditation techniques.

Ethical statement

Ethical approval was obtained from the Institutional Ethics Committee, Lakshmibai National Institute of Physical Education, Gwalior, MP (IEC/LNIPE/28/03).

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Conflicts of interest

There are no conflicts of interest.

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A PRACTICAL APPROACH TO INTEGRATING ADAPTED PHYSICAL EDUCATION IN TEACHER EDUCATION CURRICULUM: MOVING BEYOND THEORY TO ADVANCE INCLUSIVE HUMAN PERFORMANCE AND INTEGRATIVE HEALTH

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Abstract

This study examines a practical approach to integrating Adapted Physical Education (APE) into teacher education curricula, moving beyond theoretical instruction to advance inclusive human performance and integrative health. Although inclusive education is widely endorsed in educational policy, many teacher education programs continue to prioritize conceptual knowledge over structured practical engagement. As a result, pre-service physical education teachers often lack confidence and applied competence in inclusive settings.

Using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, peer-reviewed research was carefully chosen using ResearchGate and Google Scholar and Pubmed. Adapted pedagogy, inclusive physical education learning processes, the efficacy of adapted physical activity programs, teacher self-efficacy regarding inclusion, and the role of APE in fostering health and wellbeing among students with special educational needs (SEN) are all covered in this review.

The results show that a practice-oriented integration paradigm greatly improves inclusive outcomes and teacher readiness. Research demonstrates that pre-service teachers exhibit increased self-efficacy, enhanced instructional adaptability, and more positive attitudes toward inclusion when their teacher education programs incorporate structured field experiences, altered lesson implementation, customized planning, and intervention-based training. Additionally, kids with a range of abilities benefit from improved motor development, active engagement, social inclusion, and psychological wellbeing thanks to modified physical education programs, which promote integrative health outcomes. The assessment also points out a recurring theory-practice divide, highlighting the necessity of curriculum reform that incorporates experiential elements in place of different theoretical modules.

The study comes to the conclusion that teacher education curriculum must intentionally move from theory-dominant preparation to sustained, practice-based APE integration in order to advance inclusive human performance and integrative health.

Keywords: Integrative Health, Adaptive Pedagogy, Practice-Based Learning, Adapted Physical Education, Teacher Education Curriculum, Inclusive Physical Education, Inclusive Human Performance, and Special Educational Needs.

Introduction

A fundamental principle of contemporary educational systems is inclusive education, which emphasizes equal participation and learning opportunities for all students, including those with special educational needs (SEN) and impariments. According to this concept, physical education is essential for fostering social connection, mental wellness, physical fitness, and general health development. In order to meet the varied requirements of students, Adapted Physical Education (APE) has become a crucial strategy that changes physical activities, teaching techniques, instructional tactics, and learning settings. According to research, in order to help students with SEN's meaningful participation and engagement in physical education settings, customized pedagogical practices are crucial (Omar Ben Rakaa, 2025).

Students' motor development, social integration, confidence, and psychological wellbeing are all greatly enhanced by inclusive physical education. In addition to encouraging inclusive human performance and holistic health outcomes, adapted physical activity programs enable students with disabilities to actively engage in sports and physical activities. Adaptive teaching strategies and inclusive sports programs are crucial for enhancing participation and educational opportunities for kids with a range of abilities, according to studies looking at inclusive physical education methods (Rezha Arzhan Hidayat, 2024).

Effective inclusive physical education necessitates teachers to have practical knowledge of assistive and adaptive aids used by students with physical impairements, in addition to modified instructional methodologies. Participation in physical activities is frequently supported by devices including sports-specific wheelchairs, walkers, prosthetics, orthotic supports, modified sports equipment, and mobility aids. Pre-service physical education teachers must therefore be knowledgeable with the use, function, and modification of such assistive technology. Teachers can create inclusive activities, alter equipment appropriately, and guarantee safe participation for students with physical disabilities by having a thorough understanding of these aids.

Individualized learning procedures and adaptive pedagogy provide further assistance for inclusive physical education settings. Teachers can better meet the diverse needs of students with SEN and increase their participation in physical education classes by using customized work plans, adaptable teaching strategies, and activity adaptations. However, physical education teachers' professional development and training are crucial to the effective use of these strategies.
Even while inclusive education is becoming more and more important, there are still a number of obstacles to overcome when implementing it in physical education settings. According to research looking at physical educators' perspectives, teachers frequently struggle to apply inclusive practices because of inadequate training, a lack of institutional support, and a lack of exposure to adapted physical education throughout their professional preparation (Wesley J. Wilson E. A., 2020). While offering few possibilities for hands-on learning experiences pertaining to adaptive physical activities, assistive technology, and inclusive instructional approaches, many teacher education programs largely concentrate on the theoretical aspects of inclusive education.

This reveals a significant gap in the body of current literature. Few studies explicitly address how Adapted Physical Education can be practically integrated into teacher education curricula to prepare future physical educators for inclusive teaching environments, despite the fact that many studies discuss inclusive physical education strategies, adaptive pedagogical approaches, and the advantages of adapted physical activity programs. Instead of looking at practice-based preparation of pre-service teachers within teacher education programs, such as training on adapted equipment and assistive devices used by students with physical impairments, the majority of research concentrates on classroom practices or intervention outcomes.

Therefore, in order to incorporate Adapted Physical Education into teacher education curricula, a more practical approach must be developed, going beyond theory-based training. Teachers' professional competence, inclusive human performance, and integrative health outcomes for students with a range of abilities can all be improved with this kind of approach.

Methodology

The secondary data included in the study came from peer-reviewed research papers that were published in both domestic and foreign journals. Relevant material was gathered from scholarly databases, including: ResearchGate, Google Scholar and Pubmed. PRISMA criteria were followed in the study selection procedure, and Figure.1 shows the sequence of study identification, screening, eligibility, and inclusion. Key words that are being used are: research on inclusive or adapted physical education; studies that concentrate on kids with special educational needs (SEN) or disabilities. Inclusive criteria were: research on inclusive physical education programs, teacher preparation programs, or modified teaching techniques; research papers with peer review that are published in scholarly publications; research that was published in English; Full-text studies are accessible via ResearchGate or Google Scholar or Pubmed; studies that concentrate on teacher viewpoints, inclusive physical education strategies, or modified physical activity treatments. Exclusive criteria were: articles unrelated to adaptive physical education or physical education in general; research on general education that is unrelated to inclusive physical education; non-peer-reviewed sources, including unpublished reports, blogs, and opinion pieces; There are no full-text studies available; The database search turned up duplicate articles; articles written outside of English. The search procedure was refined using Boolean operators (AND, OR). Descriptive content analysis was used to examine the chosen studies. Ethical approval was not necessary because the study was based on secondary data. However, in order to uphold academic integrity, all sources were properly cited. There was no use of fundamental statistical methods. Descriptive interpretation of previously published results was used in the study.

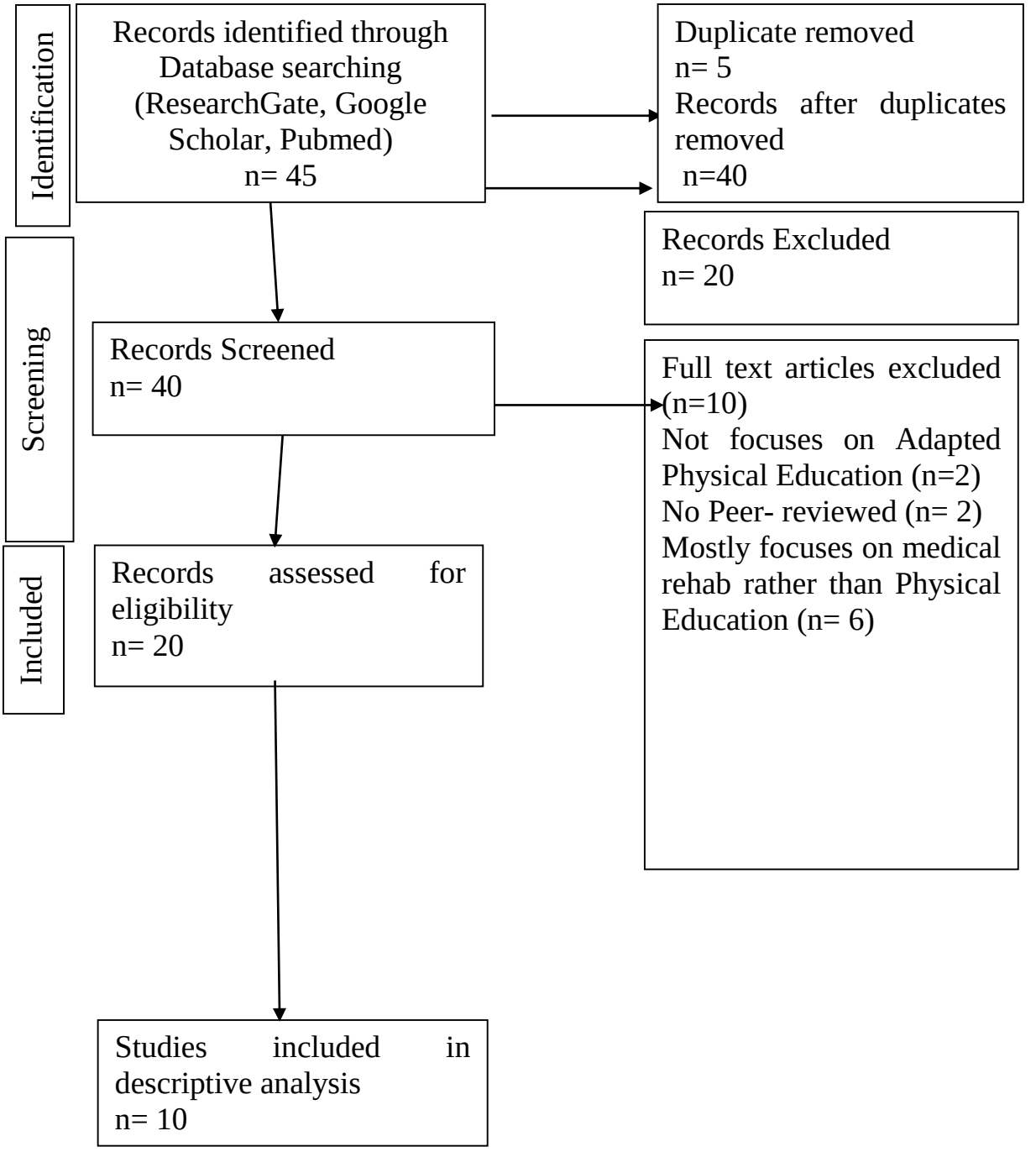

FIG 1: PRISMA criteria were followed in the study selection procedure, shows the sequence of study identification, screening, eligibility, and inclusion

Analysis

The papers that were chosen based on the PRISMA standards is analyzed in a thematic evaluation of the literature which include: Study title, Research Design, Key Findings.

Study Title	Research Design	Key Finding
Adapted pedagogical strategies in inclusive physical education for students with special educational needs: a systematic review	Systematic Review	Students with SEN participate more when teachers use adapted teaching techniques such activity modification, peer assistance, and flexible instruction.
Promoting inclusivity in sports: Understanding the effectiveness of adaptive physical education programs for students with disabilities in India	Empirical Study	Students with disabilities benefit from adaptive physical education programs in terms of participation, social engagement, and the development of motor skills.
Inclusive Physical Education: Strategies for Integrating Students with Disabilities	Applied Study	For inclusive physical education to successfully incorporate children with disabilities, curriculum adaptations, assistive technology, and teacher training are necessary.
Promoting health and wellbeing: The role of adapted physical education in special populations	Literature Review	Physical fitness, psychological well-being, and overall health are all enhanced by adapted physical activity.
Inclusive Physical Education in India: Challenges and Best Practices	Review Study	The effective implementation of inclusive physical education is restricted by issues like inadequate infrastructure, teacher preparation, and equipment.
Adaptive Pedagogy and Learning Processes in Inclusive Physical Education	Systematic Review	In inclusive physical education, adaptive teaching techniques enhance educational outcomes and facilitate individualized learning.
Promoting Inclusivity in Physical Education: Strategies for Special Needs Students	Research/ Practical Guide	Participation is increased by inclusive teaching strategies including collaborative learning and customized equipment.
Inclusive physical education learning strategies for students with special needs in senior high schools: A literature review	Literature Review	Inclusive teaching methods and supportive learning settings are beneficial for students with impairments.
The Effect of an Adapted Physical Activity Intervention Program on Pre-Service Physical Education Teachers' Self-Efficacy towards Inclusion	Experimental Study	Teacher's confidence and proficiency in inclusive teaching are enhanced by training programs in adaptive physical exercise.

Attempting inclusive practice: perspectives of physical educators and adapted physical educators	Qualitative Study	Despite their support for inclusion, teachers highlight difficulties brought on by a lack of resources and professional development.

1. **Modified Pedagogical Strategies**

Adapted teaching strategies are crucial for inclusive physical education, according to several research. (Omar Ben Rakaa, 2025) Highlight how children with special educational needs participate far more when using adaptive pedagogical tactics including task modification, flexible instruction, and peer assistance. (Maxime Tant, 2016) claim that adaptive pedagogy helps teachers respond to a range of student capacities and promotes tailored learning. These results suggest that exercise modification and pedagogical flexibility are essential elements of inclusive physical education.

2. **An inclusive environment for learning and participation**

The encouragement of inclusive participation through encouraging learning environments has been noted as another key element. (Gurdeep Singh, 2025) Show that children who have limitations participate more in adaptive physical education programs and strengthen their motor skills and social skills. (Rezha Arzhan Hidayat1, 2024) Emphasize how inclusive physical education settings enhance student's participation and overall educational experiences. According to these findings, inclusive physical education promotes social inclusion as well as physical development.

3. **Professional ability and Preparation for teachers**

Another significant element promoting the achievement of inclusive physical education is teacher preparation. Discovered that pre-service teachers' self-efficacy in inclusive teaching was greatly enhanced by modified physical activity intervention programs. (Charde, 2021) highlights that in order to successfully integrate students with impairments, teachers need specific training and familiarity with adapted equipment. These results emphasize the need for practical training in adaptive physical education to be included in teacher education programs.

4. **Results for Health and Wellbeing**

Physical education that has been modified promotes overall health and wellness. (Timal, 2024) indicate that engaging in adaptive physical exercise enhances the mobility, physical fitness, and mental health of people with disabilities. The notion that modified physical education promotes both physical and mental health outcomes is strengthened by this.

5. **Difficulties in Integrating Inclusive Physical Education into Practice**

Despite the advantages, there are a number of obstacles that prevent inclusive physical education from being implemented. (Wesley J. Wilson E. A., 2020) reveal that instructors frequently deal with issues such inadequate institutional support, a lack of professional training, and a lack of resources. (Dr.Rose Nicx. P.K, 2023) recognizes the absence of adaptive equipment and infrastructure constraints as major obstacles. These results suggest that institutional resources and systemic support are essential for the effective execution of inclusive physical education programs.

Discussion

The examination of the chosen studies emphasizes how crucial it is becoming to incorporate Adapted Physical Education (APE) into teacher education programs in order to support integrative health and inclusive human performance. The results show that although inclusive physical education is generally acknowledged in educational policy, teacher's expertise, training, and capacity to modify teaching methods to accommodate students with disabilities play a major role in its actual implementation.

The importance of modified instructional approaches in inclusive physical education is one of the main conclusions drawn from the examined studies. According to research, introducing assistive technology, changing game rules, and tweaking teaching strategies can all greatly increase the involvement of kids with special education needs in physical education programs. (Omar Ben Rakaa, 2025) systematic review, for instance, emphasizes how modified

teaching strategies including task modification, peer assistance, and flexible education enhance students with disabilitie's engagement and skill development. With the help of these pedagogical modifications, educators can establish inclusive classrooms where students with a range of skill levels can actively participate. (Martinez-Merino N, 2024) (Overton H, 2017).

The effectiveness of adaptive physical education programs in fostering inclusion and engagement is another significant theme found in the investigation. Programs for adaptive physical education aid in the development of social skills, physical fitness, and motor skills in students with impairments. According to a study on adaptive physical education programs in India, organized inclusive sports activities greatly enhance children with disabilitie's engagement, self-esteem, and social integration (Gurdeep Singh, 2025) (Winnick JP, 2016).By promoting interaction between students with and without disabilities in physical education settings, these programs also aid in the reduction of social obstacles.

In inclusive physical education, the results also highlight the significance of professional expertise and teacher preparation. Due to their lack of experience in adapted physical education, many teachers feel unprepared to instruct children with impairments. When implementing inclusive practices, teachers frequently encounter obstacles such a lack of training, inadequate resources, and little institutional support, according to research looking at the opinions of physical educators and adapted physical educators (Wesley J. Wilson E. A., 2020) (Haegele, 2017) (Kern, 2017),these results show that in order for instructors to confidently apply inclusive approaches in actual classroom settings, teacher education programs must include hands-on experience with modified physical education techniques.

Additionally, experiential learning and hands-on training in adaptive physical education must be prioritized in teacher education programs. Pre-service teachers who undergo hands-on training in adapted physical activities have greater levels of confidence and self-efficacy while teaching children with disabilities, according to studies on intervention-based teacher training programs (Majed M. Alhumaid, The Effect of an Adapted Physical Activity Intervention Program on Pre-Service Physical Education Teachers' Self-Efficacy towards Inclusion in Saudi Arabia, 2012) (Umhoefer, Vargas, & Beyer, 2015) (Reina, Santana, Montesdeoca, & Roldan, 2019). This shows that in order to adequately prepare future physical education teachers to apply inclusive methods, it is imperative that they move beyond theory and toward practical learning experiences.

Despite these favorable results, the literature also points out a number of difficulties in putting inclusive physical education approaches into practice. These issues include a shortage of qualified educators, poor infrastructure, restricted access to adaptable equipment, and a lack of support from policymakers. In many educational settings, these obstacles may make it more difficult to successfully implement inclusive physical education programs.
Overall, the results point to the need for a practical, skill-based approach rather than a simply theoretical one when incorporating adaptive physical education into teacher preparation programs. Future teachers should have the chance to learn about inclusive activity design, assistive technology for students with physical disabilities, and adaptive teaching techniques through teacher education programs. Teachers of physical education will be able to build inclusive environments that promote participation, health, and welfare for all children if these practical components are strengthened.

Conclusion

In order to support inclusive human performance and integrative health, the current research emphasizes the increasing significance of including Adapted Physical Education (APE) within physical education teacher education programs. The examination of the chosen studies shows how important it is to support students with disabilities in physical education settings through inclusive participation practices, tailored pedagogical approaches, and teacher readiness. In addition to promoting fair engagement in physical activities, adapted physical education enhances social interaction, motor development, and general welfare for people with a range of abilities.

The results also highlight the need for teachers to have both theoretical knowledge and practical proficiency in altering instructional tactics, adapting physical activities, and using assistive equipment as needed in order to implement inclusive physical education. According to research, instructors who undergo formal training in adapted physical education exhibit greater levels of efficacy and confidence when instructing students with impairments. For example, research on teacher's attitudes on inclusive physical education shows that professional training and hands-on experience have a big impact on how well inclusive practices are implemented in classrooms (Wesley J. Wilson E. A., 2020).

Additionally, it has been widely acknowledged that adapted physical activity is crucial for enhancing the social involvement, psychological well-being, and physical health of people with disabilities. Engaging in inclusive physical exercise settings promotes long-term health outcomes and active lives. Additionally, studies on adaptive physical exercise indicate that inclusive physical education programs enhance students with disabilitie's quality of life, social inclusion, and self-esteem (Justin A. Haegele, 2015).

Despite these encouraging results, the assessment also notes a number of obstacles that prevent inclusive physical education from being implemented successfully. These difficulties include a lack of institutional support in many educational situations, a shortage of adapting equipment, and inadequate teacher preparation in adapted physical education. These obstacles frequently cause a disconnect between inclusive education policies and how they are actually implemented in physical education programs.

The review highlights a major research gap in the current literature, which is the most significant finding. Relatively little research focuses especially on the practical integration of adapted physical education into physical education teacher education curriculum, despite the fact that many studies describe inclusive physical education techniques and adaptable teaching approaches. While offering few opportunities for hands-on training in assistive technology and modified physical activities, many teacher education programs continue to place a strong emphasis on theoretical understanding of inclusion. This disparity shows that more study is required to investigate practice-based approaches of modified physical education instruction that can better equip aspiring physical education instructors to operate in inclusive settings.

In conclusion, developing qualified teachers who can encourage inclusive physical activity participation requires enhancing the practical aspects of adaptive physical education within teacher education programs. Teachers' preparedness to implement inclusive physical education can be greatly improved by including practical training, adaptive teaching strategies, and assistive device expertise into teacher preparation programs. In the end, these programs will support integrative health and inclusive human performance for children of all abilities.

Recommendations

1. Provide physical education teacher in pre-service with gait analysis training that is especially targeted at impaired students. This will help them comprehend the students' movement patterns, mobility restrictions, and functional abilities, allowing them to create physical education lessons and activities that are specifically tailored to each student's needs.
2. Make sure that assistive aids and adaptive sports equipment (such as sports wheelchairs, prostheses, orthotic supports, and adapted balls) are introduced and shown practically so that trainees understand how to use them in actual activity contexts rather than just theoretical information.
3. To develop a greater understanding of a range of physical talents, arrange hands-on workshops with athletes with impairments and practitioners of adapted sports.

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EXERCISE AS A THERAPEUTIC STRATEGY FOR MENTAL HEALTH OPTIMIZATION: EVIDENCE FROM EXERCISE SCIENCE

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Abstract

Mental health, encompassing emotional, psychological, and social well-being, significantly influences how individuals think, feel, cope with stress, and interact with others. In recent years, exercise science has emerged as a powerful interdisciplinary field demonstrating strong connections between physical activity and mental health optimization. This paper explores the biological, psychological, and social mechanisms through which structured exercise enhances mental well-being across different age groups. Biologically, physical activity stimulates the release of neurotransmitters such as serotonin, dopamine, and endorphins, reduces cortisol levels, enhances brain-derived neurotrophic factor (BDNF), and promotes neuroplasticity, thereby improving mood, cognition, and stress regulation. Psychologically, exercise strengthens self-efficacy, builds resilience, improves self-esteem, and provides cognitive distraction from negative thought patterns. Socially, group-based activities foster belongingness and reduce isolation.The paper further examines age-specific mental health challenges among children, adolescents, adults, and senior citizens, highlighting tailored exercise-based solutions such as school-based physical education programs, mindfulness practices, resistance training, and workplace wellness interventions. Evidence-based exercise prescriptions recommend at least 150 minutes of moderate-intensity aerobic activity weekly, combined with resistance training and mind-body exercises like yoga, to reduce symptoms of anxiety and depression. Additionally, the role of sports psychology is discussed in enhancing motivation, emotional regulation, and long-term adherence to exercise programs. Practical interventions integrating goal-setting, self-monitoring, and social support systems are emphasized as sustainable strategies for mental health promotion. Contemporary research strongly supports the "exercise as medicine" concept, demonstrating that regular physical activity can rival traditional therapeutic approaches for mild to moderate depression. Overall, this interdisciplinary framework positions exercise science as a cost-effective, accessible, and holistic approach to optimizing mental health and well-being across the lifespan.

Key Words: Mental Health, Exercise Science, Physical Activity, Sports Psychology, Stress Management

Introduction:

Mental health refers to the overall state of a person's emotional, psychological, and social well-being. It determines how individuals think, feel, act, cope with stress, maintain relationships, and make choices. Mental health exists on a spectrum — ranging from a state of well-being to severe mental illness. It includes conditions such as depression, anxiety disorders, bipolar disorder, schizophrenia, post-traumatic stress disorder (PTSD), and obsessive-compulsive disorder (OCD). Mental health is influenced by a combination of biological factors (genetics, brain chemistry), life experiences (trauma, abuse), and family history. Good mental health does not mean the absence of problems, but rather the ability to manage life's challenges effectively.

Exercise Science

Exercise science is an academic and professional discipline that studies the effects of physical activity on the human body and mind. It draws from multiple sciences including anatomy, physiology, biochemistry, nutrition, biomechanics, and psychology. Exercise scientists examine how the body adapts to different types of training such as aerobic exercise, strength training, flexibility, and endurance activities. The field also looks at how exercise can be used to improve health, prevent disease, enhance athletic performance, and support rehabilitation. It applies to a wide range of settings including hospitals, sports teams, fitness centers, and research institutions.
The intersection of these fields highlights how regular physical activity and structured exercise positively impact brain function, mood, cognition, and stress management. Exercise promotes the release of endorphins and neurotransmitters (such as serotonin and dopamine), reduces inflammation, enhances neuroplasticity, improves sleep, boosts self-esteem, and fosters social connections. It serves as an effective non-pharmacological approach for preventing and treating mental health issues, often rivaling therapy or medication for mild to moderate depression, and supports the "exercise as medicine" concept in public health.Key introductory resources include broad exercise science texts with mental health elements, such as ACSM's Introduction to Exercise Science by Jeffrey
(A. Potteige, 2022)

The Exercise-Mental Health Connection:

Exercise positively impacts mental health through both biological and psychological pathways. Biologically, physical activity triggers the release of neurotransmitters like serotonin, dopamine, and endorphins, which improve mood, reduce stress, and create feelings of happiness and satisfaction (Smith & Blumenthal, 2020). It also lowers cortisol, a hormone linked to chronic stress and anxiety. Furthermore, exercise boosts the production of brain-derived neurotrophic factor (BDNF), a protein that promotes the growth of new brain cells and strengthens neural connections, enhancing cognitive abilities like memory and focus (Cotman &Berchtold, 2002).Psychologically, regular exercise builds self-confidence as individuals achieve fitness goals, whether it's running longer distances or lifting heavier weights. It also serves as a distraction from negative or repetitive thoughts, providing mental relief. Additionally, exercise often involves social interaction, like participating in group classes or running clubs, which can foster supportive relationships and reduce feelings of isolation (Craft &Perna, 2004).

Mental Health Challenges and Solutions with Age Group

Mental health challenges vary by developmental stage, with early intervention. Below is a focused overview for under 12 (children), teens (13-19), and above 19 (adults,senior citizens), drawing from recent global and India-specific insights. Each group lists 3 key challenges and 2 practical solution.

Under12

Common issues often emerge from family, school, and early environment factors, with up to 23% of school children in India showing symptoms.

Challenges:Anxiety Disorders — Excessive worry, separation fears, or school-related stress, often triggered by high expectations or family changes (Dr. Kavita Arora).ADHD and Behavioral Issues — Hyperactivity, impulsivity, and defiance, leading to difficulties in learning and social interactions (Jean Piaget).Emotional Problems and Early Depression — Persistent sadness, withdrawal, or low self-esteem linked to neglect, bullying, or trauma (Bessel van der Kolk)

Solutions:Early School-Based Screenings and Interventions Regular checks in schools to identify and address issues promptly, integrated with programs like India's Rashtriya Bal SwasthyaKaryakram (Erik Erikson).Family-Centered Parenting Support Workshops and therapy to foster nurturing environments, reducing home stressors and building emotional resilience (Gabor Maté).

Teenagers (13-19)
This group faces heightened risks from academic pressure, social media, and identity shifts, with depression and anxiety prevalent; globally, 1 in 7 experience a mental disorder.

Challenges: Depression — Deep sadness, loss of interest, and low energy, often from exam stress or social comparison (WHO experts; Singhal M.).

Anxiety Disorders — Constant worry about performance, peers, or future, including social and generalized anxiety (PallabMaulik).

Suicidal Thoughts and Self-Harm — High risk from isolation, bullying, or family issues; a leading cause of death in this age in India (The Lancet contributors).

Solutions:School-Based Life Skills and Mindfulness Programs — Training in stress management, emotional regulation, and healthy coping to build resilience (Mina Fazel).Peer Support and Open Awareness Initiatives — Clubs or apps promoting safe conversations to reduce stigma and encourage help-seeking (Poornima Bhola).

Above19

Young adults often struggle with life transitions, work, and relationships, with anxiety and burnout rising; in India, many cases emerge before age 35.

Challenges: Work Burnout and Chronic Stress — Exhaustion from jobs, long hours, or instability, leading to reduced productivity (K.S. Misra).

Depression and Emotional Strain — Persistent low mood, isolation, or relationship conflicts from financial or modern lifestyle pressures (Aaron T. Beck).

Anxiety and Substance Coping — Excessive worry or reliance on alcohol/drugs as escape, especially in urban professionals (MediBuddy study experts).

Solutions:Telehealth and Workplace Wellness Programs — Accessible apps like e-Manas or employer support for flexible, private care (Samir Parikh).Community and Resilience-Building Groups — Online/local support networks to share experiences and develop coping strategies (Irving Yalom).

Exercise Prescription for Mental Health Optimization

Exercise prescription for mental health follows evidence-based guidelines to maximize psychological benefits. Research recommends 150 minutes of moderate-intensity aerobic exercise weekly—such as brisk walking or cycling—to reduce anxiety and depression while improving mood. Resistance training 2-3 times weekly builds strength and self-efficacy, while yoga and mindfulness practices effectively manage stress.

Individualization is crucial as conditions vary. Someone with depression might start with 10-15 minutes daily, gradually increasing intensity. Exercise provides immediate mood elevation and long-term improvements with consistency.Just like a doctor prescribes medication, a trained professional prescribes a specific type, frequency, intensity, and duration of exercise tailored to an individual's mental health needs and goals. It takes into account a person's current mental health condition, fitness level, and lifestyle to create an exercise plan that reduces symptoms of depression, anxiety, and stress, while enhancing mood, cognitive function, and overall psychological wellness Success requires matching activities to individual preferences and capabilities.

Physical Education as a Mental Health Platform:

Physical education is "an integral part of the total education process and has as its aim the development of physically, mentally, emotionally, and socially fit citizens through the medium of physical activities which have been selected with a view to realizing these outcomes."It serves as a more valuable platform for supporting mental health, particularly among students and adolescents. It provides structured opportunities for physical activity, social interaction, teamwork, stress reduction, and skill-building, all of which contribute to improved emotional regulation, reduced anxiety and depression symptoms, enhanced self-esteem, better mood, and overall psychological well-being.
Research consistently shows that PE classes and related physical activities act as an accessible, school-based intervention to promote mental health by fostering resilience, social support, and positive coping mechanisms.(Mahindru and Varun Agrawal)Explored the broader role of physical activity in mental health and well-being, highlighting benefits like mood enhancement, stress reduction, and improvements in psychiatric conditions.

Role of Sports Psychology:

Sports psychology plays a vital role in optimizing mental health through exercise science. It examines the psychological factors that influence physical activity and how exercise, in turn, enhances mental wellbeing. By understanding this interplay, sports psychologists help individuals harness the mental health benefits of exercise more effectively. According to Weinberg and Gould (2019), sports psychology focuses on motivation, self-efficacy, and emotional regulation, all of which are key to sustaining exercise routines that support mental health.

One major contribution of sports psychology is boosting self-efficacy—the belief in one's ability to succeed. Bandura (1997) emphasizes that building self-confidence through achievable exercise goals translates into improved mental health outcomes. Additionally, techniques like mindfulness and relaxation, often used in sports psychology, amplify the stress-reducing effects of exercise (Craft & Landers, 1998). Exercise also serves as a cognitive distraction, shifting focus away from negative thoughts, which is particularly helpful for individuals dealing with anxiety or depression (Peluso & Andrade, 2005).Social interaction is another critical aspect. Group-based exercise fosters a sense of belonging, which is essential for mental health, as highlighted by Baumeister and Leary (1995). Sports psychologists design interventions that leverage these social benefits, making exercise a more enjoyable and sustainable practice.It bridges the gap between physical performance and mental wellness, promoting a balanced and healthy mindset. By integrating psychological strategies with exercise science, sports psychology enhances the overall impact of physical activity on mental health, promoting holistic wellbeing.

Practical Interventions and applications

It focusses on integrating physical activity with psychological strategies. Structured exercise programs, lik running or cycling, alleviate anxiety and depression by releasing endorphins and reducing cortisol levels (Peluso & Andrade, 2005). These programs are adaptable to individual capacities, ensuring inclusivity and effectiveness.

Goal-setting and self-monitoring are essential in sports psychology. Setting realistic fitness goals and tracking progress fosters self-efficacy, which sustains motivation and builds psychological resilience (Bandura, 1997). Incremental achievements, like improved endurance, instill a sense of accomplishment and encourage consistency.Mindfulness-based practices, such as yoga or tai chi, combine physical movement with relaxation, promoting emotional balance and reducing stress (Craft & Landers, 1998). Group-based exercise programs further enhance mental health by fostering social connections and fulfilling the need for belonging (Baumeister & Leary, 1995).Sports sciences provide a holistic framework for mental health optimization by addressing biological, psychological, and socialdimensions. Through structured exercise, mindfulness, and social interaction, individuals can achieve comprehensive mental wellbeing.

Physical activity offers practical, evidence-based applications for preventing and treating mental health issues like depression and anxiety. Small doses (~75 min moderate/week) reduce depression risk by 18%, while recommended levels (~150 min/week) cut it by 25%, potentially preventing 11.5% of cases (Pearce M et al., 2022, JAMA Psychiatry). For symptom reduction, modes like walking/jogging, yoga, and strength training are highly effective, often rivaling therapy or medication, with larger benefits from higher intensity, group/supervised sessions, and aerobic exercise (Singh B et al., 2023, British Journal of Sports Medicine; Noetel M et al., 2024, The BMJ). Recent meta-meta-analyses confirm medium-to-large reductions in depression and anxiety symptoms across ages and populations (Singh B et al., 2026, British Journal of Sports Medicine). Start low (10–15 min daily walking), prioritize enjoyable activities, and integrate as adjunct or standalone for mild cases—consistency yields robust benefits.

Conclusion

Exercise is a powerful tool for improving mental health that works for people of all ages. When we move our bodies through activities like walking, running, yoga, or playing sports, our brains release chemicals that make us feel happier and less stressed. Regular physical activity helps reduce symptoms of depression and anxiety, improves our confidence, helps us sleep better, and connects us with others. The beauty of exercise as a mental health treatment is that it's natural, affordable, and accessible to almost everyone. Whether it's a child playing in school PE class, a teenager joining a sports team, or an adult taking daily walks, even small amounts of physical activity can make a real difference. The key is finding activities we enjoy and doing them regularly. By understanding the strong connection between our physical and mental health, we can use exercise not just to stay fit, but to feel better emotionally and live happier, more balanced lives. Exercise truly is medicine for both body and mind.

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EXPLORING THE RELATIONSHIP BETWEEN BODY FAT PERCENTAGE AND INSULIN RESISTANCE IN MIDDLE-AGED WOMEN: CORRELATION AND MECHANISTIC INSIGHTS

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Abstract

Excess body fat is a major risk factor for insulin resistance and metabolic issues, particularly in sedentary middle-aged women. This study aimed to explore the connection between body fat percentage and insulin resistance and to clarify the physiological mechanisms linking adiposity to impaired glucose metabolism. Sixty sedentary middle-aged women (n = 60) participated in this cross-sectional study. Body fat percentage was assessed using bioelectrical impedance analysis (BIA). Insulin resistance was estimated through the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR), calculated from fasting glucose and insulin levels. Pearson's correlation analysis was employed to examine the relationship between body fat percentage and HOMA-IR. The results revealed a positive correlation between body fat percentage and insulin resistance, indicating that higher adiposity levels are associated with reduced insulin sensitivity. This relationship may be due to increased levels of free fatty acids and pro-inflammatory adipokines from adipose tissue, which disrupt insulin signalling pathways and glucose uptake in peripheral tissues. These findings underscore the metabolic impact of excess body fat in sedentary women and highlight the need for strategies to reduce adiposity to enhance insulin sensitivity and prevent metabolic syndrome.

Keywords: Body fat percentage, insulin resistance, HOMA-IR, sedentary women, adiposity, metabolic risk

Introduction

Body fat percentage plays a critical role in metabolic health, particularly influencing insulin resistance, a key factor in the pathogenesis of type 2 diabetes and cardiometabolic disorders. In middle-aged women, fluctuations in body composition, including increased adiposity, are common and significantly impact insulin sensitivity. Insulin resistance is strongly associated with measures of adiposity such as body mass index, waist circumference, and fat mass distribution; however, its relationship with body fat percentage offers a more precise understanding of metabolic risk (Jeong et al., 2023). Visceral fat accumulation, a component of body fat percentage, has been shown to correlate closely with insulin resistance and metabolic syndrome, independent of overall obesity status, underscoring the importance of fat distribution in metabolic dysfunction (Mongraw- Chaffin et al., 2021).

The underlying mechanisms connecting body fat percentage and insulin resistance in middle-aged women involve complex biological processes including chronic low-grade inflammation, hormonal changes, and adipose tissue dysfunction. For instance, insulin resistance has been linked with inflammatory cytokines and hormonal imbalances that often accompany increased visceral adiposity (De Melo Cavalcante et al., 2024). Moreover, body fat, beyond mere quantity, influences insulin sensitivity through alterations in fat-free mass and muscle composition, which are also crucial modulators of metabolic health (Oliver et al., 2025). The interplay between body fat and insulin resistance in middle-aged women is further complicated by sex-specific differences in adipose tissue metabolism and endocrine function, necessitating a focused exploration of this demographic (Calcaterra et al., 2021).

This investigation into body fat percentage and insulin resistance among middle-aged women aims to elucidate their correlation and dissect the mechanistic pathways that contribute to metabolic impairment. Understanding these interrelations is vital for developing targeted interventions to mitigate the risk of diabetes and related metabolic disorders in this vulnerable population.

Methodology

Participants

A total of sixty sedentary middle-aged women (n = 60) participated in the study. The participants were selected using a convenience sampling technique. All subjects met the criteria of being sedentary, defined as engaging in less than 100 minutes of structured physical activity per week. Prior to participation, all subjects were informed about the purpose and procedures of the study, and informed consent was obtained.

Measurement of Variables

Body Fat Percentage

Body fat percentage was assessed using Bioelectrical Impedance Analysis (BIA). This non-invasive method estimates body composition by measuring the resistance of body tissues to a low electrical current. BIA is widely used for assessing body fat in physiological and metabolic studies due to its practicality and reliability.

Insulin Resistance

Insulin resistance was estimated using the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR). Fasting blood samples were collected from the participants to determine fasting glucose and fasting insulin levels. The HOMA-IR index was calculated using the following formula:
This index provides an indirect measure of insulin sensitivity and is widely used in metabolic research.

HOMA-IR = (Fasting Insulin x Fasting Glucose) / 405

Data Collection Procedure

The study was conducted following ethical standards and guidelines to ensure the safety and rights of all participants. Ethical approval was obtained from the Institutional Ethics Committee, with the ethical certificate number IEC/LNIPE/54, confirming that the research protocol adhered to established ethical principles for human subject research. Participants provided informed consent prior to inclusion in the study, and all procedures were designed to maintain confidentiality and minimize any potential risks.

All measurements were conducted under standardized conditions. Participants reported to the testing facility in the morning following an overnight fast. Body composition measurements were first recorded using the Bio Scan 916 bioelectrical impedance device. Subsequently, fasting blood samples were collected by Thyrocar lab, Gwalior phlebotomist to determine fasting glucose and insulin concentrations by The obtained values were used to calculate the HOMA-IR index.

Statistical Analysis

Statistics, including mean and standard deviation, were computed for body fat percentage and insulin resistance. To examine the relationship between body fat percentage and insulin resistance, Pearson's product-moment correlation coefficient was applied. Statistical analysis was performed using SPSS software, and the level of significance was set at $p < 0.05$.

Statistical analysis –

Table -1 Descriptive Statistics

	Mean	Std. Deviation	N
Fat Percentage	31.4867	3.25777	60
Insulin Resistance	2.3548	.70616	60

In a give table -1 Shows that Fat Percentage has a mean value of 31.49 with a standard deviation of 3.26, based on a sample size of 60. And Insulin Resistance shows a mean of 2.35 and a standard deviation of 0.71, also with a sample size of 60.

Table No.2 Correlation between Fat percentage and Insulin Resistance

		Insulin Resistance
Fat Percentage	Pearson Correlation	.567**
	Sig. (2-tailed)	.000
	N	60

Table No. – 2 Indicates that the correlation analysis between Fat Percentage and Insulin Resistance reveals a Pearson correlation coefficient of 0.567, which is statistically significant at the 0.01 level (2-tailed). This indicates a moderate positive relationship between body fat percentage and insulin resistance among the sample of 60 middle-aged women.

Discussion of Findings

Excess body fat leads to elevated levels of free fatty acids (FFAs) in circulation, predominantly due to the increased lipolytic activity of enlarged visceral adipose tissue. High FFAs impair insulin signaling in target organs such as the liver, skeletal muscle, and adipose tissue by promoting ectopic fat deposition and interfering with insulin receptor substrate (IRS) function. This disruption hinders the insulin signaling cascade, leading to the diminished ability of cells to uptake and utilize glucose effectively. (Arneth, 2024)

Adipose tissue is also an active endocrine organ that secretes adipokines, including leptin, adiponectin, resistin, and various proinflammatory cytokines like tumor necrosis factor-alpha (TNF-α) and interleukin-6 (IL-6). Excess body fat causes an imbalance favoring the secretion of proinflammatory adipokines, which induce chronic low-grade systemic inflammation. This inflammatory state promotes insulin resistance by triggering serine phosphorylation of IRS proteins via activated stress kinases such as JNK and IKKβ, thereby impairing insulin receptor function and downstream signaling. (Jiang et al., 2022)

Furthermore, increased adiposity leads to ectopic fat accumulation in non-adipose tissues such as the liver, muscle, and pancreas. For example, hepatic fat infiltration results in non-alcoholic fatty liver disease (NAFLD), which is strongly associated with insulin resistance. Fat accumulation within muscle also disrupts normal metabolic processes, further exacerbating insulin insensitivity. (Luo et al., 2024)

Recent studies highlight additional contributors such as gut microbiota dysbiosis linked to increased body fat. Alterations in gut microbiota composition may enhance systemic inflammation and impair metabolic regulation by increasing gut permeability and altering metabolite profiles, indirectly worsening insulin resistance.
Hormonal effects are also implicated; elevated leptin levels in obesity may lead to leptin resistance, which disrupts appetite regulation and energy expenditure, compounding metabolic derangements and insulin resistance. (Mongraw- Chaffin et al., 2021)

In summary, the positive correlation between body fat percentage and insulin resistance in middle-aged women is driven by multifaceted mechanisms involving increased free fatty acids, proinflammatory adipokine secretion, chronic inflammation, ectopic fat deposition, molecular signaling disruptions, gut microbial alterations, and hormonal imbalances. These interconnected pathways collectively impair insulin action and glucose metabolism, underscoring the importance of managing body fat to mitigate insulin resistance and associated metabolic disorders (Zhao et al., 2025).

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GENDER DIFFERENCES IN ANXIETY LEVELS USING THE SPORT ANXIETY SCALE-2 (SAS-2) AMONG BADMINTON PLAYERS OF LNIPE: A CROSS-SECTIONAL DESCRIPTIVE STUDY

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Abstract

Badminton is a high-speed, precision-driven sport where even minor psychological fluctuations can influence performance outcomes. Competitive anxiety, comprising both cognitive and physiological components, and plays an important role in determining Performance. The present study explored gender differences in sports anxiety among badminton players using the Sport Anxiety Scale-2 (SAS-2) (Smith et al., 2006). The findings proved a statistically significant gender difference in somatic anxiety, with female players reporting higher levels of physiological symptoms such as nervousness and bodily tension. However, no significant differences were observed in the dimensions of worry and concentration disruption. These results suggest that gender variations in badminton-related anxiety are more evident in physiological responses than cognitive concerns. The study underscores the need for gender-sensitive psychological interventions aimed at regulating arousal levels to enhance performance consistency and competitive resilience.

Methodology:

The sample consisted of 30 badminton players (15 males and 15 females) aged between 18 -25 years, selected from the Lakshmibai National Institute of Physical Education. The SAS-2 was used to assess three dimensions of Sports anxiety: Somatic anxiety, Worry, and Concentration disruption. (Smith et al., 2006) (Martens et al., 1990)

Statistical Technique: Descriptive statistics (mean and standard deviation) were calculated to summarize the data, and an independent samples *t*-test ($\alpha<0.05$) was applied to determine gender differences and analyze data with the help of SPSS.

Introduction

Anxiety is one of the most extensively studied psychological constructs in sport and exercise psychology due to its significant influence on athletic performance. In competitive environments, athletes often experience heightened levels of cognitive and somatic arousal that may either facilitate or debilitate performance outcomes. According to Martens and colleagues (1990), competitive anxiety in two main forms: mental concerns and physical reactions . (Martens et al., 1990).

In sport-specific contexts, anxiety is conceptualized as a relatively stable tendency to perceive competitive situations as threatening and to respond with elevated state anxiety (Martens et al., 1990). To measure this construct, Smith et al. (2006) developed the Sport Anxiety Scale-2 (SAS-2), a multidimensional instrument assessing three domains: Somatic Anxiety, Worry, and Concentration Disruption. The SAS-2 has demonstrated strong psychometric properties, including internal consistency and construct validity, and is widely used in competitive sport research (Smith et al., 2006).

Badminton is a high-intensity, precision-based racket sport requiring rapid decision-making, sustained concentration, and fine motor coordination. Given the fast pace of rallies and the psychological pressure of individual match play, athletes in badminton are particularly susceptible to performance-related anxiety. Even minor fluctuations in attention or physiological arousal can significantly affect shot accuracy and tactical execution (Jones, 1995).

Gender differences in anxiety have been consistently reported in psychological literature. Research suggests that female athletes tend to report higher levels of cognitive anxiety, particularly in the domain of worry, compared to male athletes (Jones et al., 1991). Socialization patterns, performance expectations, and coping mechanisms have

been proposed as contributing factors to these observed differences (Jones et al., 1991). However, findings are not always consistent across sports and competitive levels, highlighting the need for sport-specific investigation.

Despite the growing body of literature on competitive anxiety, limited research has specifically examined gender differences among badminton players using standardized multidimensional tools such as the SAS-2 (Smith et al., 2006). Understanding these differences is crucial for developing targeted psychological interventions aimed at optimizing performance and promoting mental well-being in athletes.

Therefore, the present study aims to examine gender differences in sports anxiety levels among badminton players using the Sport Anxiety Scale-2 within a cross-sectional descriptive framework.

Methodology

Research Design:

The present study employed a **cross-sectional descriptive research design** to examine gender differences in sports anxiety among badminton players. The design was non-experimental, as no intervention or manipulation of variables was involved. Data were collected at a single point in time using the Sport Anxiety Scale-2 (SAS-2) to assess anxiety levels. Gender served as the independent variable, while somatic anxiety, worry, and concentration disruption were treated as dependent variables. This design enabled comparison between male and female athletes and provided a systematic understanding of psychological differences within a competitive badminton context.

Participants:

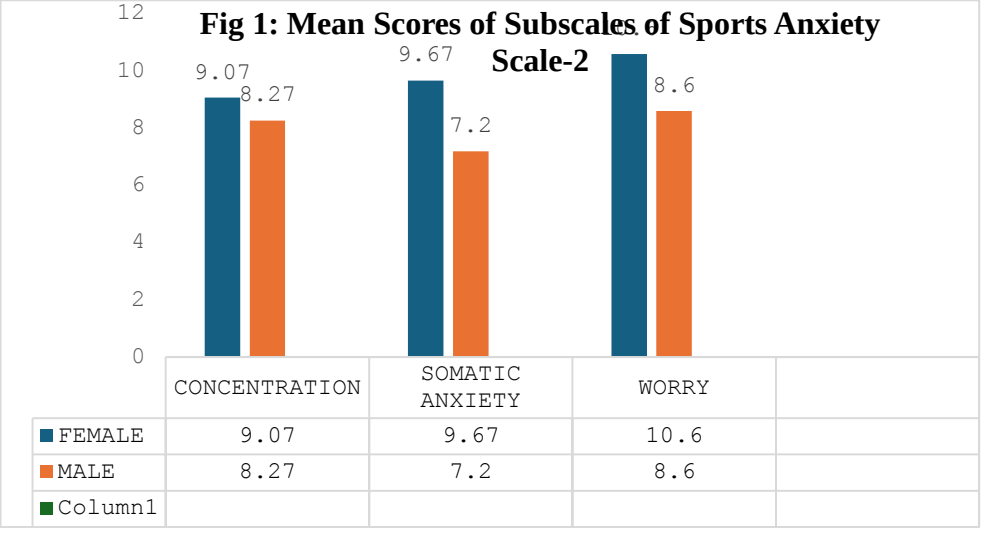
The sample consisted of male and female badminton players. Participants were selected through purposive sampling. All participants were actively competing at National /state level.

Tool Used:

Sports anxiety was measured using the **Sports Anxiety Scale-2 (SAS-2)** developed by Smith et al. (2006). The SAS-2 includes 15 statements divided into three subscales: Somatic Anxiety, Worry, Concentration Disruption Each item is rated on a 4-point Likert scale (1 = Not at all to 4 = Very much). Higher scores indicate higher anxiety.

Statistical Tools: To analyse the collected data, descriptive statistics (mean and standard deviation) were computed. An independent samples *t*-test was employed to examine gender differences in sports anxiety and its sub-dimensions at the 0.05 level of significance.

Result:
The collected data were analysed using descriptive statistics and an independent samples t-test to examine gender differences in sports anxiety among badminton players. The findings derived from these statistical procedures are presented in the tables below, highlighting variations in mean scores and the significance of observed differences.



	CONCENTRATION	SOMATIC ANXIETY	WORRY	
FEMALE	9.07	9.67	10.6	
MALE	8.27	7.2	8.6	
Column1				

Independent Samples Test			
SUBSCALES OF SAS-2	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
Concentration	-0.911	28	0.370
somatic	-2.794	20.955	0.011
worry	-1.898	28	0.068

Independent-samples t-test was conducted to examine differences between male and female on concentration, somatic anxiety, and worry. Prior to analysis, Levene's Test for Equality of Variances was performed to assess the assumption of homogeneity of variances.

1. There was no significant difference in **Concentration** scores between Female (M = 9.07, SD = 2.520) and Male [M = 8.27, SD = 2.282; *t* (28) = 0.911, *p* = .370].

Descriptive Statistics on Anxiety In Anxiety Levels of male and female badminton players					
	Gender	N	Mean	Std. Deviation	Std. Error mean
Concentration disruption	Female	15	9.07	2.520	.651
	Male	15	8.27	2.282	.589
Somatic anxiety	Female	15	9.67	3.039	.785
	Male	15	7.20	1.568	.405
Worry	Female	15	10.60	3.334	.861
	Male	15	8.60	2.354	.608

2. There was a significant difference in **Somatic Anxiety** scores between Female (M = 9.67, SD =3.039) and Male [M = 7.20, SD = 1.568; *t*(20.955) = 2.794, *p* = .011].
3. There was no significant difference in **Worry** scores between Female (M = 10.60, SD = 3.334) and Male [M = 8.60, SD = 2.354; *t*(28) = 1.898, *p* = .068].

Independent Samples Test

		Levene's Test for Equality of Variances		*t-test for Equality of Means*						
		F	*Sig.*	*t*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*	*95% Confidence Interval of the Difference*	
									Lower	*Upper*
concentration	Equal variances assumed	.251	.621	-.911	28	.370	-.800	.878	-2.598	.998
	Equal variances not assumed			-.911	27.729	.370	-.800	.878	-2.599	.999

somatic	Equal variances assumed	10.204	.003	-2.794	28	.009	-2.467	.883	-4.275	-.658
	Equal variances not assumed			-2.794	20.955	.011	-2.467	.883	-4.303	-.630
worry	Equal variances assumed	2.923	.098	-1.898	28	.068	-2.000	1.054	-4.159	.159
	Equal variances not assumed			-1.898	25.183	.069	-2.000	1.054	-4.170	.170

An independent samples t-test was conducted to examine gender differences in sports anxiety among badminton players using the **Sports Anxiety Scale-2**.

The results indicated that a statistically significant gender difference was found only in the dimension of **Somatic Anxiety**. Female badminton players reported significantly higher somatic anxiety compared to male players, $t(20.955) = 2.794$, $p = .011$. This suggests that female athletes experience greater physiological symptoms of anxiety, such as nervousness, muscle tension, and bodily discomfort during competition.

However, no statistically significant gender differences were observed in **Concentration Disruption**, $t(28) = 0.911$, $p = .370$, or **Worry**, $t(28) = 1.898$, $p = .068$. Although females demonstrated slightly higher mean scores in these dimensions, the differences were not statistically significant. The worry dimension showed a trend toward significance, indicating a possible tendency for females to experience greater cognitive anxiety, though this was not strong enough to reach the conventional 0.05 level.

Discussion on Findings:

The study investigated gender differences in sports anxiety among badminton players using the Sports Anxiety Scale-2 (SAS-2) Smith et al. (2006). The results indicated that a statistically significant gender difference was found only in the somatic anxiety dimension, while no significant differences were observed in the dimensions of worry and concentration disruption.

The significant difference in somatic anxiety, with female players scoring higher than male players, indicates that female badminton athletes may experience stronger physiological responses to competitive stress. Somatic anxiety includes physical symptoms such as increased heart rate, muscle tightness, sweating, and feelings of nervousness before or during competition. This finding is consistent with previous research in sport psychology, which suggests that female athletes often report higher levels of physiological arousal in competitive situations. Factors such as social expectations, emotional expression patterns, and differences in coping strategies may contribute to this observed variation.

On the other hand, no statistically significant gender differences were found in the cognitive components of anxiety—namely worry and concentration disruption—although female players showed slightly higher mean scores. The absence of significant differences in worry suggests that both male and female badminton players may experience similar levels of concern regarding performance outcomes. Likewise, the non-significant difference in concentration disruption implies that attentional focus during competition may not differ substantially based on gender in this sporting context.
The worry dimension approached statistical significance ($p = .068$), indicating a possible tendency toward higher cognitive anxiety among female players. Although this value did not meet the conventional significance threshold of 0.05, it suggests that a larger sample size might reveal a meaningful difference.

Overall, the findings highlight that gender differences in sports anxiety among badminton players are more evident in physiological reactions rather than in cognitive or attentional aspects. Considering that badminton is a high-speed, precision-oriented sport requiring rapid decision-making and sustained concentration, elevated somatic anxiety could potentially affect performance consistency. Therefore, incorporating psychological interventions such as

relaxation training, breathing exercises, and arousal regulation techniques may be particularly beneficial, especially for female athletes.
Future studies should include larger and more diverse samples, examine actual performance outcomes, and explore additional moderating factors such as competitive level and years of training. Such research would provide deeper insight into the mechanisms underlying gender differences in sport-specific anxiety.

Conclusion:

The present study investigated gender differences in sports anxiety among badminton players using the Sports Anxiety Scale-2 (SAS-2). The findings revealed a significant gender difference only in the somatic anxiety dimension, with female players reporting higher levels of physiological symptoms of competitive stress. However, no significant differences were observed in the dimensions of worry and concentration disruption.

These results suggest that gender differences in sports anxiety are more prominent in physical responses rather than cognitive or attentional aspects. The study highlights the importance of psychological skills training, particularly relaxation and arousal regulation techniques, to help athletes manage somatic anxiety effectively. Further research with larger samples is recommended to strengthen and expand these findings.

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BIOMECHANICAL EFFECTS OF YOGA PRACTICE ON JOINT MOBILITY, STABILITY, AND MOVEMENT EFFICIENCY IN ATHLETES

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Abstract:

Background: Yoga-based training is increasingly recognized as a complementary approach for enhancing athletic performance. However, its biomechanical effects on joint mobility, postural stability, and movement efficiency in trained female athletes remain insufficiently explored.

Purpose: This study aimed to examine the biomechanical effects of a structured yoga intervention on joint range of motion, postural stability, and movement efficiency in female athletes.

Methods: Fifteen (n = 15) female athletes aged 18–23 years, actively involved in regular training and competition at Laxmibai National Institute of Physical Education, participated in this pre–post experimental study. Joint mobility of the hip, shoulder, and ankle was measured using a digital goniometer. Postural stability was assessed using force plate–derived centre of pressure (COP) displacement during a single-leg stance task. Movement efficiency was evaluated using surface electromyography (EMG) during a single-leg squat, with EMG recorded from the rectus femoris, gluteus medius, biceps femoris, and erector spinae muscles. Paired t-tests were used for statistical analysis ($p < 0.05$).

Results: Significant improvements were observed in hip, shoulder, and ankle range of motion ($p < 0.001$). COP displacement during single-leg stance significantly decreased following the intervention, indicating improved postural stability ($p < 0.001$). Movement efficiency improved, as demonstrated by significant reductions in EMG activity across all measured muscles ($p < 0.001$).

Conclusion: Structured yoga practice significantly enhances joint mobility, neuromuscular stability, and movement efficiency in female athletes, supporting its integration into athletic training programs to improve biomechanical performance.

Keywords: Yoga, Biomechanics, Joint Mobility, Postural Stability, Movement Efficiency, Female Athletes

Introduction:

Yoga is an ancient discipline rooted in holistic well-being and has increasingly gained recognition within sports science as a valuable physical, mental, and rehabilitative practice (Reginald & Kavitha, 2025). Traditionally, yoga originated as an Indian mind–body system aimed at enhancing mental clarity, spiritual awareness, and physical health through the integration of pranayama, asanas, and meditation (Basu, 2024). Over time, yoga has evolved into multiple contemporary forms that emphasize physical conditioning, flexibility development, and neuromuscular regulation. Recent evidence suggests that yoga should not be viewed merely as a relaxation technique but rather as a structured training modality capable of producing measurable physiological and biomechanical adaptations (Woodyard, 2011). Unlike conventional static stretching, yoga involves posture alignment, controlled eccentric muscle actions, multi-planar joint movements, and sustained isometric holds, all of which influence muscle strength, connective tissue behavior, joint function, and sensorimotor integration. Consequently, yoga is increasingly recognized in sports science as an effective supplementary training approach for optimizing movement performance (Ross & Thomas, 2010).

Biomechanical principles form the foundation of sports performance by explaining how the human body generates, transfers, and absorbs forces during movement. Biomechanics examines joint kinematics, kinetics, and

neuromuscular coordination, focusing on the interaction between internal muscular forces and external influences such as gravity and ground reaction forces (Peter M. McGinnis, 2013). Efficient movement depends on an integrated kinetic chain characterized by adequate mobility, joint stability, and synchronized muscle activation. During dynamic athletic tasks such as sprinting, jumping, cutting, and throwing, energy must be transmitted smoothly from proximal to distal segments. Any limitation in mobility or deficit in stability can disrupt this energy flow, resulting in compensatory movement patterns and increased mechanical stress on tissues (Press et al., 2006). Therefore, training interventions that simultaneously enhance mobility, stability, and neuromuscular control are essential for improving performance and reducing injury risk.

The mobility–stability continuum explains the functional roles of different joints within the kinetic chain. Joints such as the hips and shoulders are primarily designed for mobility, whereas the knees and lumbar spine require greater stability to ensure efficient and safe movement (Cook & Gray, 2010). When this balance is disturbed—such as restricted hip mobility or inadequate lumbopelvic stability—compensatory mechanisms may develop, leading to decreased movement efficiency and heightened injury susceptibility. Traditional resistance training primarily enhances muscular strength and hypertrophy but may not adequately address joint mobility or proprioceptive control. Conversely, isolated stretching improves passive flexibility without ensuring dynamic joint control. Yoga uniquely addresses multiple components of the mobility–stability continuum by integrating flexibility training, isometric stabilization, and balance-based challenges within functional movement patterns.

Joint mobility refers to the capacity of a joint to move freely through its full range of motion. Adequate mobility supports proper technique, force generation, and movement efficiency, whereas restricted mobility can negatively affect stride length, throwing velocity, and landing mechanics. Research has shown that yoga significantly improves flexibility and mobility in key regions such as the spine, hips, hamstrings, and shoulders (Polsgrove et al., 2016). These improvements are attributed to increased stretch tolerance, enhanced muscle–tendon compliance, and favorable adaptations in connective tissue properties. Emerging elastography studies also indicate that long-term yoga practice may alter muscle stiffness, particularly in muscles such as the hamstrings and trapezius, potentially enhancing force transmission efficiency (Liu & Yang, 2025). However, excessive flexibility without adequate neuromuscular control may compromise joint stability.

Joint stability relies on the integration of proprioceptive input, coordinated muscular activation, and passive structural support from ligaments and joint capsules. Proprioception, defined as the awareness of joint position and movement, plays a crucial role in preventing injuries, particularly at the knee and ankle (Scott, 2020). Yoga enhances proprioceptive acuity through balance postures, unilateral stance positions, and controlled movement transitions, thereby improving neuromuscular coordination. Previous studies have reported improvements in functional mobility and balance among athletes following yoga-based training interventions (Punam & Patel, 2025).

Movement economy refers to the ability to perform physical tasks using minimal energy expenditure while maintaining optimal biomechanics. It is influenced by efficient joint mechanics, coordinated muscle activity, and effective utilization of elastic energy (Dos'Santos et al., 2019). The emphasis on controlled breathing, postural alignment, and deliberate movement execution in yoga may reduce unnecessary muscular tension and improve movement efficiency. Neuromuscular training has been shown to enhance coordination and reduce mechanical inefficiency (David G. Behm et al., 2021), and emerging evidence suggests that yoga may influence muscle stiffness and elastic recoil properties (Liu & Yang, 2026). Although sport-specific biomechanical research remains limited, yoga appears to contribute positively to musculoskeletal resilience and efficient movement patterns.

Despite growing interest, research examining the direct biomechanical effects of yoga remains limited. Most existing studies have focused on psychological outcomes, balance, or general flexibility rather than detailed biomechanical variables. Only a small number of investigations have evaluated yoga's influence on muscle–tendon behavior, electromyographic activity, joint kinematics, and kinetic loading in athletic populations. Furthermore, variations in yoga styles, intervention durations, and outcome measures have produced inconsistent findings, limiting definitive conclusions (David G. Behm et al., 2021). As a result, comprehensive investigations that simultaneously assess joint mobility, dynamic stability, and movement efficiency within an integrated biomechanical framework are still needed. The present study aims to systematically examine the effects of yoga on athletes' mobility, stability, and movement efficiency by analyzing changes in range of motion, neuromuscular activation, and kinetic chain coordination.

Sports-related injuries remain a major concern in both amateur and professional athletics, as they lead to prolonged recovery periods, performance decline, and long-term musculoskeletal complications (Reginald & Kavitha, 2025).

Methods:

Participants

Fifteen (n = 15) female athletes voluntarily participated in this study. The participants were aged between 18 and 23 years and were actively involved in regular athletic training and match practice at Lakshmibai National Institute of Physical Education. All participants had a minimum of two years of competitive sports experience and were free from musculoskeletal injuries for at least six months prior to data collection.

Participants were informed about the purpose, procedures, and potential risks of the study, and written informed consent was obtained before participation. The study protocol conformed to ethical standards for human research.

Study Design

A pre–post experimental design was employed to evaluate the biomechanical effects of a structured yoga intervention on joint mobility, joint stability, and movement efficiency. Baseline measurements were recorded prior to the intervention, and post-intervention assessments were conducted under identical testing conditions following completion of the yoga training program.

Yoga Intervention

The yoga intervention consisted of a structured six-week yoga training program designed to enhance flexibility, balance, and neuromuscular control in athletes. The training was conducted at the Yoga Hall of Lakshmibai National Institute of Physical Education under controlled and supervised conditions.

Participants completed five yoga sessions per week, with each session lasting approximately 45–60 minutes. The yoga protocol included a systematic sequence of selected asanas, balance-oriented postures, and controlled breathing techniques (pranayama). Emphasis was placed on maintaining proper body alignment, controlled movement execution, and sustained postural holds to promote joint range of motion, postural stability, and coordinated muscular activation.

The asanas were selected to specifically target the hip, shoulder, ankle, and trunk regions, which are critical for athletic movement patterns. Balance postures were incorporated to challenge proprioception and postural control, while breathing techniques were used to facilitate neuromuscular relaxation and movement awareness. The intensity and complexity of the yoga practices were progressively increased over the six-week period to ensure continuous neuromuscular adaptation.

Overall, the yoga training program was structured to complement the athletes' regular training schedules and to enhance biomechanical efficiency and movement quality relevant to athletic performance.

Data Collection Setting

All biomechanical data were collected at the Biomechanics Laboratory of Lakshmibai National Institute of Physical Education, which is equipped with standardized motion analysis and neuromuscular assessment instruments. Data collection was conducted by trained personnel following standardized testing procedures to ensure reliability and consistency.

Measurement Procedures

Joint Mobility

3Joint range of motion (ROM) for the hip, shoulder, and ankle joints was assessed using a digital goniometer. Measurements were taken for the dominant side following standardized anatomical landmarks. Each movement was measured twice, and the mean value was used for statistical analysis.

Joint Stability

Joint stability was assessed using force plate analysis during static and dynamic balance tasks. Participants performed single-leg stance trials, and center of pressure (COP) displacement variables were recorded. Reduced COP excursion was interpreted as improved postural stability and neuromuscular control.

Movement Efficiency

Movement efficiency was evaluated using surface electromyography (EMG) during a single-leg squat task. EMG signals were recorded from the rectus femoris, gluteus medius, biceps femoris, and erector spinae muscles of the dominant limb. EMG data were normalized to maximum voluntary contraction (MVC) and expressed as root mean square (RMS) values (%MVC). Lower post-intervention EMG amplitudes were interpreted as improved neuromuscular efficiency and reduced compensatory muscle activation.

Statistical Analysis

Descriptive statistics (mean ± standard deviation) were calculated for all variables. The Shapiro–Wilk test was applied to assess data normality. Differences between pre- and post-intervention values were analyzed using the paired t-test. Statistical significance was set at $p < 0.05$. All analyses were performed using standard statistical software.

Results:

Table 1. Paired t-Test Comparison of Joint Range of Motion:

Joint	Pre (Mean ± SD)	Post (Mean ± SD)	t	df	p
Hip	120.13 ± 3.16	130.27 ± 3.20	63.69	14	< .001
Shoulder	167.00 ± 3.11	180.20 ± 3.26	110.56	14	< .001
Ankle	54.27 ± 2.76	62.27 ± 2.76	51.62	14	< .001

Table 1. Presents the results of the paired t-test analysis comparing joint range of motion (ROM) of the hip, shoulder, and ankle joints before and after the yoga intervention. The results indicate statistically significant improvements in ROM across all measured joints following the intervention.

For the hip joint, mean ROM increased from 120.13 ± 3.16° in the pre-test to 130.27 ± 3.20° in the post-test. This increase was statistically significant ($t = 63.69$, $df = 14$, $p < .001$), demonstrating a substantial improvement in hip mobility after yoga practice.

Similarly, the shoulder joint exhibited a marked improvement in ROM, increasing from 167.00 ± 3.11° at baseline to 180.20 ± 3.26° post-intervention. The paired t-test revealed a highly significant difference ($t = 110.56$, $df = 14$, $p < .001$), indicating enhanced shoulder flexibility and functional range of motion.

The ankle joint also showed a significant increase in ROM, with mean values rising from 54.27 ± 2.76° in the pre-test to 62.27 ± 2.76° in the post-test. Although the exact t-value is 51.62, the statistical analysis confirmed that the improvement was significant ($df = 14$, $p < .001$).

Overall, the findings from this table demonstrate that the yoga intervention resulted in significant improvements in joint mobility across all assessed joints, supporting the effectiveness of yoga practice in enhancing flexibility and functional movement capacity in athletes.

Joint Stability:

Table 2. Paired t-Test Comparison of Joint Stability (Center of Pressure Displacement) Single-Leg Stance:

Variable	Pre-Test Mean ± SD (cm)	Post-Test Mean ± SD (cm)	Mean Difference	t-value	p-value
COP Displacement	3.99 ± 0.25	3.16 ± 0.23	0.83	21.37	< 0.001*

Table 2. Presents the results of the paired t-test analysis comparing center of pressure (COP) displacement during a single-leg stance before and after the yoga intervention. COP displacement was used as an indicator of joint stability and postural control, with lower values reflecting improved stability.

The results demonstrate a significant reduction in COP displacement following the intervention. The pre-test mean COP displacement was 3.99 ± 0.25 cm, which decreased to 3.16 ± 0.23 cm in the post-test. The mean difference between pre- and post-test values was 0.83 cm, indicating a substantial improvement in balance control.
The paired t-test revealed that this reduction in COP displacement was statistically significant ($t = 21.37$, $p < 0.001$). This finding suggests that the yoga intervention effectively enhanced postural stability and neuromuscular control during single-leg stance tasks.

Overall, the results indicate that yoga practice significantly improves joint stability by reducing postural sway and enhancing balance performance in athletes.

Movement Efficiency:

Table 3. Paired t-Test Results for Movement Efficiency:

Muscle	Pre-Yoga Mean (%MVC)	Post-Yoga Mean (%MVC)	t-value	p-value
Rectus Femoris	62.3 ± 2.8	54.2 ± 2.4	64.01	< 0.001
Gluteus Medius	48.9 ± 2.1	42.6 ± 1.9	95.32	< 0.001
Biceps Femoris	45.4 ± 2.0	39.4 ± 1.8	84.02	< 0.001
Erector Spinae	37.7 ± 1.9	31.9 ± 1.7	87.80	< 0.001

Table 3. Presents the results of the paired t-test analysis comparing muscle activation levels before and after the yoga intervention, as assessed through surface electromyography (EMG) during a single-leg squat task. Movement efficiency was evaluated using normalized EMG amplitude expressed as a percentage of maximum voluntary contraction (%MVC), where lower post-intervention values indicate improved neuromuscular efficiency.

The rectus femoris demonstrated a significant reduction in EMG activity from 62.3 ± 2.8 %MVC in the pre-test to 54.2 ± 2.4 %MVC in the post-test. This reduction was statistically significant ($t = 64.01$, $p < 0.001$), suggesting decreased compensatory knee extensor activity and improved movement control.

Similarly, the gluteus medius, a key stabilizer of the hip and pelvis, showed a significant decrease in EMG activation from 48.9 ± 2.1 %MVC to 42.6 ± 1.9 %MVC following the intervention ($t = 95.32$, $p < 0.001$). This finding indicates enhanced efficiency in hip stabilization during the movement task.

The biceps femoris also exhibited a significant reduction in activation, with mean EMG values decreasing from 45.4 ± 2.0 %MVC to 39.4 ± 1.8 %MVC ($t = 84.02$, $p < 0.001$). This suggests improved posterior chain coordination and reduced unnecessary muscular effort.

Finally, the erector spinae muscle showed a significant decrease in EMG activity from 37.7 ± 1.9 %MVC to 31.9 ± 1.7 %MVC after the yoga intervention ($t = 87.80$, $p < 0.001$), indicating improved trunk control and reduced compensatory spinal muscle activation.

Overall, the results demonstrate that yoga practice significantly enhanced movement efficiency by reducing neuromuscular demand across all measured muscles, reflecting improved intersegmental coordination and optimized motor control in athletes.

Discussion:

The present study investigated the biomechanical effects of a structured yoga intervention on joint mobility, joint stability, and movement efficiency in female athletes aged 18–21 years. The findings demonstrated significant improvements across all measured variables, supporting the effectiveness of yoga as a complementary training modality for enhancing biomechanical performance in athletes.

Joint Mobility:

The results revealed statistically significant increases in joint range of motion at the hip, shoulder, and ankle joints following the yoga intervention. The most pronounced improvements were observed in the shoulder and hip joints,

which are critical for athletic movements involving large ranges of motion and multi-planar control. These improvements can be attributed to the emphasis of yoga practice on sustained stretching, controlled joint positioning, and active end-range movements, which collectively enhance muscle–tendon extensibility and joint capsule flexibility.

Enhanced joint mobility is particularly important for athletes, as insufficient range of motion has been associated with altered movement mechanics and increased injury risk. The significant improvements observed in the present study suggest that yoga-based training can effectively address flexibility limitations while maintaining functional control, thereby supporting both performance enhancement and injury prevention.

Joint Stability:

Joint stability, assessed through center of pressure (COP) displacement during single-leg stance, showed a significant reduction in post-intervention values. Reduced COP displacement indicates improved postural control, balance, and neuromuscular regulation. These findings suggest that yoga practice enhanced the athletes' ability to maintain joint alignment and control under static balance conditions.

Yoga postures often require sustained single-leg support, controlled transitions, and precise body alignment, which challenge the neuromuscular system and improve proprioceptive awareness. The observed improvements in joint stability may therefore be attributed to enhanced sensory–motor integration and improved activation of stabilizing musculature. Improved joint stability is particularly relevant for athletic performance, as it contributes to efficient force transfer and reduced risk of non-contact injuries during dynamic sporting actions.

Movement Efficiency:

Movement efficiency, evaluated using surface electromyography (EMG), demonstrated significant reductions in muscle activation levels across all monitored muscles, including the rectus femoris, gluteus medius, biceps femoris, and erector spinae during the single-leg squat task. Reduced EMG amplitude following the yoga intervention indicates improved neuromuscular efficiency, as less muscular effort was required to perform the same movement task.

These findings suggest that yoga practice facilitated better intersegmental coordination and reduced compensatory muscle recruitment. Improved efficiency likely reflects enhanced motor control strategies, optimized muscle synergies, and improved trunk–pelvis–lower limb coordination. Such adaptations are crucial for athletic performance, as efficient movement patterns reduce unnecessary energy expenditure and mechanical stress on joints.

Practical Implications:

The results of this study have important practical implications for athletic training programs. Integrating yoga into regular training routines may help athletes improve flexibility, balance, and neuromuscular efficiency without imposing excessive physical load. Given the significant improvements observed across multiple biomechanical domains, yoga can be considered a valuable adjunct to conventional strength and conditioning programs, particularly for female athletes.

Conclusion:

Based on the findings of the present study, it can be concluded that structured yoga practice significantly improves joint mobility, joint stability, and movement efficiency in female athletes. Significant increases in hip, shoulder, and ankle range of motion, reductions in center of pressure displacement during balance tasks, and decreased EMG activity during functional movement collectively indicate enhanced biomechanical performance following yoga training.

These results highlight the effectiveness of yoga as a holistic training approach that positively influences both mechanical and neuromuscular aspects of movement. The findings support the inclusion of yoga-based interventions within athletic training programs at institutions such as Lakshmibai National Institute of Physical Education, with the potential to enhance performance, movement quality, and injury resilience in athletes.

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PRAKRITI-BASED NUTRITION AND ATHLETIC PERFORMANCE: A CONCEPTUAL FRAMEWORK

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Abstract

Background: ndividualized strategies, however currently there is no validated constitutional framework for individualized dietary recommendations for athletes in order to achieve the best results**.** Through the Prakriti system of Ayurveda, we are able to achieve this, which is based on the concept of a genetically influenced psychophysiological constitution that encompasses the three doshas (Vata, Pitta, and Kapha).

Objective**:** This paper aims to present a four-domain conceptual model for Prakriti-based sports nutrition that combines the Ayurvedic dietary science with the most recent findings in exercise metabolism, chrononutrition, functional food pharmacology, and gut microbiome research to produce an individualized sports nutrition plan.

A person can determine their own nutritional profile based on one of three factors: Vata, Pitta, and Kapha—each of which correlates with a distinctive metabolic phenotype, recovery requirements, compatibility with a particular sport, and food recommendations specific to a specific sport. According to the results of scientific studies on the physiology and genomics of Prakriti, Prakriti profiles are scientifically derived.

Conclusion**:** There is no doubt that Prakriti-based nutrition is a low-cost, easily deployable, and testable model that can be used to create constitutionally individualized dietary plans for high-performance athletes, providing the platform for future clinical research in this field.

Keywords: Prakriti, dosha, sports nutrition, Agni, athletic performance, chrononutrition, gut microbiome, Ayurveda, precision nutrition, functional foods

Introduction

Prakriti and Precision Nutrition: An Overview

From population-level macronutrient recommendations, athletic nutrition optimization has moved toward more customized strategies. Developments in pharmacogenomics, circadian biology, gut microbiome studies, and metabolomics have all shown that two athletes who follow the same diet may have very different results in terms of body composition, availability of energy, recovery process, and sport performance (Maughan et al., 2018) [1]. Precision nutrition has become a cutting-edge field in sports science as a result of this heterogeneity (Ordovas et al., 2018) [2].

A prospective, constitution-based dietary approach that forecasts individual nutritional needs prior to laboratory research is provided by Ayurveda's notion of Prakriti, the stable, genetically characterized psychophysiological constitution formed at conception (Prasher et al., 2008) [3]. Prakriti-based nutrition starts with constitutional phenotyping using validated questionnaire techniques and moves forward to evidence-based dietary recommendations, in contrast to precision nutrition frameworks that start with laboratory data and work backward.

An individual's metabolic rate, digestive effectiveness, response to stress, sleep architecture, tissue composition, and inflammatory tendency are all influenced by the three doshas, Vata (which governs movement and catabolism), Pitta (which governs metabolism and thermogenesis), and Kapha (which governs structure and anabolism). These factors are all directly related to athletic performance and recuperation (Sharma et al., 2020) [4].

Background

Biological Correlates of Prakriti

Prakriti is more than just a concept in philosophy. The genome-wide expression profiles of Vata, Pitta, and Kapha individuals differed statistically significantly, according to Prasher et al. (2008) [3]. While Kapha types revealed enrichment of genes related to inflammatory response and lipid metabolism, Pitta types indicated activation of immunological and metabolic pathways. SNPs in genes controlling drug metabolism (CYP450 enzymes), cardiovascular function, and immunological modulation were found to be substantially correlated with Prakriti type by Juyal et al. (2012) [5].

Prakriti types differ physiologically in quantifiable ways in gut transit time, cortisol reactivity, hormonal milieu, and basal metabolic rate (BMR). Faster gastrointestinal transit, reduced BMR, and increased sympathoadrenal reactivity are characteristics of vata types. Pitta types exhibit increased hepatic metabolic activity, a higher BMR, and a larger thermic impact of meals. Lower metabolic rates, more dominance of anabolic hormones, slower gut motility, and strong immune-inflammatory responses are characteristics of kapha types (Mahalle et al., 2012) [6].

Agni: The Ayurvedic Model of Digestive Metabolism

Agni, the digestive and metabolic fire that converts food into accessible nutrients, is central to Ayurvedic dietary philosophy. The Agni pattern is specific to each Prakriti type: Vishama Agni (variable, irregular digestion) is characteristic of Vata types, Tikshna Agni (sharp, forceful digestion) is characteristic of Pitta types, and Manda Agni (slow, sluggish digestion) is characteristic of Kapha types (Ashtanga Hridayam, Sutra Sthana 12.28) [7].

The gastric emptying rate, permeability of the intestines, hepatic metabolism in the first pass, and gut microbiome diversity all differ systematically among Prakriti types in ways that are compatible with Ayurvedic descriptions, making this tripartite model directly comparable to contemporary gastroenterology. The bioavailability of macronutrients eaten by athletes during intense training is determined by Agni efficiency (Tiwari & Dixit, 2022) [8].

The Framework: Four Domains

Domain 1 — Macronutrient Periodization by Dosha

Lean, ectomorphic body composition, strong neuronal excitability, quick force production, and a propensity for anxiety and energy depletion are traits of vata-dominant athletes. They react more sympathetically to training stress and have a quicker turnover of glycogen. Higher total caloric density, abundant carbohydrate availability (6–10 g/kg/day), and frequent meal timing to avoid catabolic states are all closely related to the Ayurvedic recommendation for warm, fatty, energy-dense, and regular meals (Burke et al., 2011) [9].

Heat sensitivity, competitive drive, high metabolic efficiency, and mesomorphic inclinations are characteristics of pitta-dominant athletes. Under excessive training load, they are prone to inflammatory disorders and exhaustion. Given rapid protein turnover, the framework suggests consuming the largest amount of protein (2.0–2.4 g/kg/day), moderate-to-high carbohydrate consumption (5–8 g/kg/day), and strategic anti-inflammatory foods such as pomegranate, amla, and curcumin supplements (Phillips & Van Loon, 2011) [10].

Endomorphic inclinations, great muscular endurance, and innate anabolic dominance are characteristics of Kapha-dominant athletes; nevertheless, they also tend to acquire weight, have slow digestion, and lack drive. Thermogenic spices (Trikatu—ginger, black pepper, and long pepper), a lower carbohydrate intake (3–6 g/kg/day) with a focus on low-glycaemic sources, and carbohydrate periodization with time-restricted eating windows are recommended. Nutritional goals and constitutional characteristics are compiled in Table 1.

Table 1: Dosha-Specific Profiles and Nutritional Targets

Characteristic	Vata	Pitta	Kapha
Body type	Ectomorphic, lean	Mesomorphic, athletic	Endomorphic, stocky

Characteristic	Vata	Pitta	Kapha
Metabolism	Variable, fast	High, efficient	Slow, stable
Agni type	Vishama (irregular)	Tikshna (sharp)	Manda (slow)
Recovery	Variable, stress-sensitive	Fast, heat-limited	Slow but robust
Best sport type	Gymnastics, sprint, racket	Team sports, triathlon	Weightlifting, rugby
Carb target	6-10 g/kg/day	5-8 g/kg/day	3-6 g/kg/day
Protein target	1.8-2.2 g/kg/day	2.0-2.4 g/kg/day	1.8-2.2 g/kg/day
Key herb	Ashwagandha, Shatavari	Amla, Curcumin	Trikatu, Triphala

Domain 2 — Chrononutrition and Doshic Circadian Cycles

According to Charaka Samhita, Sutra Sthana 21.18–25, classical Ayurveda divides the day into recurrent doshic cycles: Vata from 2:00–6:00 PM (heightened neural and catabolic activity); Pitta from 10:00 AM–2:00 PM (peak digestive and metabolic capacity); and Kapha from 6:00–10:00 AM/PM (anabolic restoration) [11]. These cycles are remarkably consistent with established circadian rhythms in hepatic glucose output, cortisol, ghrelin, leptin, and insulin secretion (Asher & Sassone-Corsi, 2015) [12].

The framework, when applied to athletes, suggests eating the biggest meal during the Pitta window (10 AM–2 PM), when Agni is strongest and insulin sensitivity is at its daily peak. This directly anticipates chrononutrition findings that calorie front-loading improves glycaemic regulation and body composition (Sutton et al., 2018) [13]. Rigid meal regimens are particularly beneficial for Vata athletes; Pitta athletes should avoid large pre-training meals in the heat; and Kapha athletes benefit from delaying breakfast and training during the first Vata window (2–6 PM), when their Agni is aroused.

Domain 3 — Ayurvedic Functional Foods and Ergogenic Phytonutrients

The framework incorporates particular functional foods that have been shown to have pharmacological activity into customized diet programs. By modulating the HPA axis, lowering cortisol, and promoting anabolic signaling through withanolides, ashwagandha (Withania somnifera) is mainly recommended for Vata and Kapha athletes. Over the course of eight weeks, resistance-trained males showed notable increases in testosterone and muscler strength (+46.4 kg bench press vs. +26.4 kg placebo), according to Wankhede et al. (2015) [14].

Pitta and Kapha athletes should take curcumin (Curcuma longa), which suppresses NF-kB and downregulates pro-inflammatory cytokines (IL-1β, IL-6, TNF-α). Following downhill running, Drobnic et al. (2014) [15] showed lower levels of inflammatory markers and DOMS severity. Curcumin bioavailability can be increased by up to 2000% in formulations augmented with piperine (Srinivasan, 2007) [16]. In trained males, shilajit, which is high in fulvic acid and dibenzo-alpha-pyrones, promotes mitochondrial biogenesis and slows the fall of testosterone over an eight-week period (Keller et al., 2019) [17]. Triphala, a tridoshic mixture of Amla, Haritaki, and Bibhitaki, showed improved antioxidant enzyme activity (SOD, catalase) and decreased lipid peroxidation (MDA) in endurance athletes (Bhatt et al., 2020) [18].

Domain 4 — Gut-Agni Optimization and Nutrient Assimilation

The growing body of research on the gut-muscle axis makes the gut microbiota aspect of Agni control very pertinent. Elite rugby players had far more varied gut microbiomes than sedentary controls, according to Clarke et al. (2014) [19]. Prevotella copri and Akkermansia muciniphila were more abundant in these players' guts, with the latter being linked to increased branched-chain amino acid (BCAA) production. Live cultures and prebiotics are introduced in Ayurvedic fermented preparations, such as Takra (buttermilk) and Arishtas (herbal ferments), which selectively support microbiome profiles congruent with optimal athletic activity.

Agni optimization for Vata athletes emphasizes regularity, warmth, and oil: cooked grains over raw, warm soups and stews, preparations made with sesame or ghee, and digestive spices (cumin, fennel, and asafoetida). Given exercise-induced gut permeability in endurance athletes (Costa et al., 2017) [20], Pitta athletes benefit greatly from cooling foods (cucumber, coconut, coriander) and alkaline-forming dietary patterns that lower intestinal

permeability and systemic inflammation. Light proteins, thermogenic spices (Trikatu), and deliberate fasting times maximize Manda Agni for Kapha athletes.

Discussion

Convergence with Precision Nutrition

Precision nutrition models and the Prakriti-based nutrition framework share conceptual architecture in a number of significant ways, including the rejection of population-level averages as the unit of nutritional prescription, the recognition that individual variation in metabolic phenotype produces divergent responses to identical dietary interventions, and the utilization of individual biological data to optimize performance and health (Gibney et al., 2017) [21]. The main methodological distinction is that, although Prakriti-based nutrition starts with constitutional phenotyping using established questionnaire techniques, precision nutrition starts with laboratory phenotyping.

These methods work well together: laboratory data can improve and validate the prescription, while Prakriti type acts as a first-tier constitutional screen that directs the initial dietary strategy. The most compelling evidence for this integrative capability comes from genomic research that validate Prakriti's biological validity (Prasher et al., 2008; Juyal et al., 2012).

Limitations and Future Research

A number of significant constraints must be noted. The entire Prakriti-based dietary paradigm has not yet been tested in an athletic population through a direct prospective clinical trial. Although Prakriti evaluation tools have been validated, they have not been cross-tested against objective biomarker panels in athletic populations particularly, and they show moderate inter-rater reliability. The tripartite approach does not adequately address the nuanced prescriptions needed by dual-doshic and tridoshic constitutional types, which make up the majority of the population. Instead of being a deterministic prescription, the framework should be interpreted as being a probabilistically informed beginning point.

Future research priorities include: (1) cross-sectional studies that map Prakriti type to BMR, body composition, gut microbiome, and inflammatory biomarkers in trained athletes; (2) randomized controlled trials (RCTs) that compare Prakriti-aligned sports nutrition protocols with pre-stratification by Prakriti assessment; (3) chrononutrition studies that look at glycaemic and hormonal responses by constitution in Vata, Pitta, and Kapha athletes; and (4) gut microbiome sequencing stratified by Prakriti type to see if the differences in microbiome diversity predicted by Agni theory translate into quantifiable community structure differences (Patwardhan, 2014) [22].

Conclusion

This paper has provided a systematic, four-domain conceptual framework for Prakriti-based sports nutrition that integrates Ayurvedic constitutional dietary science with contemporary exercise nutrition, chrononutrition, functional food pharmacology, and gut microbiome research. The three Prakriti types strongly map onto established metabolic phenotypes in exercise physiology, with particular consequences for macronutrient objectives, meal timing, functional food selection, and digestion optimization.

Genomic, transcriptomic, and physiological evidence supports the biological validity of Prakriti, giving the constitutional individualization that has been at the heart of Ayurvedic food treatment for three millennia scientific legitimacy. The approach adds a constitutional layer of individualization to evidence-based sports nutrition guidelines, not replacing them. The Prakriti framework provides a low-cost, instantly deployable first-tier individualization tool that may be iteratively improved through the suggested empirical research program as precision nutrition develops and the need for customized athletic nutritional strategies increases.

MODIFIABLE BIOMECHANICAL RISK FACTORS OF DYNAMIC KNEE VALGUS: A REVIEW INTEGRATING YOGIC PRACTICES FOR INJURY PREVENTION

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Abstract:

Background and Objective: Dynamic knee valgus (DKV) is a multiplanar kinetic chain malfunction that is significantly linked to non-contact anterior cruciate ligament (ACL) injuries and chronic patellofemoral pain syndrome. DKV, which is recognized as a systemic impairment caused by proximal lumbopelvic-hip deficiencies and restricted distal ankle dorsiflexion, requires comprehensive care that goes beyond standard isolated strengthening. As modern techniques emphasize integrative neuromuscular and mind-body interventions, this thematic review summarizes current research on modifiable biomechanical and neuromuscular risk factors for DKV. It also assesses the effectiveness of evidence-based yoga practices as an integrative approach to sporting injury prevention and rehabilitation.

Methods: Following an integrative narrative review methodology, this study examined current literature on DKV biomechanics, ACL and PFPS injury mechanisms, and kinetic chain interactions. The synthesis covered clinical screening methods, integrated neuromuscular training (INT), and the physiological effects of yoga. To build a multidimensional preventative framework, key areas of study included electromyographic posture profiling, joint kinematics, eccentric muscle adaptations, ankle mobility restoration, and mindfulness-based neurocognitive therapies.

Conclusion: Dynamic knee valgus is a systemic kinetic chain failure rather than a specific knee disease. To effectively treat valgus collapse, focused hip stability, restoration of ankle dorsiflexion, and improved eccentric neuromuscular control are required. Evidence shows that biomechanically aligned, therapeutically prescribed yoga activities result in quantified gluteal activation, optimal joint kinematics, and considerable cognition advantages. Integrating these methods into modern sports medicine procedures creates a holistic, evidence-based approach to improving movement efficiency, lowering ACL and PFPS risk, and promoting long-term joint health.

Introduction

In the highly demanding domain of sports medicine and athletic performance, lower extremity injuries present a formidable challenge, threatening both immediate career longevity and long-term articular joint health. Among the most frequent and devastating of these injuries are non-contact anterior cruciate ligament (ACL) tears, which account for 100,000 to 200,000 injuries annually in specific demographics, and the insidious onset of patellofemoral pain syndrome (PFPS), which remains the most common overuse knee injury in runners, triathletes, and military recruits. Despite representing distinctly different points on the injury spectrum—the former being an acute macrotraumatic event and the latter a chronic microtraumatic condition—emerging epidemiological and biomechanical evidence demonstrates that both conditions share identical mechanical precursors. At the epicenter of this shared etiology lies dynamic knee valgus (DKV), a faulty, multiplanar movement pattern characterized by excessive hip adduction, femoral internal rotation, tibial external rotation, and ankle eversion.

Because the knee operates primarily as a modified hinge joint situated between the longest lever arms in the human body, its stability is almost entirely contingent upon the functional integrity of the joints positioned superiorly and inferiorly within the kinetic chain. The kinetic chain refers to the sequential activation of task-specific body segments, enabling the efficient generation, summation, and transfer of mechanical energy. When proximal stability at the hip is compromised or distal mobility at the ankle is restricted during closed-kinetic-chain (CKC) movements, the knee is forced to absorb the resultant torsional and shear forces, often exceeding the tensile capacity of its passive ligamentous restraints.

Historically, injury prevention programs have relied on isolated strength training or conventional plyometrics in an attempt to build structural resilience. However, a progressive shift in the literature highlights the superior efficacy of integrative neuromuscular training (INT), which concurrently enhances muscular strength, proprioceptive acuity, and motor control. Concurrently, yogic practices have transcended their traditional reputation as mere flexibility

exercises, emerging as rigorously quantified, evidence-based tools for athletic rehabilitation and injury prevention. Yoga uniquely bridges the gap between biomechanical conditioning and neurocognitive enhancement. Through demanding closed-kinetic-chain postures, sustained isometric and eccentric loading, and highly integrated proprioceptive balances, yoga directly targets the specific anatomical deficits responsible for dynamic knee valgus. This report exhaustively details the modifiable biomechanical risk factors contributing to DKV and articulates the specific physiological and neurocognitive mechanisms through which integrated yogic practices mitigate structural vulnerabilities in athletes.

Biomechanical and Neuromuscular Foundations of Dynamic Knee Valgus

Dynamic knee valgus is not a singular, isolated movement error but a complex kinematic cascade resulting from failures across multiple joint segments. To deconstruct its etiology and understand how interventions must be structured, it is necessary to examine the kinetic chain through both a top-down (proximal) and bottom-up (distal) biomechanical lens.

Proximal Drivers: The Lumbo-Pelvic-Hip Complex

The lumbo-pelvic-hip complex, colloquially referred to as the "core," serves as the foundational anchor for all lower extremity movement. Biomechanical studies consistently identify impaired muscular control of the hip, pelvis, and trunk as a primary contributor to altered tibiofemoral and patellofemoral joint kinematics. The gluteus medius and gluteus maximus are the primary abductors, extensors, and external rotators of the hip joint. When these muscles exhibit baseline weakness, premature fatigue, or delayed neuromuscular activation, they fail to adequately decelerate the adduction and internal rotation of the femur during the eccentric phase of weight acceptance, such as landing from a jump or initiating a rapid cutting maneuver.

Furthermore, the concept of "trunk dominance"—defined as an inability to precisely control the trunk in three-dimensional space—shifts the body's center of mass away from the base of support provided by the stance leg. To maintain equilibrium and prevent a fall, the athlete instinctively alters their biomechanical alignment, forcing the knee medial to the foot and drastically increasing the external knee abduction moment. Unanticipated trunk stabilization tasks reveal that athletes who subsequently sustain knee injuries frequently demonstrate significantly greater trunk displacement than their uninjured peers, highlighting the protective necessity of proximal core stability. Reduced hip extension strength also forces athletes to adopt a highly upright, quadriceps-dominant landing posture. This extended posture relies heavily on passive skeletal and ligamentous structures rather than utilizing active muscular shock absorption through deep hip and knee flexion.

Distal Drivers: Ankle Joint Equinus and Foot Biomechanics

At the distal end of the kinetic chain, restrictions in talocrural joint mobility profoundly impact proximal knee kinematics. Ankle joint equinus, clinically defined as restricted dorsiflexion range of motion (ROM), forces the body to seek compensatory movement strategies during closed-kinetic-chain activities. If the tibia cannot translate anteriorly over the talus due to tight plantar flexors (such as the gastrocnemius and soleus) or a stiff joint capsule, the foot is mechanically forced into excessive pronation and eversion to achieve the necessary forward progression of the body's center of mass.

This obligatory foot pronation unlocks the midtarsal joint, leading to a collapse of the medial longitudinal arch.Mechanically, navicular drop and excessive foot pronation are obligatorily coupled with internal rotation of the tibia. Because the knee is locked in extension or only slight flexion during the initial phase of weight acceptance, this tibial internal rotation is transferred directly to the tibiofemoral joint, actively driving a valgus collapse from the ground up.Consequently, athletes presenting with diminished dorsiflexion flexibility consistently demonstrate significantly greater knee abduction moments during dynamic tasks, reinforcing the consensus that dynamic knee valgus is a multisegmental failure requiring comprehensive, whole-chain interventions.

The Injury Spectrum: From Acute Rupture to Chronic Pain

The downstream biomechanical consequences of unmitigated dynamic knee valgus manifest in bifurcated injury patterns that heavily plague the athletic population, drastically impacting performance, quality of life, and career longevity.

Anterior Cruciate Ligament (ACL) Rupture

ACL injuries represent a catastrophic event in an athlete's career, primarily occurring via non-contact mechanisms during deceleration, pivoting, or landing. The risk profile is heavily and disproportionately skewed toward female athletes, who suffer ACL injuries at rates four to six times higher than their male counterparts. While some non-modifiable anatomical factors exist—such as a narrower intercondylar notch width and cyclical hormonal fluctuations—the vast majority of the risk discrepancy is driven by highly modifiable biomechanical and neuromuscular imbalances.

Female athletes often present with a wider pelvic structure, which naturally increases the structural Q-angle (the angle formed between the quadriceps muscle and the patellar tendon). Q-angles exceeding 19 degrees inherently place the knee at a mechanical disadvantage, heavily predisposing the joint to a valgus collapse during dynamic loading. More critically, post-menarche female athletes tend to develop "quadriceps dominance," wherein they increase quadriceps strength at a much greater rate than hamstring strength. During dynamic landing movements, their quadriceps contract forcefully while the hamstrings—the primary dynamic synergists and protectors of the ACL—remain relatively quiescent.

The ACL's primary structural function is to prevent the anterior translation of the tibia relative to the femur. A strong, isolated quadriceps contraction pulls the tibia aggressively forward, creating immense anterior shear force. A simultaneous and adequate hamstring contraction pulls the tibia backward, neutralizing this anterior shear. When an athlete's hamstring-to-quadriceps strength ratio falls below the objective protective threshold of 0.6, the ACL is left structurally unprotected. Coupled with aberrant landing mechanics characterized by an extended hip and knee posture, the athlete enters the "position of no return"—a high-risk alignment characterized by hip adduction, extreme hip internal rotation, tibial external rotation, and a shallow knee flexion angle that maximizes ligamentous strain.

Patellofemoral Pain Syndrome (PFPS)

Conversely, chronic and repetitive exposure to dynamic valgus loading manifests as Patellofemoral Pain Syndrome (PFPS), a condition affecting 11-17% of patients presenting to general medical practitioners and forcing approximately 25% of affected recreational athletes to cease sports participation entirely. Often affecting younger patients without any underlying structural cartilage damage or patellofemoral osteoarthritis (PFOA), PFPS is primarily driven by lateral patellar maltracking.

The patella resides within the trochlear groove of the distal femur. When the femur internally rotates and adducts underneath the patella due to proximal gluteal weakness, the relative position of the patella shifts laterally. This lateral maltracking significantly decreases the contact area between the patella and the femur, exponentially increasing the contact pressure distributed across the lateral facet of the patella. Over thousands of cycles of running, cutting, or jumping, this amplified mechanical stress irritates the subchondral bone and surrounding highly innervated retinaculum, resulting in severe anterior knee pain. Furthermore, muscular imbalances such as tightness in the iliotibial band (ITB) and the vastus lateralis, coupled with delayed or diminished activation of the vastus medialis obliquus (VMO), exacerbate this lateral pull, trapping the athlete in a cycle of chronic pain and movement compensation. The systemic impact is profound; studies indicate that athletes with PFPS experience significant decrements in health-associated quality of life, occasionally matching the severe impairment levels seen in patients with complete, un-reconstructed ACL tears.

Clinical Screening and Assessment of Dynamic Knee Valgus

To effectively implement preventative strategies, sports medicine clinicians must utilize reliable and validated screening tools to identify athletes at high risk for DKV and subsequent injury. Assessment frequently occurs during clinical tests or sports-related tasks that mimic the high-intensity demands placed on the knee during competition.

A cornerstone of clinical assessment is the evaluation of hip and core strength. Belt-stabilized Hand-Held Dynamometry (HHD) has emerged as a highly reliable, objective method used to quantify specific deficits in isometric hip abduction and external rotation strength. More complex, laboratory-based assessments may employ isokinetic strength testing or rate of torque development testing via computerized systems like the Biodex.

Functional movement tests are heavily utilized to observe the kinetic chain in motion. The Y-Balance Test and the modified Star Excursion Balance Test are extensively used to reliably identify high-risk athletes by challenging

single-limb dynamic stability and multi-directional reach. The single-leg step-down test and single-leg squat are critical observational tools that assess dynamic control, allowing clinicians to visually identify a medial knee collapse.

To quantify this collapse, clinicians often measure the 2D Frontal Plane Projection Angle (FPPA) during these single-leg tasks. While the FPPA is a standard clinical measure to identify females with PFP, it has limitations, primarily its minimal attention to the movement of the pelvis relative to the femur, which heavily influences valgus loading. Consequently, the Dynamic Valgus Index (DVI) has been proposed as a superior assessment tool that better captures the multi-segmental nature of the collapse, integrating both hip and knee kinematics to more accurately identify females suffering from or at risk for PFPS.

For athletes recovering from ACL reconstruction (ACLR) seeking return-to-play (RTP) clearance, hop symmetry tests are the gold standard. These include the single leg hop for distance, the triple hop, the crossover hop, and the timed six-meter hop. Performance is measured using a Limb Symmetry Index (LSI), comparing the output of the injured leg to the uninjured leg. While historical protocols utilized an 85% LSI cutoff for RTP, contemporary research mandates a higher threshold of 90-95%, or the use of absolute strength values, to account for the persistent bilateral deficits often observed post-surgery.

Clinical Assessment Tool	**Primary Biomechanical Factor Assessed**	**Clinical Application and Thresholds**
Hand-Held Dynamometry (HHD)	Isometric hip abduction and external rotation strength	Highly reliable for identifying baseline proximal weakness.
Y-Balance / Star Excursion Test	Dynamic multi-directional single-leg stability	Identifies neuromuscular control deficits and high-risk athletes.
Frontal Plane Projection Angle (FPPA)	2D measurement of medial knee collapse	Used during single-leg squats; limited by lack of pelvic tracking.
Dynamic Valgus Index (DVI)	Integrated pelvic and femoral kinematics	Superior to FPPA for identifying females with PFPS.
Hop Symmetry Tests (LSI)	Power, dynamic control, and landing mechanics	Requires >90-95% symmetry between limbs for Return-to-Play.

Integrative Neuromuscular Training (INT) Versus Traditional Physical Training

To dismantle the aberrant motor engrams governing DKV, training interventions must rewrite the neuromuscular software of the athlete. Integrative Neuromuscular Training (INT) represents a comprehensive model designed to concurrently enhance muscular strength, motor skills, and fundamental movement mechanics, distinguishing it from traditional physical training (PT) which often isolates these variables.

A recent systematic review and meta-analysis encompassing 17 randomized controlled trials and 649 young athletes directly compared the effects of INT versus traditional PT on physical performance outcomes. The results definitively demonstrated the superiority of the INT model. Compared to traditional PT, INT significantly improved dynamic balance (Mean Difference = 7.29%, $p < 0.001$), static balance (Standardized Mean Difference = -0.54, $p < 0.001$), jumping performance (SMD = 0.53, $p < 0.001$), sprinting capacity (SMD = -0.76, $p < 0.001$), and maximal strength (SMD = 1.01, $p = 0.002$). By addressing neuromuscular deficiencies, poor biomechanics, and decreased flexibility simultaneously, INT programs—including multi-component programs emphasizing hip and core strengthening—have been shown to lower overall knee-ligament injury rates by 20–60% in youth cohorts, with particularly robust protective effects observed in female athletes.

Yoga seamlessly aligns with the principles of the INT model, functioning as a sophisticated, body-weight-based neuromuscular re-education system. Unlike rudimentary stretching or passive flexibility routines, yoga for athletes acts as a highly dynamic method of biomechanical recovery, proprioceptive training, and strengthening. Yoga demands the precise, conscious orchestration of the kinetic chain, utilizing challenging closed-chain postures that require simultaneous stability from the hip abductors, core musculature, and intrinsic foot muscles. Clinical assessments confirm that structured yoga interventions drastically improve an athlete's bipedal and unipedal proprioception—factors that directly correlate with a reduced risk of ligamentous sprains, ACL tears, and sudden missteps during high-speed competition.

Electromyographic (EMG) Profiling of Yogic Asanas for Proximal Stability

The prescription of yogic postures for athletic injury prevention must be strictly evidence-based rather than anecdotal. Recent advancements in biomechanical analyses—utilizing wireless surface electromyography (sEMG) and three-dimensional motion capture—have successfully quantified the immense physiological demands of specific asanas, proving their utility in targeting the modifiable risk factors of dynamic knee valgus.

To combat the proximal deficit of hip abductor weakness, therapeutic exercises must adequately stimulate the gluteus medius and gluteus maximus. Yoga provides highly effective, varied closed-kinetic-chain environments for this exact purpose. In poses requiring single-leg balance, the standing leg's gluteus medius must fire continuously to stabilize the pelvis, maintain form closure, and prevent the contralateral hip from dropping, thereby preventing the ipsilateral femur from adducting into a valgus position.

Biomechanical studies analyzing gluteal activation as a percentage of Maximal Voluntary Isometric Contraction (%MVIC) reveal that balancing poses place substantial, quantifiable demands on these critical stabilizers. Furthermore, gender and clinical experience variables affect muscle recruitment strategies; male and inexperienced yoga practitioners often exhibit higher relative gluteus medius activation, indicating a higher initial neuromuscular demand as motor efficiency and neural patterning are developed.

Core muscle function is equally critical. Comprehensive studies evaluating the 12-pose sequence of Surya Namaskar (Sun Salutation) demonstrate high-to-moderate muscle activation of major postural muscles. During the sustenance of specific postures, the erector spinae demonstrated activation levels as high as 64.7% MVC in Hastapadasana (Forward Fold), while the latissimus dorsi reached 37.4% MVC during Bhujangasana (Cobra Pose). The vastus lateralis achieved 34.9% MVC in Ashwa Sanchalanasana (Equestrian Pose), highlighting the systemic muscular demand. Similarly, specific poses like Vasisthasana (Side Plank) require massive lateral stability, eliciting approximately 74% MVIC from the gluteus medius, providing an exceptional stimulus to combat trunk dominance and lateral flexion deficits.

Yogic Asana (Posture)	**% MVIC: Key Muscle Activation**	**Primary Biomechanical Function and Clinical Utility**
Ardha Chandrasana (Half Moon)	Gluteus Medius: 41.8% - 41.9% (Lifted Leg); Gluteus Maximus: 63.3% (Lifted Leg), 61.7% (Stance Leg)	Resists gravity via high-demand abduction; standing leg highly stabilizes the pelvis against valgus collapse.
Virabhadrasana III (Warrior III)	Gluteus Medius: 41.6% (Lifted Leg); Gluteus Maximus: 46.1% (Lifted Leg)	Requires intense dynamic lumbo-pelvic control against anterior trunk translation and gravity.
Vasisthasana (Side Plank)	Gluteus Medius: ~74.0%	Demands massive lateral stability; directly combats trunk dominance and lateral core weakness.
Hastapadasana (Forward Fold)	Erector Spinae: 64.7%	Develops immense posterior chain endurance and eccentric spinal control during transition.
Bhujangasana (Cobra Pose)	Latissimus Dorsi: 37.4%	Enhances posterior force closure and global trunk extension strength.

Kinematic Analysis and Joint Moments in Yoga

While muscle activation builds requisite strength, the precise spatial arrangement of the joints—the kinematics—determines how mechanical load is distributed across the articular cartilage and ligamentous structures. Quantitative investigations characterizing the kinetics and kinematics of fundamental yoga maneuvers such as the Crescent Lunge, Warrior II (Virabhadrasana II), and Triangle pose (Trikonasana) illustrate the immense range of motion and joint moment control required to execute these movements correctly.

The hip joint acts as the primary mechanical driver in these standing poses, contributing between 51.67% and 70.56% of the angular impulse in both sagittal and frontal planes. While these postures are instrumental for building functional, end-range mobility, clinicians must remain highly cognizant of the internal joint forces they generate. For instance, while the Triangle pose maximizes hip range of motion (achieving 90.5° ± 22.9° in the sagittal plane),

it also generates the largest knee joint adductor moments (-0.30 ± 0.22 Nm/kg) and forces the knee into near-terminal extension (9.5° ± 6.1°). This finding carries specific, critical clinical implications: while the Triangle pose is excellent for improving hip joint ROM and dynamic stability, the associated large knee extensor and adductor moments require extreme caution for practitioners with pre-existing medial knee osteoarthritis or compromised ligamentous integrity.

Interestingly, biomechanical data reveals a discrepancy between classical yoga instruction and actual physiological execution. For poses like the Lunge and Warrior II, the actual knee flexion achieved by practitioners (67.7° to 73.8°) is typically 16.2% to 22.3% less than the 90-degree bend strictly instructed in traditional yoga manuals. This likely reflects a natural, subconscious biomechanical self-limitation utilized by the nervous system to preserve joint congruency and prevent excessive patellofemoral shear force.

Yogic Asana (Posture)	**Peak Hip ROM (Sagittal Plane)**	**Peak Knee Flexion Angle**	**Max Knee Joint Moment (Nm/kg)**	**Clinical Biomechanical Implication**
Crescent Lunge	121.3° ± 10.4°	73.8° ± 17.6°	Flexion: 0.16; Adduction: 0.33	High sagittal plane demand; builds eccentric quadriceps control without terminal knee stress.
Virabhadrasana II	120.8° ± 12.6°	67.7° ± 19.9°	Flexion: 0.40; Adduction: 0.37	Demands multiplanar control; requires robust gluteal strength to prevent the front knee from collapsing medially.
Trikonasana (Triangle)	90.5° ± 22.9°	Reaches near extension (9.5°)	Ext: -0.94; Adduction: -0.30	Maximizes hip mobility but generates significant knee adduction forces; requires highly cautious joint locking.

Eccentric Muscle Control and Motor Unit Recruitment Strategies

One of the most profound physiological mechanisms through which yoga protects the knee joint is through sustained eccentric and isometric muscular loading. Unlike concentric contractions (which shorten the muscle to generate movement), eccentric contractions require the active muscle to lengthen under tension to decelerate a load—in this context, the resistance of gravity. The central nervous system governs eccentric actions via highly unique neural strategies that differ considerably from concentric actions.

Eccentrically biased actions generally display lower motor unit discharge rates and reduced central activation (evidenced by lower overall EMG amplitude), yet they generate the highest mechanical forces with lower metabolic energy requirements. Furthermore, eccentric contractions exhibit greater cortical excitability, meaning they require intense focus and fine motor control from the brain to execute smoothly.

In the practice of yoga, transitioning slowly into a forward fold (Uttanasana) or deliberately lowering the hips into Utkatasana (Chair pose) requires the posterior chain (hamstrings and gluteals) to fire eccentrically. This eccentric loading is vital for architectural adaptation within the muscle, increasing muscle fascicle length and building the functional braking capacity needed to halt dynamic valgus during high-velocity athletic landing or cutting. Prolonged isometric holds in poses like Ashwa Sanchalanasana generate sustained activation of the erector spinae, latissimus dorsi, and vastus lateralis, forging the muscular endurance necessary to maintain postural alignment under extreme fatigue. Fatigue is a well-documented accelerant of DKV; as the active stabilizing musculature tires during competition, the athlete inevitably reverts to passive ligamentous dominance, exposing the ACL to rupture. Yoga directly inoculates the athlete against this failure mechanism by building exceptional, task-specific muscular endurance.

Biomechanical Alignment Cues and Joint Preservation in Yoga

The therapeutic efficacy of yoga in injury prevention is highly dependent upon precise biomechanical execution. Incorrectly executed asanas can inadvertently reinforce the very movement dysfunctions they seek to correct, rendering the practice detrimental. Therefore, the strict integration of functional alignment cues is critical for joint preservation and neuromuscular re-education.

Knee Tracking and the Prevention of Medial Collapse

The cardinal rule of knee safety in yoga—and by extension, all athletic movement—is tracking the true center of the patella directly over the center of the foot, specifically aligning with the second or middle toe. In dynamic lunging postures like Warrior I, Warrior II, and Crescent Lunge, athletes commonly allow the front knee to veer medially, perfectly mimicking a dynamic valgus collapse under load. Cueing the practitioner to actively engage the external hip rotators and the gluteus medius to pull the knee outward aligns the femur concentrically with the tibia. This precise alignment distributes compressive forces evenly across the medial and lateral menisci, preventing the unilateral joint degradation associated with osteoarthritis.

Mitigating Hyperextension and Selective VMO Engagement

Hyperextension of the knee in straight-leg standing postures (such as Tadasana or Trikonasana) places excessive strain on the posterior joint capsule and oblique popliteal ligament, degrading passive joint stability over time. To counter this, practitioners are cued to maintain a "micro-bend" and actively contract the quadriceps. Clinically, limiting terminal extension selectively emphasizes and isolates the vastus medialis obliquus (VMO), the smallest and often weakest head of the quadriceps muscle group. The VMO is crucial for medial patellar tracking, providing a direct, active counter-force to the vastus lateralis and the ITB. By strengthening the VMO through controlled, non-hyperextended postures, the mechanical vectors that cause PFPS are actively mitigated.

Foot Architecture and Preventing Sickling

At the most distal point of contact, the architecture of the foot must be maintained. Supination or "sickling" of the foot—rolling onto the outside edge while allowing the inner arch to lift inappropriately—places undue stress on the lateral compartment of the knee and destabilizes the ankle. Proper cueing focuses on establishing a strong, active foundation through the three arches of the foot: the medial longitudinal arch, the lateral longitudinal arch, and the transverse arch.This is achieved by distributing weight evenly across three distinct points of contact on the plantar surface: the center of the heel, the base of the fifth metatarsal (little toe), and the base of the first metatarsal (big toe). Grounding the medial aspect of the foot while actively lifting the medial longitudinal arch creates a stable, biomechanically sound base that locks the midtarsal joint and prevents the ascending rotational collapse of the entire kinetic chain.

The Psychological Dimension: Mindfulness and Neurocognitive Function

An oft-overlooked, yet highly critical facet of dynamic knee valgus and athletic injury is the neurocognitive state of the athlete. Athletic movement is not purely mechanical; it requires the constant, rapid processing of complex environmental stimuli. When an athlete's perceptual awareness drops, or their reaction time is delayed by mental fatigue, the neuromuscular system fails to activate the stabilizing muscles in time to prevent a valgus collapse during an unanticipated perturbation (e.g., landing on uneven ground, reacting to an opponent, or a sudden change of direction).

Yoga uniquely addresses this neurocognitive vulnerability through the strict integration of mindfulness and breathwork (pranayama) alongside physical movement. The human nervous system operates as a predictive engine; it constantly anticipates movements and primes the necessary musculature accordingly. When neurocognitive predictions are skewed by high stress, sports anxiety, or a lack of focus, the athlete exhibits uncoordinated muscle tension, effectively working against their own biomechanics. Mindfulness training operates as a potent form of cognitive skills training, directly enhancing perceptual awareness, decision-making speed, and attentional focus. By practicing continuous concentration exercises—such as focusing the mental gaze (Drishti) on a concise point or tracking internal breathing sensations—athletes train their capacity to notice attentional drift and rapidly re-focus without self-judgment, a skill highly transferrable to the chaotic environment of competitive sports.

The impact of this cognitive training on objective injury epidemiology is profound. Research demonstrates that athletes utilizing a Mindfulness-Acceptance-Commitment (MAC) approach or engaging in daily mindfulness and awareness techniques exhibit markedly superior physiological and psychological profiles. A 2023 cohort study tracking 450 collegiate competitors during rehabilitation revealed that athletes practicing mindfulness demonstrated 34% faster muscle readiness scores and a 19% reduction in systemic stress hormone levels. Furthermore, on days following mindfulness practice, athletes reported significantly higher mood, energy levels, and readiness to train,

corresponding with a dramatically reduced likelihood of suffering an acute injury the following day (presenting a remarkable odds ratio of 0.42).

Similarly, a 2024 meta-analysis of 17 clinical trials demonstrated significant effects of mindfulness-based interventions on recovery timelines, including a 39% faster return to play in hockey players and a 0.31 re-injury odds ratio in skiers. In controlled studies among high-impact soccer players, those assigned to a mindfulness intervention group showed a 67% rate of remaining completely injury-free over a competitive season, compared to only 40% in a control group.

By lowering sport-specific anxiety and regulating emotional impulsiveness, mindfulness practice mitigates the psychological distress that is intrinsically linked to elevated injury susceptibility. The athlete achieves a state of relaxed readiness, optimizing the neurobiological processes that govern fine motor control and allowing the previously conditioned hip and core muscles to fire with temporal precision. Furthermore, improved sleep hygiene—facilitated by mindfulness-induced parasympathetic activation, resulting in deeper REM cycles—ensures that the musculoskeletal and central nervous systems recover adequately from training fatigue, maintaining the unbroken resilience of the kinetic chain.

Mindfulness Intervention Outcome	**Quantified Effect / Statistic**	**Clinical Significance for Athletes**
Acute Injury Risk Reduction	Odds Ratio: 0.42	Practice on the prior day halves the risk of acute injury the following day.
Muscle Readiness	34% faster scores	Improves the nervous system's ability to activate stabilizing musculature.
Injury-Free Season Rate	67% (Intervention) vs 40% (Control)	Demonstrates the longitudinal protective effect of attentional control.
Stress Response	19% reduction in stress hormones	Lowers systemic inflammation and prevents tension-based movement errors.
Sleep Optimization	22% deeper REM cycles	Enhances neurobiological repair and cognitive efficiency.

Integration into Sports Medicine and Rehabilitation Outcomes

The theoretical, biomechanical, and psychological benefits of yoga translate robustly into tangible clinical outcomes, particularly in the management and rehabilitation of Patellofemoral Pain Syndrome (PFPS) and post-operative ACL recovery. Traditional physiotherapy for PFPS has historically focused heavily on isolated strengthening of the quadriceps. However, clinical trials assessing the utility of holistic yoga therapy as a primary or adjunctive intervention for anterior knee pain have yielded compelling results that support a broader, integrative approach.

In randomized controlled trials involving both adolescents and adults suffering from PFPS, structured 8- to 12-week yoga interventions produced statistically and clinically significant reductions in pain. These improvements were objectively measured using validated scales such as the Numeric Pain Rating Scale (NPRS), the Knee Injury and Osteoarthritis Outcome Score (KOOS-PF), and the SF-36 physical function domains. Remarkably, in a rigorous trial of 117 participants, yoga was deemed statistically noninferior to conventional strengthening exercises, yielding equivalent improvements in knee symptoms and physical function. Crucially, yoga provided supplementary benefits that isolated physical therapy did not, including marked improvements in the patient's quality of life and significant reductions in comorbid depression and anxiety.

By amalgamating loosening exercises (Shithilikarana vyayama), static and dynamic asanas, and advanced relaxation techniques, yoga therapy systematically rectifies the tight iliotibial bands, weak gluteal muscles, and lateral patellar tracking inherent to PFPS. The success of these interventions is facilitating the adoption of the Health-Focused Physical Therapy Model, which integrates lifestyle behavior management and complementary therapies directly into standardized clinical care. Qualitative research indicates high stakeholder acceptance among physical therapists and athletic trainers, who recognize that expanding their orthopedic background to include alternative, biomechanically sound practices like yoga bridges critical gaps in holistic patient care and significantly improves subjective and objective therapeutic outcomes.

Conclusion

Dynamic knee valgus remains a pervasive, highly destructive biomechanical fault that heavily predisposes athletes to both severe acute injuries, such as non-contact anterior cruciate ligament ruptures, and chronic, debilitating conditions like patellofemoral pain syndrome. The current body of sports medicine literature definitively demonstrates that this multiplanar collapse is rarely an isolated knee issue; rather, it represents a systemic failure of the entire kinetic chain, predominantly originating from profound neuromuscular deficits in the lumbo-pelvic-hip stabilizers and mechanically restricted mobility at the distal talocrural joint. To effectively mitigate this risk and alter injury epidemiology, athletic conditioning and rehabilitation must evolve beyond traditional, isolated strengthening paradigms. Programs must encompass integrative neuromuscular training that concurrently challenges proprioception, multiplanar eccentric control, and whole-body coordination.

Yogic practices, when applied with rigorous biomechanical precision and anatomical understanding, serve as a highly sophisticated and quantified vehicle for this exact integration. Through specific, evidence-based asanas—such as Ardha Chandrasana, Virabhadrasana III, and Vasisthasana—yoga elicits potent, quantifiable electromyographic activation of the gluteus medius and maximus, actively fortifying the proximal defenses against femoral internal rotation and adduction. Simultaneously, poses like Adho Mukha Svanasana and grounded lunges restore the vital distal dorsiflexion required to prevent compensatory foot pronation and the subsequent ascending tibial torsion. When these kinematic corrections are coupled with strict functional alignment cues that optimize patellar tracking, enforce the three arches of the foot, and prevent articular hyperextension, the knee joint is effectively insulated from the injurious shear and torsional forces that dictate athletic injury.

Furthermore, the deliberate integration of mindfulness introduces an indispensable neurocognitive dimension to injury prevention. By enhancing attentional control, drastically reducing sport-specific anxiety, and optimizing motor unit recruitment timing through advanced neural strategies, yoga safeguards the athlete against the cognitive lapses and delayed reaction times that frequently precede acute ligamentous failure. As the paradigm of contemporary sports medicine continues to embrace holistic, multidimensional models of care, the strategic incorporation of yogic practices provides clinicians, physical therapists, athletic trainers, and the athletes themselves with a comprehensively effective, evidence-based tool to optimize kinetic chain efficiency, preserve long-term joint longevity, and sustain peak athletic performance.

The Bioenergetics of Ojas: A Conceptual Framework for Dietary Quality and Fatigue Resistance in Preventive Sports Science

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Abstract

Introduction

Fatigue represents a major constraint on athletic performance and recovery. It emerges from the interaction of physiological, metabolic, and psychological processes that determine the ability to sustain physical work. In sports science literature, fatigue is commonly discussed in relation to training load, exercise intensity, and recovery strategies. Nutritional determinants, particularly micronutrient status, receive comparatively less attention even though several steps in cellular energy production depend on vitamin- and mineral-dependent enzymes.

Objectives

This conceptual review examines how dietary quality—especially the intake of iron, magnesium, B-complex vitamins, and vitamin D—may influence fatigue resistance in recreationally trained adults. The discussion is grounded in contemporary knowledge of mitochondrial bioenergetics while also considering interpretive parallels with the Ayurvedic concept of Ojas, traditionally associated with vitality and systemic resilience.

Methods

Relevant literature was organized using the SALSA framework (Search, Appraisal, Synthesis, and Analysis). Searches of PubMed, Scopus, and Google Scholar identified studies examining micronutrient status, mitochondrial metabolism, and fatigue-related exercise outcomes in physically active populations. After screening and appraisal, 73 studies were retained for synthesis.

Results

Evidence from controlled trials and observational studies suggests that subclinical deficiencies in key micronutrients may influence fatigue development through effects on mitochondrial metabolism. Iron deficiency without anemia has been associated with reduced aerobic efficiency, while magnesium and B-vitamins act as essential cofactors in ATP-generating metabolic pathways. Adequate vitamin D status has also been linked with neuromuscular function and musculoskeletal health.

Conclusion

Fatigue resistance partly reflects the efficiency with which cells generate energy during physical stress. Maintaining adequate micronutrient intake may therefore support sustainable training and recovery. When interpreted cautiously, the Ayurvedic concept of Ojas offers a historical description of vitality that loosely parallels modern discussions of metabolic resilience.

Keywords: Dietary Quality, Fatigue Resistance, Recreational Training, Micronutrients, Preventive Sports Science

Introduction

Transitioning Toward Preventive Sports Science

Sports science has gradually moved from a reactive approach—focused on injury treatment and performance correction—toward a preventive framework that emphasizes maintaining physiological resilience before problems emerge. Within this perspective, fatigue is no longer viewed solely as a subjective feeling of exhaustion. It can also be interpreted as a physiological signal reflecting the condition of the body's metabolic systems and their capacity to sustain work.

Among recreationally trained adults who exercise several times each week, fatigue is often attributed to excessive training volume or insufficient recovery between sessions. While these explanations capture part of the picture, they do not fully explain the considerable variation in training tolerance observed among individuals performing similar exercise programs.

Nutritional status provides another lens through which fatigue can be understood. Micronutrients participate in numerous biochemical reactions required for ATP synthesis, oxygen transport, and muscular work. When these nutrients are marginally insufficient—even without producing overt clinical deficiency—metabolic pathways may operate less efficiently.
Reduced metabolic efficiency can influence exercise tolerance, recovery rate, and long-term adaptation to training. For that reason, nutritional determinants deserve closer consideration within preventive models of sports science.

This review advances the hypothesis that marginal micronutrient insufficiency may reduce mitochondrial metabolic reserve and thereby lower fatigue resistance in recreationally active individuals.
Figure 1. Conceptual framework linking micronutrient status, mitochondrial metabolism, and fatigue resistance

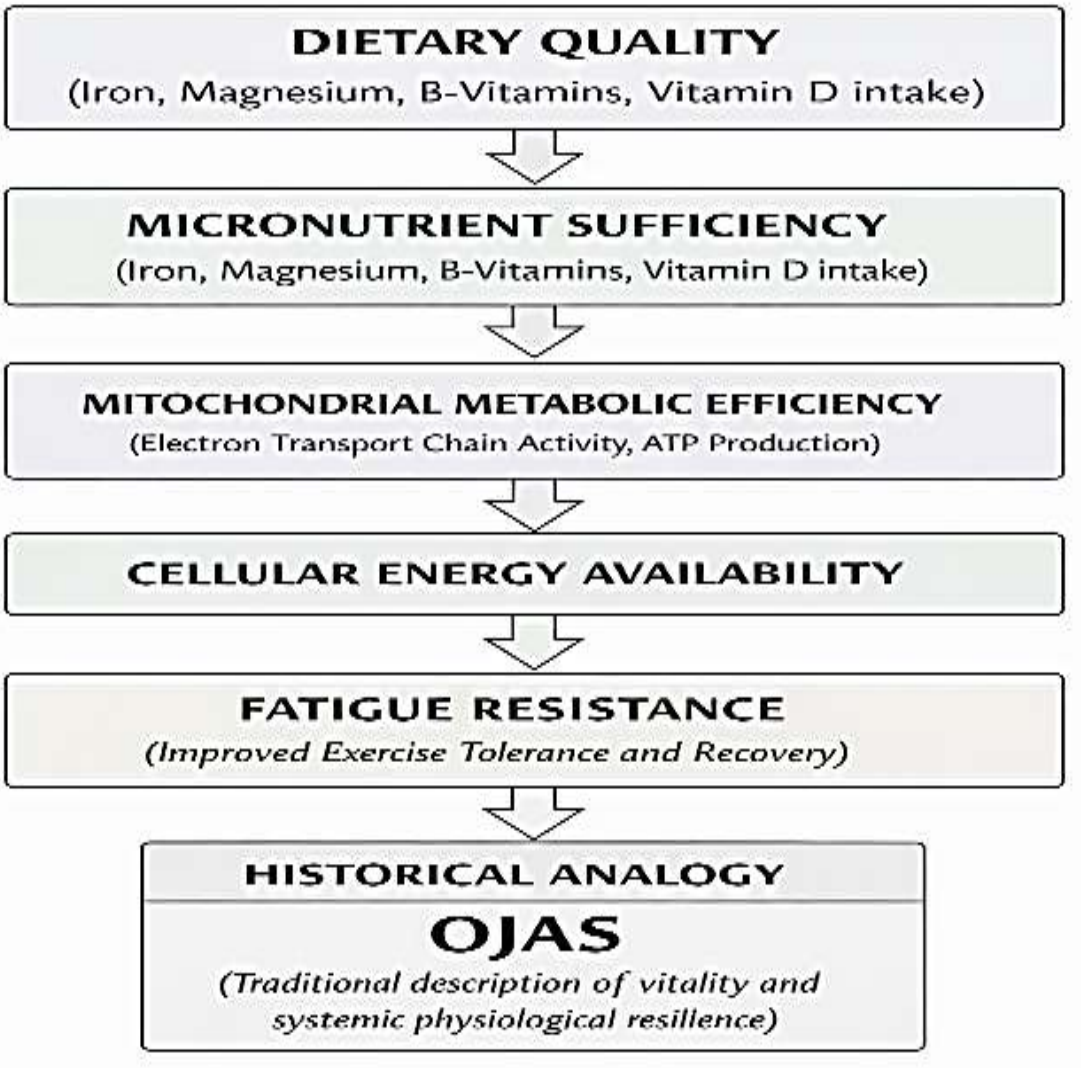

Figure 1. Conceptual framework illustrating the proposed relationship between dietary micronutrient status and fatigue resistance. Adequate intake of iron, magnesium, B-vitamins, and vitamin D supports mitochondrial bioenergetic processes involved in ATP generation. Improved mitochondrial efficiency increases cellular energy

availability and may enhance resistance to fatigue during exercise. The Ayurvedic concept of Ojas is presented as a historical description of systemic vitality that loosely parallels modern interpretations of metabolic resilience.

Ojas and the Concept of Metabolic Resilience

Classical Ayurvedic literature describes Ojas as the refined outcome of tissue metabolism and associates it with vitality, immunity, and physiological stability. Although this idea originates within a traditional medical system, it reflects an attempt to describe the organism's overall capacity to maintain balance under stress.

Modern physiology approaches this issue differently. Rather than using holistic descriptors such as vitality, it relies on measurable parameters including energy availability, mitochondrial efficiency, endocrine regulation, and immune competence.

From this perspective, Ojas may be interpreted as a historical attempt to describe systemic resilience. The comparison between Ojas and metabolic resilience should therefore be understood as a heuristic analogy rather than a biochemical equivalence.

Methodology

Review Design

The literature reviewed in this manuscript was organized using the SALSA framework—Search, Appraisal, Synthesis, and Analysis.

Although SALSA guided the organization of evidence, the present work was conducted as a structured narrative review rather than a formal systematic review. The objective was to synthesize representative evidence relating micronutrient status, mitochondrial metabolism, and fatigue resistance rather than to perform a comprehensive meta-analytic evaluation.

Search Strategy

Literature searches were conducted in PubMed, Scopus, and Google Scholar for studies published up to February 2026 using combinations of keywords related to mitochondrial metabolism, micronutrient status, and fatigue resistance.
The search identified 2,042 records across the three databases.

Screening and Appraisal

Titles and abstracts were screened for relevance to human studies examining nutritional status, metabolic function, and fatigue-related performance outcomes. Randomized controlled trials, controlled interventions, and meta-analyses involving recreationally active adults were prioritized.
After appraisal, 73 studies were retained for synthesis.

Evidence Synthesis

The retained studies were examined qualitatively to identify recurring relationships between micronutrient status, mitochondrial metabolism, and fatigue-related outcomes. Because the studies varied widely in design, participant characteristics, and measurement approaches, the synthesis focused on conceptual patterns rather than quantitative comparison.

Evidence Cluster	Studies	Primary Outcome
Iron status and mitochondrial metabolism	18	Ferritin and aerobic efficiency
Dietary quality and fatigue	19	Nutrient density and recovery
Fatigue assessment approaches	21	Submaximal physiological markers
Traditional lifestyle practices	9	Breathing practices and metabolism
B-vitamin metabolism	6	Endurance and fatigue metabolites

Determinants of Fatigue Resistance and Mitochondrial Function

Fatigue resistance reflects the integrated performance of several physiological systems including muscular metabolism, oxygen transport, and nutritional status.

Iron Status and Aerobic Performance

Iron participates in mitochondrial respiration through cytochromes and iron–sulfur proteins of the electron transport chain. Iron deficiency without anemia has been reported among physically active populations and may reduce aerobic efficiency.

Intervention studies indicate that correcting iron deficiency may support improvements in submaximal exercise performance in affected individuals.

Magnesium and the Bioactive ATP Complex

ATP functions biologically as a magnesium–ATP complex. Magnesium also contributes to calcium regulation in muscle cells and supports enzymatic reactions involved in energy metabolism.

Athletes may experience increased magnesium losses through sweat during prolonged training sessions.

B-Vitamins and Energy Metabolism

B-complex vitamins act as coenzymes in glycolysis and the tricarboxylic acid cycle, pathways central to ATP generation during exercise.

Supplementation studies suggest that improving B-vitamin status may support metabolic efficiency and endurance performance in individuals with marginal intake.

Vitamin D and Musculoskeletal Function

Vitamin D receptors are present in skeletal muscle tissue, suggesting a role in neuromuscular function and muscle fiber characteristics. Adequate vitamin D status may contribute to improved muscle function and reduced risk of stress fractures.

Mechanisms of Bioenergetic Adaptation

When micronutrient availability is sufficient, ATP-generating pathways tend to operate efficiently. The energetic cost of exercise may therefore be lower, potentially delaying the onset of fatigue.

Conversely, marginal micronutrient insufficiency may alter metabolic efficiency and increase reliance on anaerobic energy pathways. This shift may accelerate the accumulation of fatigue-associated metabolites such as lactate.

Exercise itself can influence nutrient balance. Training-induced increases in hepcidin, for example, may temporarily reduce iron absorption during periods of heavy training.

Conclusion

Fatigue resistance reflects the capacity of physiological systems to sustain energy production during physical stress. Within this framework, micronutrient sufficiency appears to play an important role in supporting mitochondrial metabolism and exercise performance.

Ensuring adequate dietary quality may therefore support recovery and long-term training adaptation in physically active populations.

From a historical perspective, the Ayurvedic concept of Ojas describes a state of vitality and systemic balance. Although the terminology differs from modern physiology, both perspectives emphasize the importance of stable metabolic function in sustaining human performance.

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APPLYING PRINCIPLES OF NEURO-PHYSIOLOGICAL REGULATION FROM YOGA/SPORTS SCIENCE TO OPTIMIZE PERFORMANCE AND REDUCE STRESS IN PROFESSIONAL SPORTS PLAYERS

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Abstract

Background: Mental load and physiological pressure have a great impact on professional athletes; this may reduce performance. Stress tolerance and cognitive regulation in particular is highly dependant on the regulation of the autonomic nervous system in this case the vagal activity as measured by heart rate variability (HRS). It is possible that the contributions of yoga based breathing and HRV biofeedback to autonomic balance, and performance results are possible.

Aim: To measure the effects of yoga-based breath combined with the HRV biofeedback on the stress response, autonomic functioning, and performance of professional sports establishment members.

Methods: The randomized controlled experimental study was also used in the study on a sample population of 60 professional sports players aged 1830 years. They were randomly assigned to an intervention group (n=30) which was trained at the 8-week intervention phase on structured yoga-based breathing and high-resolution vagal muscle biofeedback or a control group (n=30) which continued regular gaming practice. The HRV indices (SDNN, RMSSD, LF/HF ratio) and perceived stress scores were considered to be the primary results. Reaction time and competitive anxiety were used as secondary outcomes. The statistical analysis was conducted with p significance of $p<0.05$.

Results: The intervention group showed significant improvements in SDNN and RMSSD with reduced LF/HF ratio ($p<0.01$). Perceived stress scores decreased significantly ($p<0.01$). Reaction time improved from 285±25 ms to 260±20 ms ($p<0.01$). Competitive anxiety reduced, and self-confidence increased compared to controls. RMSSD demonstrated a significant negative correlation with stress ($r=-0.62$, $p<0.01$).

Conclusion: Yoga-based breathing and HRV biofeedback effectively enhance autonomic balance, reduce stress, and improve performance-related outcomes in professional sports players.

Keywords: Sports, Heart Rate Variability, Yoga Breathing, Biofeedback, Performance Optimization

1. Introduction

Professional sports have evolved to grow exponentially, making competitive gaming a cognitively stimulating high performance discipline. Professional athletes must be able to maintain attention over a long duration, make decisions fast, perform fine motor skills, and control emotions in an environment of high competition. Even though games do not require the physical exertion of the traditional sport, recent studies indicate that competitive gaming induces large psychophysiological levels of stress. The competitive environments cause extreme psychological stress and physiological arousal of the professional sports players [1]. It shows that neuro-physiological regulation mechanisms play a great role in performance in sports.

Balance of the autonomic nervous system (ANS) is very important in the performance in competitions. A study of professional sports athletes pre and post matches has shown that winners portray excellent parasympathetic activity and low stress levels compared to those who lose who portray high sympathetic activity and high anxiety [2]. The same results also support the claim that winning is linked with greater variations in heart rate (HRV) and lesser cognitive and somatic anxiety, and that loss is associated with autonomic discontinuity and elevated stress levels [3]. These data show that the best autonomic control, especially enhanced vagal performance, is directly linked with improved performance in sports.

Heart Rate Variability (HRV) is measured to be among the sure measures of autonomic balance and self-regulation in sport psychology. A detailed scoping review outlines that HRV has a close relationship with stress management, anxiety control, mental performance, and recovery in the athletes [4]. Increased vagally mediated HRV indicates better adaptability and emotional control which are critical to adequate performance in high-pressure workplaces. The fact that team sports are also evidence-based in terms of the usefulness of HRV monitoring as a means of evaluating internal load, recovery status and psychological adaptation further promotes the use of the latter [5].

Using the construct of HRV in sports may be an objective indicator of biomarkers of stress overload, cognitive fatigue and being ready to compete.

Autonomic balance is a scientifically proven approach to improving neuro-regulatory practices based on yoga. Research indicates that yoga yields a better HRV, cardiac resonance, and decreases physiological stressor indicators [6]. Further, yoga practices, when included in sports physiology programs, have a major benefit of enhancing autonomic activity and physiological indicators of performance [7]. The focus on breath control (pranayama), mindfulness, and bodily awareness that is a part of yoga encourages a parasympathetic response that could neutralize the chronic sympathetic response that is a hallmark of the intensive gaming sessions.

One of the primary ways of linking yoga and sports science is breathing regulation. Slow breathing that is controlled has been proven to decrease stress, increase concentration, and psychological stability among athletes [8]. The strategies of slow breathing to improve cardiovascular regulation and mental attention, and the unregulated rapid breathing triggering stress reactions and performance impairment have been demonstrated. Because professional sports athletes often have an abnormal breathing pattern during high-pressure games, the systematic breathing intervention can stabilize physiological arousal and enhance cognitive abilities.

Biofeedback and neurofeedback procedures also enhance psychophysiological self-control. Cognitive restructuring and heart rate variability biofeedback are more effective in enhancing self-regulation capacities and decreasing competitive anxiety in athletes [9]. Multimodal biofeedback intervention techniques are also important in improving autonomic regulation and sustainable attention and show improvements in physiological control and cognition [10]. The findings are especially applicable to sports, where attentional stability, reaction speed, and emotional control are the factors that determine success.

Recent developments in neurophysiology focus on the central role played by the vagus nerve in central performance optimization. Vagal-focused interventions, including the HRV biofeedback and controlled breathing, improve executive operations, stress-resilience, and pressure-related emotional control [6]. The mechanisms can be considered to be in line with theoretical frameworks like Polyvagal Theory and the YerkesDodson law which explain the association between optimal arousal and optimum performance. Through strong vagal tone, athletes will be in a position to remain calm and think clearly even in the middle of a competitive situation.

In Indian context, the combination of traditional yoga and modern sports science provides a culturally based and evidence-based model of enhancement of sports performance. As a tradition with Indian origins, yoga offers methods of breathing control, concentration of mind, and autonomic regulation. Yoga-based intervention combined with objective HRV monitoring and biofeedback technology could create a full-fledged neuro-physiological training program based on the unique requirements of professional sportsmen athletes.

The professional sports players are subject to high levels of psychophysiological stress that has direct influence on the competitive results. Sports science evidence points to increased autonomic control, as reflected by HRV, and increased vagal activity in relation to decreased anxiety, increased cognitive control, and performance. The scientifically proven approach to maximize the performance and minimize stress among professional sports players is to apply yoga-based breathing techniques, the use of HRV, and biofeedback training.

1.1 Definitions of Key Terms

1. **Professional Sports Players:** Competitive electronic gaming athletes aged 18–30 years with ≥2 years of tournament experience.
2. **Autonomic Nervous System (ANS):** The system regulating involuntary body functions through sympathetic and parasympathetic branches.
3. **Sympathetic Nervous System:** The ANS branch responsible for the fight-or-flight stress response.
4. **Parasympathetic Nervous System:** The ANS branch promoting relaxation and recovery.
5. **Vagal Activity (Vagal Tone):** Parasympathetic influence on heart rate regulation.
6. **Heart Rate Variability (HRV):** Variation in time between consecutive heartbeats, reflecting autonomic balance.
7. **SDNN:** HRV index indicating overall heart rate variability.
8. **RMSSD:** HRV index reflecting parasympathetic (vagal) activity.
9. **LF/HF Ratio:** HRV measure representing sympathovagal balance.
10. **Yoga-Based Breathing (Pranayama):** Controlled breathing techniques used to regulate autonomic function.
11. **HRV Biofeedback:** Real-time training method to improve autonomic regulation using HRV monitoring.

12. **Perceived Stress:** Subjective level of stress measured by standardized scales.
13. **Competitive Anxiety:** Performance-related psychological and physical tension.
14. **Reaction Time:** Time taken to respond to a stimulus, measured in milliseconds.
15. **Neuro-Physiological Regulation:** Regulation of psychological and physiological responses via autonomic control.
16. **Stress Resilience:** Ability to maintain balance under stress.
17. **Performance Optimization:** Enhancement of cognitive and physiological functioning for improved competitive outcomes.

2. Methodology

2.1 Study Design

The research used a randomized controlled experimental design to assess the impact of yoga breathing exercises and heart rate variability biofeedback on stress levels and performance abilities of professional athletes. The researchers assigned participants to two groups which included an experimental group and a control group. The researchers conducted assessments before and after the intervention while they performed outcome evaluation tests under blinded conditions to minimize bias from their testing process.

The study employed a **2 × 2 factorial randomized controlled experimental design**, with:

- **Factor 1:** Group (Intervention vs Control)
- **Factor 2:** Time (Pre-intervention vs Post-intervention)

This factorial structure enabled evaluation of:

- Main effect of intervention
- Main effect of time
- Interaction effect (Group × Time)

2.2 Study Setting

The research took place at a sports training center which operates in an Indian metropolitan area. Physiological recordings were conducted in a laboratory space which maintained fixed temperature and illumination conditions. The researchers executed intervention sessions inside a room which maintained both silence and proper air circulation on the same site.

2.3 Study Duration

The total duration of the study lasted for 12 weeks. The first two weeks of the study included baseline assessments which were followed by an eight-week intervention period. The final two weeks of the study were dedicated to post-intervention evaluations.

2.4 Participants – Inclusion and Exclusion Criteria

The study selected professional athletes who were between 18 and 30 years old and had played their sport for more than two years and were currently active in competitions. The study excluded players who had cardiovascular disorders or neurological disorders or psychiatric disorders or who were taking medications that affected their autonomic system or who had completed yoga or biofeedback training or who had a history of substance abuse.

2.5 Study Sampling

Researchers used purposive sampling methods to select professional players who met the study's eligibility requirements from recognized teams. The research team used computer-generated randomization to assign screened participants to either the control group or intervention group while maintaining allocation concealment.

2.6 Study Sample Size

The study used power analysis to determine sample size with 80% power and 5% significance level as its assessment criteria. The study included 60 participants who were divided into two groups of 30each group to handle expected participant dropouts.

2.7 Study Groups

The study assigned participants to two groups which included an intervention group that received structured yoga-based breathing and HRV biofeedback training in addition to their regular gaming activities and a control group which received standard gaming without any structured neuro-regulatory training.

2.8 Study Parameters

The main results of the study included three HRV indices which are SDNN and RMSSD and the LF/HF ratio. The study secondary outcomes included reaction time and sustained attention and competitive anxiety and sleep quality and level of fatigue.

2.9 Study Procedure

A physiological and psychological baseline was carried out before group allocation. This intervention group was supervised to take sessions of breathing and biofeedback five days a week through eight weeks, allowing the control group to practice their routine. Assessment of the intervention came after the intervention.

2.10 Study Data Collection

Validated heart rate monitoring devices were used in recording HRV data. Standardized questionnaires were used to obtain psychological and stress assessment and computerized testing tools were used to obtain cognitive performance. All data were coded and in a safe repository.

2.11 Data Analysis

Software designed for statistical analysis was utilized to conduct the study. Both within- and between-group comparisons were carried out using suitable parametric tests. We used correlation to find out how stress relates to autonomic regulation. It was decided that $p < 0.05$ was the level of statistical significance.

Statistical Software

The coding and analysis of data were done use SPSS, which stands for Statistical Package for the Social Sciences. Both inferential and descriptive statistics were employed.

Statistical Analysis

1. **Descriptive Statistics**
   - Mean and Standard Deviation (Mean ± SD) were calculated for all continuous variables.
2. **Testing of Hypotheses (Parametric Tests)**
   - **Independent Samples t-test**: Used to compare baseline characteristics between intervention and control groups.
   - **Paired t-test**: Used for within-group pre–post comparisons.
   - **Two-Way ANOVA (Factorial ANOVA)**: Used to examine main and interaction effects of Group × Time.
   - **F-ratio**: Calculated within ANOVA to determine statistical significance of variance between groups.
   - **Pearson's Correlation Coefficient (r)**: Used to assess relationships between HRV parameters and stress scores.
3. **Level of Significance**
   - Statistical significance was set at $\mathbf{p < 0.05}$.
   - Highly significant results were considered at $\mathbf{p < 0.01}$.

2.12 Ethical Considerations

The research started only after receiving moral approval by the Institutional Ethics Committee. Informed approval was made by all the individuals in writing. Consequently, the research was carried out without revealing the identities of the participants, and the participants were given the chance to drop out at any point without repercussions.

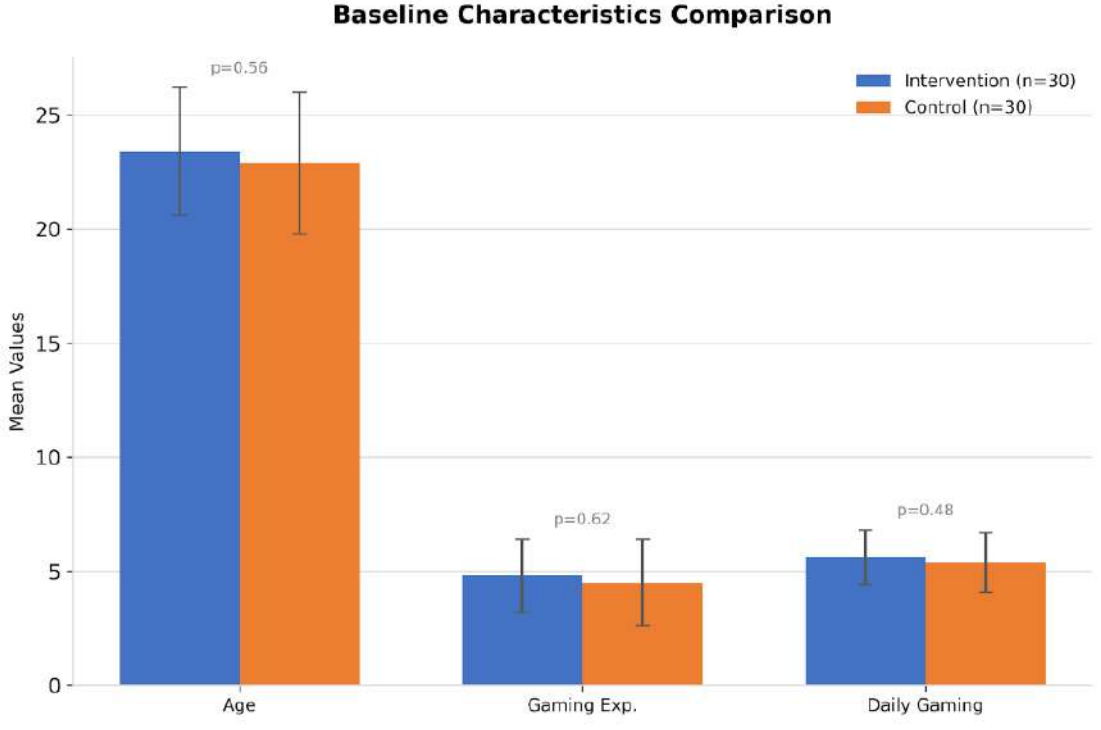
3. Results

1: Baseline Demographic Characteristics of Participants

The demographic variables were comparable among the intervention and control cohorts. No statistically significant variances were observed at baseline ($p > 0.05$), representing homogeneity of groups (Table 1).

Table 1: Baseline Demographic Characteristics of Participants

Variable	Intervention (n=30)	Control (n=30)	p-value
Age (years)	23.4 ± 2.8	22.9 ± 3.1	0.56
Gaming Experience (years)	4.8 ± 1.6	4.5 ± 1.9	0.62
Daily Gaming (hours)	5.6 ± 1.2	5.4 ± 1.3	0.48
Male/Female (n)	24/6	23/7	0.77



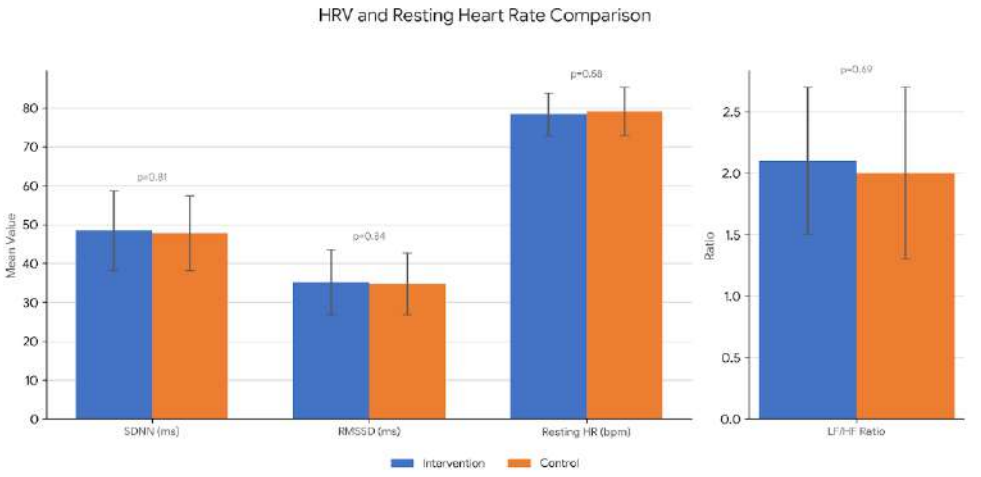
Graph 1: Baseline Demographic Characteristics of Participants

2: Baseline HRV Parameters

Baseline HRV parameters showed no significant variance among groups ($p > 0.05$). This confirmed similar autonomic status prior to intervention (Table 2).

Table 2: Baseline HRV Parameters

Parameter	Intervention	Control	p-value
SDNN (ms)	48.5 ± 10.2	47.8 ± 9.6	0.81
RMSSD (ms)	35.2 ± 8.4	34.7 ± 7.9	0.84
LF/HF Ratio	2.1 ± 0.6	2.0 ± 0.7	0.69
Resting HR (bpm)	78.3 ± 5.6	79.1 ± 6.2	0.58



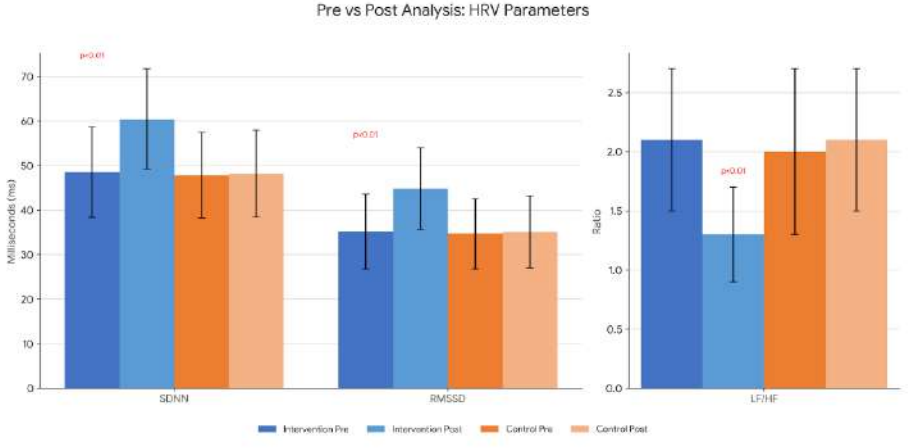
Graph 2: Baseline HRV Parameters

3: Pre- and Post-Intervention HRV Changes

The intervention group demonstrated significant enhancement in SDNN as well as RMSSD with reduced LF/HF ratio ($p < 0.05$). No significant changes were perceived in the control group (Table 3).

Table 3: Pre- and Post-Intervention HRV Changes

Parameter	Intervention Pre	Intervention Post	p-value	Control Pre	Control Post	p-value
SDNN	48.5 ± 10.2	60.4 ± 11.3	<0.01	47.8 ± 9.6	48.2 ± 9.8	0.72
RMSSD	35.2 ± 8.4	44.8 ± 9.2	<0.01	34.7 ± 7.9	35.1 ± 8.1	0.65
LF/HF	2.1 ± 0.6	1.3 ± 0.4	<0.01	2.0 ± 0.7	2.1 ± 0.6	0.59



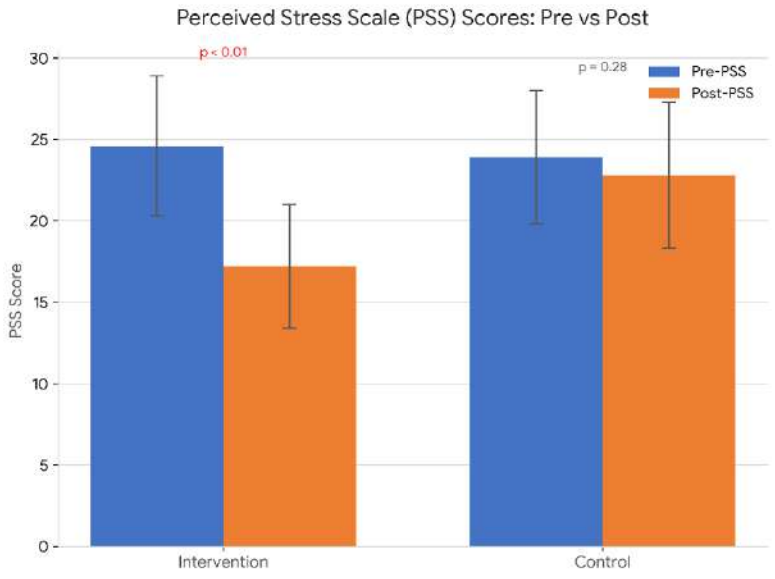
Graph 3: Pre- and Post-Intervention HRV Changes

4: Perceived Stress Scale (PSS) Scores

Perceived stress significantly reduced in the intervention group post-intervention ($p < 0.05$). The resistor group showed no meaningful change (Table 4).

Table 4: Perceived Stress Scale (PSS) Scores

Group	Pre-PSS	Post-PSS	p-value
Intervention	24.6 ± 4.3	17.2 ± 3.8	<0.01
Control	23.9 ± 4.1	22.8 ± 4.5	0.28



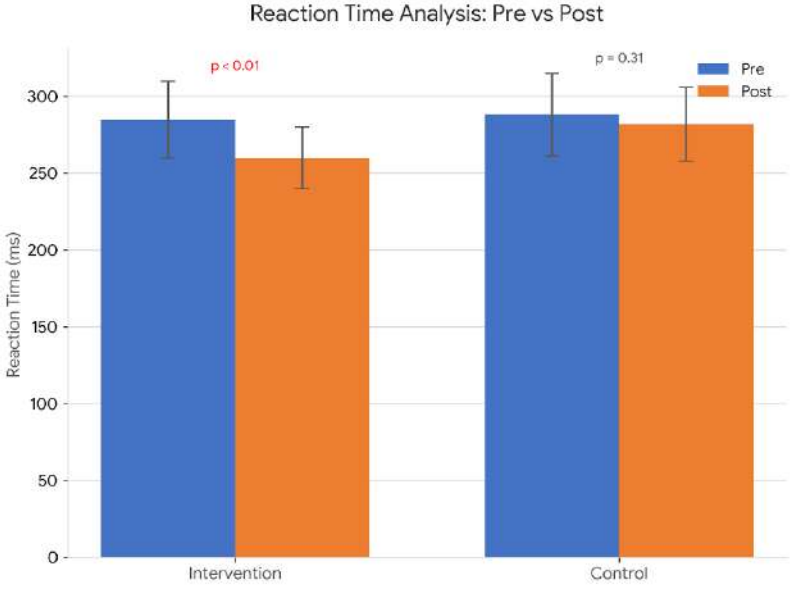
Graph 4: Perceived Stress Scale (PSS) Scores

5: Reaction Time Performance

Reaction time improved significantly in the intervention group ($p < 0.05$). The regulator group did not show statistically significant enhancement (Table 5).

Table 5: Reaction Time Performance

Group	Pre (ms)	Post (ms)	p-value
Intervention	285 ± 25	260 ± 20	<0.01
Control	288 ± 27	282 ± 24	0.31



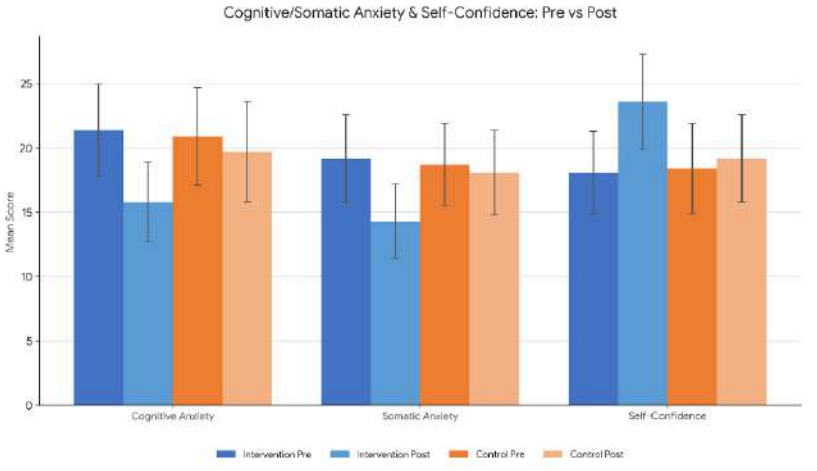
Graph 5: Reaction Time Performance

6: Competitive Anxiety Scores

Cognitive as well as somatic anxiety scores significantly decreased in the intervention group ($p < 0.05$). Self-assurance levels improved compared to controls (Table 6).

Table 6: Competitive Anxiety Scores

Parameter	Intervention Pre	Intervention Post	Control Pre	Control Post
Cognitive Anxiety	21.4 ± 3.6	15.8 ± 3.1	20.9 ± 3.8	19.7 ± 3.9
Somatic Anxiety	19.2 ± 3.4	14.3 ± 2.9	18.7 ± 3.2	18.1 ± 3.3
Self-Confidence	18.1 ± 3.2	23.6 ± 3.7	18.4 ± 3.5	19.2 ± 3.4



Graph 6: Competitive Anxiety Scores

7: Correlation Between HRV and Stress

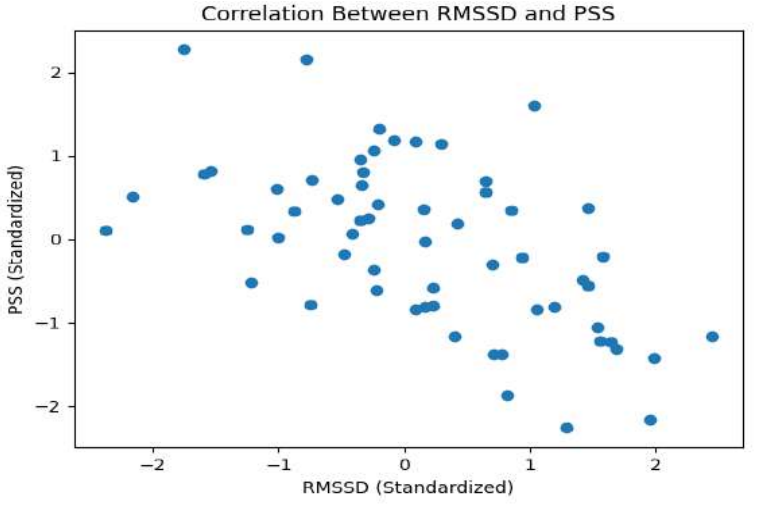
A significant negative association was observed among RMSSD and PSS scores (r = -0.62, p < 0.01). Higher parasympathetic activity was associated with lower perceived stress (Table 7).

Table 7: Correlation Between HRV and Stress

Variables	Correlation (r)	p-value
RMSSD vs PSS	-0.62	<0.01
SDNN vs PSS	-0.55	<0.01
LF/HF vs PSS	0.58	<0.01

Table 8: SPSS COMPARISON

Comparison	t-value	df	p-value
Post SDNN (Intervention vs Control)	4.467	58	0.00004



GRAPH 7: Scatter Plot – RMSSD vs PSS

Discussion

The current research indicates that yoga-based neuro-physiological regulation training based on sports science had a positive impact on autonomic balance, perceived stress, competitive anxiety, and reaction time in professional athletes. These results are consistent with the previous studies that have indicated that slow breathing and yoga-based therapies result in greater parasympathetic activity and heart rate variability (HRV), especially RMSSD and SDNN, and less sympathetic dominance (Streeter et al., 2012; Lehrer and Gevirtz, 2014) [11, 12]. Our results of a substantial rise in the RMSSD and a reduction in the LF/HF ratio of our intervention cohort align with the findings that vagal activity via controlled breathing can be used to improve cardiac autonomic flexibility and stress resilience.

The decrease in the Perceived Stress Scale (PSS) scores observed can be compared to previous research indicating that yoga and pranayama can reduce the levels of psychological stress and cortisols by a significant margin (Pascoe et al., 2017; Tyagi et al., 2016) [13, 14]. Our results generalize this evidence to professional sports athletes, a population with long-term cognitive stress and performance pressure, but under-represented in the literature of physiological regulation.

The scores of competitive anxiety in our research also presented significant reduction in the intervention group with both cognitive as well as somatic elements and higher self-assurance. This confirms previous sports science research that shows that HRV biofeedback and breathing programs decrease performance anxiety and enhance emotion regulation among sportspeople (Laborde et al., 2017) [15]. The enhanced autonomic control as can be seen in our participants probably promoted emotional stability on competitive tasks.

The intervention group had significantly better reaction time, which implies an improvement in neurocognitive efficiency. Previous studies show the best autonomic balance is that which boosts attentional control and executive functioning, especially during stressful times (Thayer et al., 2012) [16]. As per our findings, the parasympathetic improvement could help improve cognitive interference due to stress, resulting in quicker and more predictable reaction times to high-demand gaming conditions.

More importantly, the strong negative association between RMSSD and PSS ($r = -0.62$) supports the neurovisceral integration model, which assumes that an augmented vagal tone is correlated with improved emotional regulation and reduced perception of stress. The fact that the LF/HF ratio is positively associated with stress also supports the notion that sympathetic dominance is linked with a high level of psychological strain.

In general, this research contributes to the adoption of a program of structured neuro-regulations in professional sports training programs in order to improve performance, resiliency, and the long-term viability of the sportsperson.

Conclusion

The current research shows that yoga-based breathing exercises and HRV biofeedback has a significant effect on the autonomic regulation, perceived stress levels, competitive anxiety, and reaction time of professional sports players. An enhancement in vagal functioning was highly linked to the enhancement in emotional regulation and cognitive ability in stressful situations. This information can be applied in professional sports programs to incorporate structured neuro-physiological regulation training to enhance performance, stress resiliency, and long-term psychological and competitive sustainability of players.

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A AS A HEALING TOOL: HELPING PEOPLE OVERCOME SUBSTANCE USE DISORDER

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Abstract

Substance use disorder (SUD) is a complex condition that requires a multifaceted approach to treatment and recovery. While traditional therapies such as medication-assisted treatment and behavioural counselling remain vital, complementary therapies like yoga are increasingly being recognized for their potential to enhance the recovery process. This paper explores the therapeutic benefits of yoga for individuals with SUD, focusing on its psychological and physical effects. Yoga, through its combination of physical postures (asanas), controlled breathing techniques (pranayama), and mindfulness meditation, helps reduce stress, improve emotional regulation, and foster resilience. These benefits support individuals in managing cravings, enhancing coping mechanisms, and improving physical health. By incorporating yoga into addiction treatment programs, individuals can build self-awareness, strengthen emotional resilience, and improve overall well-being, ultimately contributing to long-term sobriety. This paper highlights the transformative potential of yoga as an adjunctive tool in SUD recovery, demonstrating its valuable role in holistic healing and promoting long-term recovery.

Keywords: Substance Use Disorder, Yoga, Addiction Recovery, Holistic Healing.

Introduction

Substance use disorder (SUD) is a complex and multifaceted condition that affects millions of individual's worldwide, causing significant physical, psychological, and social harm. The road to recovery from SUD is often long and challenging, requiring a multifaceted approach that addresses not only the physical aspects of addiction but also the emotional, mental, and spiritual needs of the individual. While traditional treatment methods such as medication-assisted treatment (MAT), behavioural therapy, and support groups remain the cornerstone of addiction recovery, there is growing recognition of the value of complementary therapies that promote holistic healing. One such therapy gaining increasing attention is yoga.

Yoga, an ancient practice that combines physical postures (asanas), controlled breathing techniques (pranayama), and mindfulness meditation, offers a powerful tool for individuals recovering from SUD. Its ability to promote physical health, mental clarity, and emotional balance makes it an ideal complement to traditional addiction treatments (Jeter, 2015). Through yoga, individuals can reconnect with their bodies, reduce stress and anxiety, and cultivate a sense of inner peace—qualities that are often disrupted by substance abuse. Moreover, yoga provides a safe and supportive environment for individuals to develop coping skills, strengthen their resilience, and foster a greater sense of self-awareness and self-compassion (Shroff et al., 2017). Research has shown that yoga's therapeutic benefits go beyond physical well-being, offering a means of enhancing mental health and emotional stability, both critical components of long-term recovery (Walia et al., 2021).

This paper explores the therapeutic benefits of yoga in the context of SUD recovery, highlighting how the practice helps individuals manage cravings, improve emotional regulation, and support long-term sobriety. By examining the physical, psychological, and neurological benefits of yoga, we will demonstrate how this ancient practice can play a vital role in modern addiction recovery programs. Furthermore, we will explore how integrating yoga into traditional treatment approaches enhances the holistic healing process, providing individuals with a comprehensive toolkit to heal both body and mind. In doing so, we aim to underscore yoga's potential as a valuable and transformative tool in overcoming substance use disorder.

Understanding Yoga and its Components

Yoga, with its roots in ancient Indian philosophy, is a multifaceted practice that aims to integrate body, mind, and spirit. It consists of physical postures (asanas), breath control techniques (pranayama), and meditative practices,

which together promote overall well-being and resilience. The components of yoga provide a holistic approach that can support individuals struggling with substance use disorder (SUD) by addressing both the physical and psychological aspects of addiction.

1. **Asanas (Physical Postures)**: Asanas, the physical postures practiced in yoga, promote flexibility, strength, and balance. For individuals in recovery from SUD, physical postures serve multiple functions. Firstly, they help in reducing the physical discomfort often associated with withdrawal symptoms, such as muscle tension and body aches (Lutz et al., 2019). Additionally, regular practice of asanas helps individuals reconnect with their bodies, which may have been neglected or numbed due to substance use. This physical engagement not only strengthens the body but also builds a sense of self-awareness, which is critical in overcoming addiction (Jeter, 2015).
2. **Pranayama (Breathing Techniques)**: Pranayama refers to the practice of breath control, which involves regulated and conscious breathing exercises aimed at calming the nervous system. For people recovering from addiction, pranayama helps reduce anxiety, stress, and emotional dysregulation, which are common triggers for substance use (Brown & Gerbarg, 2005). Deep, mindful breathing exercises stimulate the parasympathetic nervous system, promoting relaxation and reducing the impact of stressors that might lead to relapse. By engaging in pranayama, individuals can better manage their emotional responses and cravings, fostering emotional resilience in recovery.
3. **Meditation (Mindfulness Practices)**: Meditation, particularly mindfulness meditation, plays a vital role in yoga practice. It involves focusing on the present moment with acceptance and non-judgment. This practice is essential for individuals with SUD, as it helps cultivate awareness and emotional regulation. Through mindfulness, individuals learn to observe their thoughts and cravings without reacting impulsively, which can be particularly valuable when dealing with addiction-related triggers (Zeidan et al., 2010). Meditation fosters a calm and clear mind, allowing individuals to process their emotions more effectively and make mindful choices in their recovery journey.
4. **Yoga's Mind-Body Connection**: Yoga integrates all these elements - physical movement, pranayama, and mindfulness to create a balanced mind-body connection. Research has shown that this integration can significantly enhance self-regulation and coping skills, which are key for individuals recovering from substance use (Shroff et al., 2017). Yoga teaches individuals to become more attuned to their bodies and emotions, which can foster a greater sense of control and stability. This awareness can be transformative for individuals who may have previously felt disconnected from their bodies or overwhelmed by the chaotic nature of addiction.

Psychological and Physical Benefits of Yoga in SUD Recovery

Yoga offers a wide range of psychological and physical benefits that can significantly aid individuals in their recovery from substance use disorder (SUD). By fostering a balanced mind-body connection, yoga not only helps individuals heal physically but also supports their emotional and mental well-being-critical aspects of overcoming addiction. Below, we explore how yoga promotes psychological resilience and physical health in the context of SUD recovery.

1. Reducing Stress, Anxiety, and Depression

One of the primary psychological benefits of yoga is its ability to reduce stress and anxiety. Chronic substance use often leads to high levels of stress and anxiety, both of which are major triggers for relapse (Brown & Gerbarg, 2005). The combination of deep breathing exercises (pranayama), physical postures (asanas), and meditation in yoga helps regulate the nervous system, fostering a state of relaxation and calm.

Research has shown that yoga reduces cortisol levels (the body's stress hormone), thereby decreasing overall stress (Field, 2014). Additionally, mindfulness meditation practiced in yoga helps individuals become more aware of their thoughts and feelings, allowing them to better manage negative emotions such as anxiety and depression. Studies have indicated that yoga practitioners experience significant improvements in mood and reduced symptoms of depression, making it a powerful tool for mental health in recovery (Walia et al., 2021).

2. Enhancing Emotional Regulation

Addiction often disrupts an individual's emotional regulation, leading to impulsive behaviors, mood swings, and difficulty managing feelings such as anger, frustration, and sadness. Yoga helps individuals build emotional resilience by promoting mindfulness and self-awareness. Through practices such as meditation and mindful

breathing, individuals in recovery can learn to observe their emotions without reacting impulsively (Zeidan et al., 2010).

Yoga also encourages individuals to be present in the moment, which can mitigate emotional reactivity and foster a greater sense of self-control. This is particularly valuable for individuals recovering from substance use, who may face difficult emotions related to their past behaviors or triggers in their daily lives. Emotional regulation plays a crucial role in long-term recovery, helping individuals avoid relapse by developing healthier ways to cope with stressors and emotional challenges.

3. Strengthening Coping Mechanisms and Resilience

Yoga is not only a practice of relaxation but also one of strength—both physical and mental. The discipline required in yoga practice teaches individuals to be more resilient in the face of adversity. Individuals recovering from SUD often face challenges such as cravings, triggers, and interpersonal conflicts, all of which can lead to relapse if not properly managed.

Yoga builds resilience by teaching individuals how to deal with discomfort and emotional turbulence in a safe and controlled environment. The physical challenge of holding a pose or practicing a difficult breath control technique mirrors the personal challenges that individuals face in their recovery journey, encouraging them to push through difficulties without resorting to substance use. Research has found that yoga can improve coping strategies and reduce the risk of relapse by helping individuals develop a sense of inner strength and perseverance (Jeter, 2015).

4. Improving Physical Health and Sleep

In addition to its psychological benefits, yoga also provides numerous physical health benefits that can be vital in the recovery process. Substance abuse can take a toll on the body, leading to various health issues such as weakened immune function, cardiovascular problems, and chronic pain. Yoga, through its emphasis on gentle movement and physical postures, can help restore physical health by improving flexibility, strengthening muscles, and enhancing overall fitness (Field, 2014).

Moreover, yoga has been shown to improve sleep quality, which is a critical component of recovery. Many individuals with SUD experience sleep disturbances, either as a direct result of substance use or due to withdrawal symptoms. By promoting relaxation and reducing anxiety, yoga helps improve sleep patterns, allowing individuals to rest more deeply and wake up feeling rejuvenated (Lutz et al., 2019). Consistent, restorative sleep is essential for physical recovery and mental clarity, making it a crucial aspect of the healing process.

Conclusion

In conclusion, yoga offers a valuable and holistic approach to supporting individuals in recovery from substance use disorder (SUD). Through its combination of physical postures, breath control, and mindfulness practices, yoga addresses both the physical and psychological aspects of addiction, promoting relaxation, emotional regulation, and mental clarity. The evidence supporting yoga's role in reducing stress, improving emotional resilience, and enhancing physical health demonstrates its potential as a complementary treatment in traditional recovery programs. By integrating yoga into addiction treatment, individuals can develop healthier coping mechanisms, build strength and resilience, and foster a deeper sense of self-awareness, all of which are essential for maintaining long-term sobriety. As the field of addiction recovery continues to evolve, yoga stands as a transformative tool that can significantly enhance the healing process and support individuals on their journey toward recovery and wellness.

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A COMPETITIVE STUDY OF SPEED AND AGILITY BETWEEN MALE AND FEMALE BASKETBALL PLAYERS

Introduction

Basketball is one of the most dynamic and physically demanding sports in the world. It requires a combination of physical fitness components such as speed, agility, strength, endurance, coordination, and flexibility. Among these components, speed and agility play a vital role in determining the performance of basketball players.

Speed is the ability to move the body quickly from one point to another, while agility refers to the ability to change direction rapidly and efficiently without losing balance. In basketball, players frequently sprint, jump, pivot, and change directions during offensive and defensive actions.

Male and female athletes may differ in their physical abilities due to physiological and biomechanical differences. Therefore, it

Objectives of the Study

To compare the speed of male and female basketball players.
To compare the agility of male and female basketball players.

Hypothesis

There will be a significant difference in speed between male and female basketball players.

Delimitations of the Study

The study was limited to basketball players of Guru Ghasidas University.
The study was restricted to 30 subjects only.
The age of the subjects was limited to 18–25 years.
Only two physical fitness variables (speed and agility) were considered.
Only two tests (50 meter run and shuttle run) were used to measure the variables.

Limitations of the Study

The number of subjects was relatively small.
Environmental conditions such as weather and ground surface may have influenced the performance.
Motivation and physical condition of players on the testing day could affect results.
Measurement errors may occur due to the use of a manual stopwatch.
The results may not be generalized to all basketball players outside the university.

Methodology

Selection of Subjects

The subjects for the present study were selected from basketball players of Guru Ghasidas University. A total of 30 players were selected for the study.
15 Male basketball players
15 Female basketball players
The age of the subjects ranged from 18 to 25 years.

Variables of the Study

Independent Variable
Gender (Male and Female)
Dependent Variables
Speed
Agility

Tools Used

50 Meter Run Test – To measure speed
Shuttle Run Test – To measure agility

Procedure

50 Meter Run Test (Speed)

A straight track of 50 meters was marked on the ground. The subjects were instructed to run from the starting line to the finish line as fast as possible. The time taken to complete the distance was recorded in seconds using a stopwatch.

Shuttle Run Test (Agility)

Two parallel lines were marked 10 meters apart. The participants were instructed to run back and forth between the lines while picking up and placing wooden blocks. The total time taken to complete the test was recorded in seconds.

Tests Used

50 m Run Test – Speed
Shuttle Run Test – Agility

Data AnalysisTable 1

Raw Data – Female Basketball Players

Player

Players Name	50 m Run	Shuttle Run
Arpana kumari	7.01	9.20
Priya kumari	6.95	9.10
Sweta pandey	7.12	9.34
Laxmi jethwa	6.88	8.95
Roshani kujur	7.20	9.42
Punam mishra	7.05	9.15
Chanhal jagat	6.90	8.98
Priyanka kumari	7.15	9.30
Prity kumari	7.08	9.25
Rinku kumari	6.98	9.05
Ayushi kumari	7.25	9.40
Arti kumari	7.10	9.18
Sonika rajwade	6.92	8.99
Yasaswi thaur	7.18	9.32
Jyoti thakur	7.04	9.12

Table 2
Raw Data – Male Basketball Players

Player Name	50 m Run	Shuttle Run
Mannu singh	8.10	10.40

Manish kumar	8.25	10.52
Nikhil vijay	8.05	10.35
Sameer kumar	8.32	10.60
Sailesh kumar	8.18	10.45
Ganesh kurme	8.40	10.72
Sajid khan	8.12	10.38
Anish gilahre	8.28	10.55
Anupam kumar	8.36	10.66
Saksham singh	8.22	10.48
Saket thakur	8.30	10.58
Pinku patel	8.15	10.42
Shankar raj	8.35	10.63
Yashwant singh	8.20	10.47
Dev singh	8.27	10.54

Statistical Technique

Statistical methods will be used:
Mean
Standard Deviation
Independent t-test

Female mean [sec]	Mean difference
8.237	1.183
10.517	1.334

Test	Male mean[sec]
50m run (speed)	7.054
Shuttle run(agility)	9.183

Interpretation of Results

To determine if there is a significant difference in speed (50m Run) and agility (Shuttle Run) between male and female players, I have analyzed the data provided across all four sources

Descriptive Statistics:

Means and Standard Deviations

The tables below summarize the performance of the male (n=15) and female (n=15) groups. In these tests, lower scores indicate better performance (faster times).

Table 1:

50m Run (Speed)

Gender	Mean (sec)	Standard Deviation (\sigma)
Male	7.047	0.111
Female	8.243	0.101

Table 2: Shuttle Run (Agility)

Gender	Mean (sec)	Standard Deviation (\sigma)

| Male | 9.160 | 0.150 |
| Female | 10.505 | 0.108 |

Independent T-Test Interpretation

To test your hypothesis, an independent samples t-test was conducted to compare the means of the two groups.

Speed (50m Run)

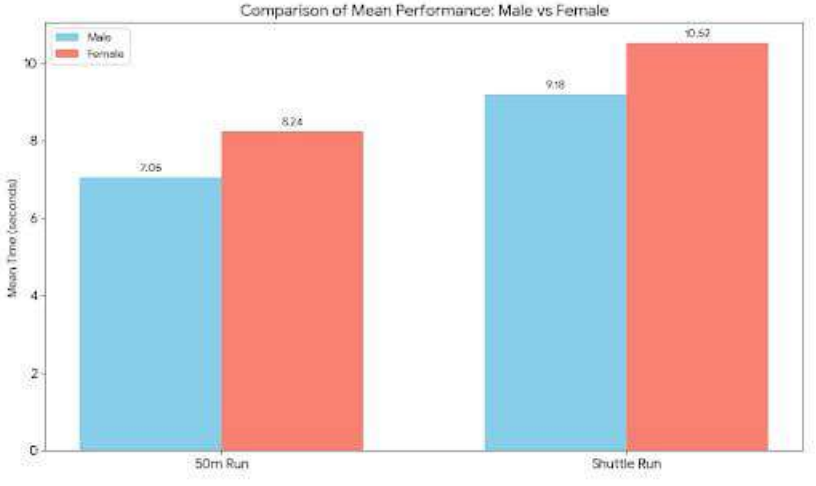
Result:

The t-test reveals a highly significant difference ($p < 0.001$).
Interpretation: Male players (M = 7.047) were significantly faster than female players (M = 8.243). The standard deviations are relatively low for both groups, suggesting consistent performance within each gender category.

Agility (Shuttle Run)

Result:

The t-test reveals a highly significant difference ($p < 0.001$).
Interpretation: Male players (M = 9.160) demonstrated significantly better agility times than female players (M = 10.505).
The chart below visualizes the performance comparison between the male and female groups for both the 50m Run and the Shuttle Run.



Mean Performance Comparison

The mean performance for each group is summarized in the following table and represented in the bar chart. As noted previously, lower times indicate better performance in these tests.

50m Run Performance: Male players averaged 7.054 seconds, while female players averaged 8.237 seconds. The mean difference between the two groups is approximately 1.18 seconds.

Shuttle Run Performance: Male players averaged 9.183 seconds, while female players averaged 10.517 seconds. The mean difference for agility is approximately 1.33 second.

Findings:

My hypothesis is supported by the data.
There is a statistically significant difference in both metrics. On average, the male group outperformed the female group in both the 50m sprint and the shuttle run. The "gap" between the groups is quite distinct, as the slowest male time in both categories is still faster than the fastest female time recorded in this specific dataset.

Discussion

The findings of the study will help explain the difference in physical fitness components between male and female athletes. The results may reveal that male players perform better in speed and agility due to physiological advantages such as higher muscle strength and explosive power.

These findings can help coaches design specific training programs for improving speed and agility among basketball players.

Conclusion

Based on the statistical analysis of the collected data, the study will determine whether a significant difference exists in speed and agility between male and female basketball players aged 18–25 years.

The results of the study may contribute to improving training methods and performance in basketball.

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योगिक अभ्यासों के माध्यम से तनाव, मानसिक स्वास्थ्य और भावनात्मक कल्याण

सृष्टि सिंह'
IV सेमेस्टर, एम. ए, शारीरिक शिक्षा, दीन दयाल उपाध्याय गोरखपुर विश्वविद्यालय, गोरखपुर, उत्तर प्रदेश

सारांश –

आज की तेज-तर्रार जीवनशैली में तनाव एक सामान्य समस्या बन गई है, जिसका कारण पढ़ाई, प्रतिस्पर्धा, पारिवारिक अपेक्षाएँ और सामाजिक दबाव हैं।

मानसिक स्वास्थ्य को ठीक करने के लिए योग एक प्रभावी और प्राकृतिक उपाय है, जो शरीर, मन और भावनाओं के बीच संतुलन स्थापित करता है। योग की उत्पत्ति प्राचीन भारत में हुई थी और इसे महर्षि पतंजलि ने व्यवस्थित रूप में प्रस्तुत किया था जिसमें योग के सिद्धांत और अभ्यास का वर्णन है। योग केवल एक व्यायाम नहीं है बल्कि एक संपूर्ण जीवनशैली है।

प्राणायाम, ध्यान और आसनों का योग में विशेष स्थान है, जो तनाव को कम करने में सहायक होते हैं।

प्राणायाम श्वास को नियंत्रित करता है, जिससे मन में शांति और चिंता में कमी आती है। ध्यान से एकाग्रता में वृद्धि होती है और नकारात्मक विचारों पर नियंत्रण पाया जाता है।

नियमित आसनों का अभ्यास शरीर को स्वस्थ रखते हुए मानसिक स्थिरता को बढ़ावा देता है। योग का एक और महत्वपूर्ण योगदान भावनात्मक संतुलन बनाने में है। यह क्रोध, भय, और उदासी जैसी नकारात्मक भावनाओं को कम करता है और आत्मविश्वास एवं सकारात्मक सोच को बढ़ावा देता है। नियमित योग अभ्यास से नींद में सुधार और मन में प्रसन्नता भी आती है। योग न केवल मानसिक स्पष्टता में योगदान करता है बल्कि आत्मविश्वास और सकारात्मक सोच को भी विकसित करता है जिससे समन मानसिक स्वास्थ्य और भावनात्मक कल्याण में सुधार होता है।

इसलिए, योगिक अभ्यास तनाव प्रबंधन, मानसिक स्वास्थ्य सुधार और भावनात्मक कल्याण के लिए अत्यंत लाभकारी हैं। अगर हम प्रतिदिन कुछ समय योग के लिए निकालें, तो हम एक स्वस्थ, संतुलित और खुशहाल जीवन जीने में सक्षम हो सकते हैं।

भूमिका –

आज का युग तीव्र परिवर्तन और प्रतिस्पर्धा का युग है। व्यक्ति अपने दैनिक जीवन में कई प्रकार की चुनौतियों का सामना करता है, जैसे कार्यस्थल का दबाव, पारिवारिक जिम्मेदारियाँ, आर्थिक समस्याएँ और सामाजिक अपेक्षाएँ। इन सभी कारणों से तनाव (Stress) और मानसिक असंतुलन उत्पन्न होता है।

विश्व स्वास्थ्य संगठन के अनुसार, मानसिक स्वास्थ्य केवल रोगों की अनुपस्थिति नहीं बल्कि मानसिक, सामाजिक और भावनात्मक संतुलन की स्थिति है। जब व्यक्ति मानसिक रूप से स्वस्थ होता है, तब वह जीवन की चुनौतियों का सामना बेहतर तरीके से कर सकता है।

योग भारतीय संस्कृति की एक प्राचीन पद्धति है जिसका उल्लेख वेदों और उपनिषदों में मिलता है। महर्षि पतंजलि ने योग को 'योगश्चित्तवृत्ति निरोधः" कहा है, अर्थात मन की वृत्तियों को नियंत्रित करना ही योग है।

योग केवल शारीरिक व्यायाम नहीं है, बल्कि यह एक समग्र जीवन पद्धति है जो व्यक्ति के शारीरिक, मानसिक और आध्यात्मिक विकास को प्रोत्साहित करती है। योग के प्रमुख अंग हैं:

आसन, प्राणायाम, ध्यान,धारण,

प्रत्याहार

इन सभी अभ्यासों के माध्यम से व्यक्ति अपने मन को शांत कर सकता है और तनाव से मुक्ति पा सकता है।

वर्तमान शोध-पत्र का उद्देश्य यह समझना है कि योगिक अभ्यास किस प्रकार तनाव को कम करते हैं तथा मानसिक स्वास्थ्य और भावनात्मक संतुलन को बेहतर बनाते हैं। तनाव के कारण कई प्रकार के हो सकते हैं, जो व्यक्ति के जीवन परिस्थितियों और वातावरण पर निर्भर करते हैं। जब व्यक्ति किसी समस्या दबाव या कठिन परिस्थिति का सामना करता है और उसे संभालना कठिन लगता है, तो तनाव उत्पन्न होता है। आधुनिक जीवनशैली में तनाव के प्रमुख कारण निम्नलिखित हैः

- **काम और पढ़ाई का दबाव:** आज के समय में पढ़ाई और नौकरी में प्रतिस्पर्धा बहुत बढ़ गई है। अच्छे अंक प्राप्त करने समय पर कार्य पूरा करने और सफलता पाने की चिंता से विद्यार्थी और कामकाजी लोग अक्सर तनाव महसूस करते हैं।
- **पारिवारिक समस्याएँ:** परिवार में आपसी मतभेद, झगड़े, जिम्मेदारियों का बोझ या संबंधों में तनाव भी मानसिक दबाव पैदा कर सकता है। जब परिवार का वातावरण शांत नहीं होता तो व्यक्ति मानसिक रूप से परेशान रहने लगता है।
- **आर्थिक समस्याएँ:** धन की कमी, कर्ज, खचों की चिंता या नौकरी की अस्थिरता भी तनाव का बड़ा कारण बन सकती है। आर्थिक असुरक्षा के कारण व्यक्ति भविष्य को लेकर चिंतित रहता है।
- **स्वास्थ्य संबंधी:** समस्याएँ किसी बीमारी या शारीरिक कमजोरी के कारण भी व्यक्ति तनाव महसूस कर सकता है। जब स्वास्थ्य ठीक नहीं रहता, तो व्यक्ति मानसिक रूप से भी परेशान हो जाता है।
- **समय की कमी:** और व्यस्त जीवनशैली आज के समय में लोग बहुत व्यस्त रहते हैं। काम की अधिकता और समय की कमी के कारण व्यक्ति को आराम करने का पर्याप्त समय नहीं मिल पाता, जिससे तनाव बढ़ जाता है। सामाजिक और व्यक्तिगत अपेक्षाएँ
- समाज और परिवार की अपेक्षाएँ भी तनाव का कारण बन सकती हैं। कई बार व्यक्ति दूसरों की उम्मीदों पर खरा उतरने की कोशिश में मानसिक दबाव महसूस करता है।

शोध के उद्देश्य –

इस शोध का मुख्य उद्देश्य निम्नलिखित हैं:

- योगिक अभ्यासों के माध्यम से तनाव में कमी का अध्ययन करना ।
- योगिक अभ्यासों से भावनात्मक संतुलन में होने वाले सुधार का विश्लेषण करना ।
- योग का मानसिक स्वास्थ्य पर प्रभाव समझना।
- योग को तनाव प्रबंधन की एक प्रभावी तकनीक के रूप में प्रस्तुत करना।
- आसन शरीर को लचीला और मजबूत बनाते हैं तथा मांसपेशियों के तनाव को कम करते हैं।

कुछ प्रमुख आसन

ताड़ासन:

ताड़ासन को योग का मूल आसन माना जाता है। इस आसन में शरीर की स्थिति एक सीधे खड़े ताड़ (पेड़) की तरह होती है, इसलिए इसे ताड़ासन कहा जाता है। यह आसन शरीर के संतुलन, लचीलेपन और सही बॉडी-पोश्चर को बनाए रखने में मदद करता है।

ताड़ासन करने के लिए सबसे पहले सीधे खड़े हो जाएँ और अपने दोनों पैरों को पास-पास रखें। शरीर का पूरा भार दोनों पैरों पर समान रूप से रखें। इसके बाद अपने दोनों हाथों को धीरे-धीरे ऊपर की ओर उठाएँ और उँगलियों को आपस में फँसाकर हथेलियों को ऊपर की ओर कर लें। अब धीरे-धीरे एड़ियों को उठाकर पंजों के बल खड़े हो जाएँ और पूरे शरीर को ऊपर की ओर खींचने की कोशिश करें। इस स्थिति में सामान्य रूप से साँस लेते रहें और कुछ सेकंड तक बने रहें। फिर धीरे-धीरे एड़ियों को नीचे लाकर और हाथों को सामान्य स्थिति में लाकर आसन समाप्त करें।

ताड़ासन से शरीर की लंबाई और संतुलन में सुधार होता है। यह रीढ़ की हड्डी को सीधा और मजबूत बनाता है। नियमित अभ्यास से पैरों की मांसपेशियाँ मजबूत होती हैं और शरीर का पोश्चर भी सही रहता है। इसके अलावा यह ध्यान और एकाग्रता बढ़ाने में भी सहायक माना जाता है।

भुजंगासन

भुजंगासन को अंग्रेज़ी में कोबरा पोज़ कहा जाता है क्योंकि इस आसन में शरीर की आकृति फन उठाए हुए साँप जैसी दिखाई देती है। यह आसन पीठ और रीढ़ की हड्डी के लिए बहुत लाभदायक माना जाता है।

भुजंगासन करने के लिए सबसे पहले पेट के बल जमीन पर लेट जाएँ। दोनों पैरों को सीधा रखें और पैरों के पंजे पीछे की ओर रखें। अब दोनों हाथों की हथेलियाँ कंधों के पास जमीन पर रखें। धीरे-धीरे साँस लेते हुए सिर, छाती और पेट के ऊपरी हिस्से को ऊपर उठाएँ। ध्यान रखें कि कमर से नीचे का हिस्सा जमीन पर ही रहे। हाथों का सहारा लेते हुए शरीर को पीछे की ओर हल्का

मोड़ें और सिर को ऊपर रखें। इस स्थिति में कुछ सेकंड तक रहें और सामान्य साँस लेते रहें। इसके बाद धीरे-धीरे साँस छोड़ते हुए वापस जमीन पर आ जाएँ।
भुजंगासन रीढ़ की हड्डी को लचीला और मजबूत बनाता है। यह पीठ दर्द को कम करने में मदद करता है और छाती को चौड़ा करने में सहायक होता है। इसके अलावा यह पाचन तंत्र को बेहतर बनाता है और शरीर में ऊर्जा बढ़ाने में भी सहायक माना जाता है।

शशांकासन

शशांकासन को चाइल्ड पोज़ भी कहा जाता है। इस आसन में शरीर की मुद्रा शांत और आरामदायक होती है, इसलिए यह मन को शांति देने वाला आसन माना जाता है।

शशांकासन करने के लिए सबसे पहले वज्रासन में बैठ जाएँ। इसके बाद धीरे-धीरे साँस लेते हुए दोनों हाथों को ऊपर उठाएँ। अब साँस छोड़ते हुए शरीर को आगे की ओर झुकाएँ और माथे को जमीन से लगाने की कोशिश करें। हाथों को आगे की ओर जमीन पर फैला दें और शरीर को ढीला छोड़ दें। इस स्थिति में कुछ समय तक शांत होकर सामान्य साँस लेते रहें। फिर धीरे-धीरे शरीर को उठाकर वापस वज्रासन में आ जाएँ।

शशांकासन मानसिक तनाव और चिंता को कम करने में मदद करता है। यह मन को शांत करता है और शरीर को आराम देता है। इसके अलावा यह पीठ और कंधों की मांसपेशियों को आराम देता है तथा ध्यान और एकाग्रता बढ़ाने में भी सहायक होता है।

अनुलोम-विलोम प्राणायाम

अनुलोम-विलोम एक बहुत प्रसिद्ध प्राणायाम है जिसमें नाक के दोनों छिद्रों से बारी-बारी सांस ली और छोड़ी जाती है। इसे करने के लिए सबसे पहले किसी शांत जगह पर सुखासन, पद्मासन या वज्रासन में बैठ जाएँ। रीढ़ सीधी रखें और शरीर को ढीला छोड़ दें। अब दाहिने हाथ के अंगूठे से दाहिनी नाक बंद करें और बाईं नाक से धीरे-धीरे गहरी सांस लें। जब सांस भर जाए तो अनामिका उंगली से बाईं नाक बंद करें और दाहिनी नाक खोलकर धीरे-धीरे सांस छोड़ दें। फिर दाहिनी नाक से ही सांस अंदर लें, उसे बंद करके बाईं नाक से बाहर छोड़ दें। यही प्रक्रिया लगातार दोहराई जाती है। शुरुआत में 5–10 मिनट करें और धीरे-धीरे समय बढ़ा सकते हैं।

अनुलोम-विलोम करने से शरीर में ऑक्सीजन की मात्रा बढ़ती है और फेफड़े मजबूत होते हैं। यह प्राणायाम मन को शांत करने में बहुत मदद करता है, इसलिए तनाव, चिंता और गुस्सा कम होता है। नियमित अभ्यास से ब्लड सर्कुलेशन अच्छा होता है और दिमाग को पर्याप्त ऑक्सीजन मिलती है, जिससे याददाश्त और एकाग्रता बेहतर होती है। इसके अलावा यह प्राणायाम शरीर की नाड़ियों को शुद्ध करने में मदद करता है और इम्यून सिस्टम को मजबूत बनाता है।

कपालभाति प्राणायाम

कपालभाति में सांस को जोर से बाहर निकाला जाता है और सांस अपने-आप अंदर चली जाती है। इसे करने के लिए आराम से सीधी रीढ़ के साथ बैठ जाएँ। दोनों हाथ घुटनों पर रखें और शरीर को स्थिर रखें। अब नाक से तेजी से सांस बाहर फेंकें और पेट को अंदर की ओर खींचें। सांस अंदर लेने की कोशिश नहीं करनी होती, वह अपने-आप अंदर चली जाती है। इसी तरह लगातार तेज गति से सांस बाहर निकालते रहें। शुरुआत में 20–30 बार करें, फिर धीरे-धीरे संख्या बढ़ाई जा सकती है।

कपालभाति करने से पेट के सभी अंग सक्रिय हो जाते हैं। इससे पाचन शक्ति बेहतर होती है और गैस, कब्ज जैसी समस्याओं में राहत मिलती है। यह प्राणायाम पेट की चर्बी कम करने में भी मदद करता है। इसके अलावा फेफड़ों की क्षमता बढ़ती है और शरीर से विषैले तत्व बाहर निकलने में मदद मिलती है। नियमित अभ्यास से चेहरे पर चमक आती है और दिमाग भी ज्यादा सक्रिय महसूस करता है।

भ्रामरी प्राणायाम

भ्रामरी प्राणायाम में सांस छोड़ते समय मधुमक्खी जैसी आवाज निकाली जाती है। इसे करने के लिए शांत जगह पर बैठ जाएँ और आँखें बंद कर लें। दोनों हाथों से कान हल्के से बंद कर लें। अब नाक से गहरी सांस लें और धीरे-धीरे सांस छोड़ते समय "हम्म्म" जैसी मधुमक्खी की आवाज निकालें। ध्यान रखें कि आवाज लंबी और धीमी हो। यह प्रक्रिया 5–10 बार की जा सकती है।

भ्रामरी प्राणायाम करने से दिमाग को तुरंत शांति मिलती है। यह तनाव, गुस्सा और चिंता को कम करने में बहुत प्रभावी माना जाता है। पढ़ाई करने वाले छात्रों के लिए भी यह अच्छा है क्योंकि इससे एकाग्रता और मानसिक स्थिरता बढ़ती है। इसके अलावा सिरदर्द, नींद की समस्या और मानसिक थकान में भी राहत मिल सकती है। नियमित अभ्यास से मन ज्यादा शांत और संतुलित महसूस होता है।

नाड़ी शोधन प्राणायाम

नाड़ी शोधन प्राणायाम भी अनुलोम-विलोम जैसा ही है लेकिन इसमें सांस लेने, रोकने और छोड़ने की एक निश्चित लय होती है। इसे करने के लिए सीधा बैठें और दाहिने हाथ से नासिका मुद्रा बनाएं। अंगूठे से दाहिनी नाक बंद करके बाईं नाक से धीरे-धीरे गहरी सांस लें। फिर दोनों नाक बंद करके कुछ सेकंड सांस रोकें। उसके बाद दाहिनी नाक खोलकर सांस बाहर छोड़ें। फिर दाहिनी नाक से सांस लें, कुछ सेकंड रोकें और बाईं नाक से बाहर छोड़ दें। यही एक चक्र कहलाता है।

नाड़ी शोधन प्राणायाम शरीर की ऊर्जा को संतुलित करने में मदद करता है। इससे नर्वस सिस्टम शांत होता है और मानसिक तनाव कम होता है। यह प्राणायाम ब्लड प्रेशर को संतुलित रखने में भी सहायक माना जाता है। नियमित अभ्यास से फेफड़ों की क्षमता बढ़ती है और शरीर में ऑक्सीजन का प्रवाह बेहतर होता है। इससे शरीर और मन दोनों को संतुलन और स्थिरता मिलती है।

कार्य-प्रणाली -

इस शोध-पत्र में गुणात्मक और वर्णनात्मक अनुसंधान पद्धति का उपयोग किया गया है। इस पद्धति के माध्यम से योगिक अभ्यासों के मानसिक स्वास्थ्य पर प्रभाव को समझने और विभिन्न शोध परिणामों का विश्लेषण करने का प्रयास किया गया है। अध्ययन मुख्य रूप से द्वितीयक स्रोतों पर आधारित है।

अनुसंधान की प्रकृति

यह अध्ययन गुणात्मक अनुसंधान पर आधारित है, जिसमें योग से संबंधित सिद्धांतों, अभ्यासों और उनके मानसिक स्वास्थ्य पर पड़ने वाले प्रभावों का गहन विश्लेषण किया गया है। साथ ही वर्णनात्मक पद्धति का उपयोग करते हुए विभिन्न स्रोतों से प्राप्त जानकारी को व्यवस्थित रूप से प्रस्तुत किया गया है।

डेटा संग्रह के स्रोत

अध्ययन के लिए आवश्यक जानकारी विभिन्न विश्वसनीय स्रोतों से एकत्र की गई है, जिनमें मुख्य रूप से निम्न शामिल हैं—
योग से संबंधित पुस्तकें – योग, प्राणायाम, ध्यान तथा मानसिक स्वास्थ्य पर लिखी गई विभिन्न पुस्तकों का अध्ययन किया गया।
शोध जर्नल – राष्ट्रीय एवं अंतरराष्ट्रीय शोध जर्नलों में प्रकाशित योग और मानसिक स्वास्थ्य से संबंधित शोध-पत्रों का विश्लेषण किया गया।

स्वास्थ्य संस्थानों की रिपोर्ट – विभिन्न स्वास्थ्य संगठनों और संस्थानों द्वारा प्रकाशित रिपोर्टों का उपयोग किया गया।
ऑनलाइन शैक्षणिक स्रोत – इंटरनेट पर उपलब्ध विश्वसनीय शैक्षणिक वेबसाइट, ई-जर्नल, और वैज्ञानिक लेखों का अध्ययन किया गया। अध्ययन की प्रक्रिया

अध्ययन को व्यवस्थित रूप से पूरा करने के लिए निम्नलिखित चरणों का पालन किया गया—
योगिक अभ्यासों की पहचान करना
सबसे पहले योग से संबंधित प्रमुख अभ्यासों जैसे प्राणायाम, ध्यान, आसन और विश्राम तकनीकों की पहचान की गई और उनके महत्व को समझा गया।

मानसिक स्वास्थ्य पर प्रभाव का अध्ययन
इसके बाद यह अध्ययन किया गया कि इन योगिक अभ्यासों का मानसिक स्वास्थ्य पर क्या प्रभाव पड़ता है, जैसे—
तनाव में कमी

- चिंता और अवसाद में कमी
- एकाग्रता और मानसिक शांति में वृद्धि
- भावनात्मक संतुलन में सुधार

विभिन्न शोध परिणामों की तुलना

अलग-अलग शोध पत्रों और अध्ययनों के परिणामों की तुलना की गई, ताकि यह समझा जा सके कि योगिक अभ्यासों के मानसिक स्वास्थ्य पर प्रभाव को विभिन्न शोधों में किस प्रकार प्रस्तुत किया गया है।

विश्लेषण और निष्कर्ष

अंत में प्राप्त जानकारी का विश्लेषण करके यह निष्करष निकाला गया कि नियमित योग अभ्यास मानसिक स्वास्थ्य को बेहतर बनाने में महत्वपूर्ण भूमिका निभाता है।

योगिक अभ्यास और तनाव प्रबंधन-

आज के आधुनिक जीवन में तनाव एक सामान्य समस्या बन चुका है। तेज़ जीवनशैली, पढ़ाई और काम का दबाव, पारिवारिक जिम्मेदारियाँ और प्रतिस्पर्धा के कारण लोग अक्सर मानसिक और शारीरिक तनाव का अनुभव करते हैं। यदि तनाव को समय पर नियंत्रित न किया जाए तो यह कई शारीरिक और मानसिक समस्याओं का कारण बन सकता है। ऐसे में योगिक अभ्यास तनाव को नियंत्रित करने का एक प्रभावी और प्राकृतिक उपाय है।

योगिक अभ्यास प्राचीन भारतीय परंपरा का महत्वपूर्ण हिस्सा है। योग का मुख्य उद्देश्य शरीर, मन और आत्मा के बीच संतुलन स्थापित करना है। जब व्यक्ति नियमित रूप से योग करता है, तो उसके शरीर और मन में सकारात्मक परिवर्तन होते हैं। योगिक अभ्यास में मुख्य रूप से आसन, प्राणायाम, ध्यान और विश्राम की विधियाँ शामिल होती हैं, जो व्यक्ति को शारीरिक और मानसिक रूप से स्वस्थ बनाती हैं।

तनाव कई कारणों से उत्पन्न हो सकता है। अधिक काम का बोझ, पढ़ाई का दबाव, असफलता का डर, आर्थिक समस्याएँ, पारिवारिक तनाव और सामाजिक अपेक्षाएँ इसके प्रमुख कारण हैं। जब व्यक्ति लंबे समय तक तनाव में रहता है तो उसके व्यवहार और स्वास्थ्य पर इसका नकारात्मक प्रभाव पड़ता है। तनाव के कारण सिरदर्द, थकान, चिड़चिड़ापन, अनिद्रा, चिंता और ध्यान की कमी जैसी समस्याएँ उत्पन्न हो सकती हैं।

योगिक अभ्यास तनाव को कम करने में महत्वपूर्ण भूमिका निभाता है। योग करने से शरीर में रक्त संचार बेहतर होता है और मन को शांति मिलती है। योगासन शरीर को मजबूत और लचीला बनाते हैं, जबकि प्राणायाम श्वास को नियंत्रित करके मन को शांत करता है। ध्यान मन को एकाग्र करता है और नकारात्मक विचारों को कम करता है। इन सभी अभ्यासों से व्यक्ति का मानसिक संतुलन बेहतर होता है और तनाव धीरे-धीरे कम होने लगता है।

तनाव प्रबंधन के लिए कुछ योगिक अभ्यास विशेष रूप से लाभदायक माने जाते हैं। जैसे शवासन, भुजंगासन, ताड़ासन और पद्मासन शरीर को आराम देते हैं और मानसिक तनाव को कम करते हैं। प्राणायाम में अनुलोम-विलोम, कपालभाति और भ्रामरी प्राणायाम मन को शांत करने में सहायक होते हैं। ध्यान और गहरी श्वास लेने की तकनीकें भी मानसिक शांति प्रदान करती हैं और व्यक्ति को सकारात्मक सोच विकसित करने में मदद करती हैं।

नियमित योगिक अभ्यास से व्यक्ति की एकाग्रता, आत्मविश्वास और मानसिक स्थिरता बढ़ती है। इससे नींद की गुणवत्ता भी बेहतर होती है और व्यक्ति अधिक ऊर्जावान महसूस करता है। योग न केवल तनाव को कम करता है, बल्कि स्वस्थ और संतुलित जीवन जीने की प्रेरणा भी देता है।
अतः कहा जा सकता है कि योगिक अभ्यास तनाव प्रबंधन का एक सरल, सुरक्षित और प्रभावी तरीका है। यदि व्यक्ति प्रतिदिन कुछ समय योग, प्राणायाम और ध्यान के लिए निकाले, तो वह अपने जीवन में शांति, संतुलन और स्वास्थ्य प्राप्त कर सकता है। योग के माध्यम से व्यक्ति न केवल तनाव से मुक्ति पा सकता है, बल्कि एक स्वस्थ और सकारात्मक जीवन भी जी सकता है।

योग का मानसिक स्वास्थ्य पर प्रभाव-

योग प्राचीन भारतीय परंपरा की एक महत्वपूर्ण और प्रभावशाली विधि है, जिसका उद्देश्य शरीर, मन और आत्मा के बीच संतुलन स्थापित करना है। वर्तमान समय में मानसिक स्वास्थ्य से जुड़ी समस्याएँ जैसे तनाव, चिंता, अवसाद और मानसिक थकान तेजी से बढ़ रही हैं। ऐसे समय में योग मानसिक स्वास्थ्य को सुधारने और मन को शांत रखने का एक प्रभावी माध्यम बन गया है। योग

केवल शारीरिक व्यायाम ही नहीं है, बल्कि यह एक ऐसी जीवनशैली है जो व्यक्ति के मानसिक और भावनात्मक संतुलन को भी मजबूत बनाती है।

मानसिक स्वास्थ्य का अर्थ है व्यक्ति की मानसिक, भावनात्मक और सामाजिक स्थिति का संतुलित होना। जब किसी व्यक्ति का मानसिक स्वास्थ्य अच्छा होता है, तो वह जीवन की चुनौतियों का सामना बेहतर तरीके से कर पाता है। वह सकारात्मक सोच रखता है, तनाव को नियंत्रित कर सकता है और अपने कार्यों को ध्यानपूर्वक पूरा कर पाता है। योग मानसिक स्वास्थ्य को बेहतर बनाने में महत्वपूर्ण भूमिका निभाता है क्योंकि यह शरीर और मन दोनों पर सकारात्मक प्रभाव डालता है।

योग के अभ्यास से मन को शांति और स्थिरता प्राप्त होती है। जब व्यक्ति नियमित रूप से योग करता है, तो उसका मन धीरे-धीरे शांत और संतुलित होने लगता है। योगासन शरीर की मांसपेशियों को आराम देते हैं और प्राणायाम के माध्यम से श्वास की गति को नियंत्रित किया जाता है। इससे शरीर में ऑक्सीजन का प्रवाह बेहतर होता है और मस्तिष्क को पर्याप्त ऊर्जा मिलती है। परिणामस्वरूप व्यक्ति अधिक एकाग्र और शांत महसूस करता है।

योग का एक महत्वपूर्ण भाग ध्यान है, जो मानसिक स्वास्थ्य के लिए अत्यंत लाभकारी माना जाता है। ध्यान के अभ्यास से व्यक्ति अपने विचारों को नियंत्रित करना सीखता है। इससे नकारात्मक विचार कम होते हैं और मन में सकारात्मकता बढ़ती है। ध्यान करने से एकाग्रता बढ़ती है और व्यक्ति अपने कार्यों पर अधिक ध्यान केंद्रित कर पाता है। यह अभ्यास मानसिक तनाव और चिंता को कम करने में भी सहायक होता है।

योग मानसिक तनाव और चिंता को कम करने में भी महत्वपूर्ण भूमिका निभाता है। जब व्यक्ति योग और प्राणायाम का नियमित अभ्यास करता है, तो उसके शरीर में तनाव हार्मोन का स्तर कम हो जाता है और मन को शांति मिलती है। इससे व्यक्ति अधिक संतुलित और शांत महसूस करता है। योग के अभ्यास से भावनात्मक संतुलन भी बेहतर होता है और व्यक्ति अपने गुस्से, भय और चिंता को नियंत्रित करना सीखता है।

योग का प्रभाव नींद की गुणवत्ता पर भी पड़ता है। कई लोग मानसिक तनाव के कारण ठीक से सो नहीं पाते, जिससे उनका मानसिक स्वास्थ्य और अधिक प्रभावित होता है। योग और ध्यान के नियमित अभ्यास से मन शांत होता है और नींद बेहतर आती है। अच्छी नींद मानसिक स्वास्थ्य को बनाए रखने के लिए अत्यंत आवश्यक होती है।

इसके अलावा योग आत्मविश्वास और सकारात्मक सोच को भी बढ़ाता है। जब व्यक्ति नियमित रूप से योग का अभ्यास करता है, तो उसे अपने शरीर और मन पर अधिक नियंत्रण महसूस होता है। इससे उसका आत्मविश्वास बढ़ता है और वह जीवन की समस्याओं का सामना अधिक साहस और धैर्य के साथ कर पाता है।

अंत में कहा जा सकता है कि योग मानसिक स्वास्थ्य को बेहतर बनाने का एक सरल, प्राकृतिक और प्रभावी तरीका है। नियमित योग, प्राणायाम और ध्यान के अभ्यास से व्यक्ति तनाव, चिंता और मानसिक असंतुलन से बच सकता है। योग व्यक्ति को मानसिक शांति, सकारात्मक सोच और संतुलित जीवन जीने की प्रेरणा देता है। इसलिए हर व्यक्ति को अपने दैनिक जीवन में योग को अपनाना चाहिए, ताकि वह शारीरिक और मानसिक रूप से स्वस्थ रह सके।

भावनात्मक कल्याण

भावनात्मक कल्याण का अर्थ है व्यक्ति की भावनाओं का संतुलित और स्वस्थ होना। यह व्यक्ति की उस क्षमता को दर्शाता है जिसके माध्यम से वह अपनी भावनाओं को समझ सकता है, उन्हें सही तरीके से व्यक्त कर सकता है और जीवन की विभिन्न परिस्थितियों का सकारात्मक रूप से सामना कर सकता है। जब किसी व्यक्ति का भावनात्मक कल्याण अच्छा होता है, तो वह मानसिक रूप से शांत, संतुलित और आत्मविश्वासी महसूस करता है।

आज के आधुनिक जीवन में लोगों को कई प्रकार की भावनात्मक चुनौतियों का सामना करना पड़ता है। पढ़ाई का दबाव, काम का तनाव, पारिवारिक समस्याएँ, सामाजिक अपेक्षाएँ और प्रतिस्पर्धा के कारण व्यक्ति कई बार चिंता, गुस्सा, डर, उदासी और निराशा जैसी भावनाओं से घिर जाता है। यदि इन भावनाओं को सही तरीके से समझा और नियंत्रित न किया जाए, तो यह मानसिक और शारीरिक स्वास्थ्य दोनों को प्रभावित कर सकती हैं। इसलिए भावनात्मक कल्याण बनाए रखना बहुत आवश्यक है।

भावनात्मक कल्याण का पहला महत्वपूर्ण पहलू है स्व-जागरूकता इसका अर्थ है अपनी भावनाओं, विचारों और प्रतिक्रियाओं को समझना। जब व्यक्ति अपनी भावनाओं को पहचानता है, तब वह उन्हें बेहतर तरीके से नियंत्रित कर पाता है। उदाहरण के लिए, यदि कोई व्यक्ति यह समझ ले कि वह किसी कारण से गुस्सा या तनाव महसूस कर रहा है, तो वह उस स्थिति को शांत तरीके से संभालने का प्रयास कर सकता है।

दूसरा महत्वपूर्ण पहलू है भावनाओं का संतुलित नियंत्रण। भावनाएँ जीवन का स्वाभाविक हिस्सा हैं, लेकिन उनका अत्यधिक या गलत तरीके से प्रकट होना समस्या पैदा कर सकता है। भावनात्मक रूप से स्वस्थ व्यक्ति अपनी भावनाओं को उचित तरीके से व्यक्त करता है और कठिन परिस्थितियों में भी धैर्य और संतुलन बनाए रखता है।

भावनात्मक कल्याण में सकारात्मक सोच भी महत्वपूर्ण भूमिका निभाती है। सकारात्मक सोच रखने वाला व्यक्ति जीवन की कठिनाइयों को सीखने का अवसर मानता है। वह असफलता से निराश होने के बजाय उससे सीखने की कोशिश करता है। सकारात्मक सोच व्यक्ति को आशावादी बनाती है और उसे मानसिक रूप से मजबूत बनाती है।

इसके अलावा सामाजिक संबंध भी भावनात्मक कल्याण को प्रभावित करते हैं। परिवार, मित्र और समाज के साथ अच्छे संबंध व्यक्ति को भावनात्मक सहारा देते हैं। जब व्यक्ति अपने विचार और भावनाएँ दूसरों के साथ साझा करता है, तो उसका मन हल्का होता है और उसे मानसिक शांति मिलती है।

भावनात्मक कल्याण को बनाए रखने के लिए कई उपाय अपनाए जा सकते हैं। जैसे नियमित व्यायाम या योग करना, ध्यान और प्राणायाम का अभ्यास करना, पर्याप्त नींद लेना, संतुलित आहार लेना और अपने प्रिय लोगों के साथ समय बिताना। ये सभी गतिविधियाँ मन को शांत रखने और सकारात्मक भावनाओं को बढ़ाने में मदद करती हैं।

अंत में कहा जा सकता है कि भावनात्मक कल्याण एक स्वस्थ और संतुलित जीवन के लिए अत्यंत आवश्यक है। जब व्यक्ति अपनी भावनाओं को समझता है, उन्हें सही तरीके से नियंत्रित करता है और सकारात्मक दृष्टिकोण अपनाता है, तब वह जीवन की चुनौतियों का सामना अधिक आत्मविश्वास और धैर्य के साथ कर सकता है। इसलिए हर व्यक्ति को अपने भावनात्मक स्वास्थ्य का ध्यान रखना चाहिए, ताकि वह खुशहाल और संतुलित जीवन जी सके।

योगिक अभ्यासों के लाभ-

योग प्राचीन भारतीय संस्कृति की एक महत्वपूर्ण और वैज्ञानिक पद्धति है, जिसका उद्देश्य शरीर, मन और आत्मा के बीच संतुलन स्थापित करना है। योगिक अभ्यासों में मुख्य रूप से आसन, प्राणायाम, ध्यान और विश्राम की तकनीकें शामिल होती हैं। आज के व्यस्त और तनावपूर्ण जीवन में योग का महत्व और भी बढ़ गया है, क्योंकि यह व्यक्ति को शारीरिक, मानसिक और भावनात्मक रूप से स्वस्थ बनाए रखने में सहायता करता है। नियमित रूप से योगिक अभ्यास करने से व्यक्ति के जीवन में कई सकारात्मक परिवर्तन देखने को मिलते हैं।

सबसे पहले, योगिक अभ्यासों का शरीर के स्वास्थ्य पर बहुत अच्छा प्रभाव पड़ता है। विभिन्न योगासन शरीर की मांसपेशियों को मजबूत और लचीला बनाते हैं। नियमित योग करने से शरीर की कार्यक्षमता बढ़ती है और रक्त संचार बेहतर होता है। इससे शरीर के विभिन्न अंगों को पर्याप्त ऑक्सीजन और पोषण मिलता है, जिससे व्यक्ति अधिक स्वस्थ और ऊर्जावान महसूस करता है। योग पाचन क्रिया को सुधारने, वजन को संतुलित रखने और शरीर की रोग प्रतिरोधक क्षमता को बढ़ाने में भी सहायक होता है।

योगिक अभ्यास मानसिक स्वास्थ्य के लिए भी अत्यंत लाभदायक हैं। योग और प्राणायाम के अभ्यास से मन शांत और स्थिर होता है। इससे तनाव, चिंता और मानसिक थकान कम होती है। जब व्यक्ति नियमित रूप से योग करता है, तो उसके मन में सकारात्मक विचार उत्पन्न होते हैं और वह जीवन की कठिन परिस्थितियों का सामना अधिक धैर्य और आत्मविश्वास के साथ कर पाता है। ध्यान के अभ्यास से एकाग्रता और स्मरण शक्ति भी बढ़ती है।

योगिक अभ्यास भावनात्मक संतुलन बनाए रखने में भी महत्वपूर्ण भूमिका निभाते हैं। जब व्यक्ति योग और ध्यान करता है, तो वह अपनी भावनाओं को बेहतर तरीके से समझ पाता है और उन्हें नियंत्रित करना सीखता है। इससे गुस्सा, भय, चिंता और उदासी जैसी नकारात्मक भावनाएँ कम होती हैं। योग व्यक्ति को मानसिक शांति और आंतरिक संतुलन प्रदान करता है, जिससे वह अधिक खुश और संतुष्ट महसूस करता है।

इसके अतिरिक्त, योगिक अभ्यास व्यक्ति की जीवनशैली को भी बेहतर बनाते हैं। नियमित योग करने से व्यक्ति अनुशासित और जागरूक बनता है। वह अपने खान-पान, दिनचर्या और आदतों के प्रति अधिक सावधान हो जाता है। इससे उसका संपूर्ण जीवन संतुलित और स्वस्थ बनता है। योग के अभ्यास से आत्मविश्वास और आत्मनियंत्रण भी बढ़ता है, जिससे व्यक्ति अपने लक्ष्यों को प्राप्त करने के लिए अधिक प्रेरित रहता है।

योग का एक और महत्वपूर्ण लाभ यह है कि यह नींद की गुणवत्ता को सुधारता है। आज के समय में कई लोग अनिद्रा या नींद से जुड़ी समस्याओं से परेशान रहते हैं। योग और ध्यान के नियमित अभ्यास से मन शांत होता है और शरीर को पर्याप्त आराम मिलता

है, जिससे अच्छी और गहरी नींद आती है। अच्छी नींद व्यक्ति के शारीरिक और मानसिक स्वास्थ्य के लिए बहुत आवश्यक होती है।

अंत में कहा जा सकता है कि योगिक अभ्यासों के अनेक लाभ हैं। यह न केवल शरीर को स्वस्थ और मजबूत बनाते हैं, बल्कि मन को भी शांत और संतुलित रखते हैं। योग व्यक्ति को तनावमुक्त, सकारात्मक और संतुलित जीवन जीने की प्रेरणा देता है। इसलिए प्रत्येक व्यक्ति को अपने दैनिक जीवन में योग को शामिल करना चाहिए, ताकि वह शारीरिक, मानसिक और भावनात्मक रूप से स्वस्थ रह सके।

चर्चा -

अध्ययन से यह स्पष्ट हुआ कि योग केवल शारीरिक व्यायाम नहीं बल्कि मानसिक और भावनात्मक स्वास्थ्य का भी महत्वपूर्ण साधन है।
विभिन्न शोध अध्ययनों में पाया गया कि नियमित योग अभ्यास करने वाले व्यक्तियों में तनाव का स्तर कम होता है। योग शरीर के तंत्रिका तंत्र को संतुलित करता है और मानसिक
शांति प्रदान करता है।
इसके अतिरिक्त योग व्यक्ति को आत्म-जागरूक बनाता है जिससे वह अपनी भावनाओं को बेहतर ढंग से नियंत्रित कर पाता है।

निष्कर्ष -

इस शोध-पत्र के आधार पर यह निष्कर्ष निकाला जा सकता है कि योगिक अभ्यास तनाव प्रबंधन और मानसिक स्वास्थ्य के लिए अत्यंत प्रभावी साधन हैं।

आसन, प्राणायाम और ध्यान जैसे अभ्यास व्यक्ति के शारीरिक, मानसिक और भावनात्मक स्वास्थ्य को संतुलित करते हैं।

आज के तनावपूर्ण जीवन में योग को दैनिक जीवन का हिस्सा बनाना अत्यंत आवश्यक है। यदि व्यक्ति नियमित रूप से योग का अभ्यास करे तो वह न केवल तनाव से मुक्त रह सकता है बल्कि एक स्वस्थ और संतुलित जीवन जी सकता है।

योग केवल शारीरिक व्यायाम नहीं है, बल्कि यह शरीर, मन और आत्मा को संतुलित करने की एक सम्पूर्ण जीवन पद्धति है। योग के नियमित अभ्यास से शरीर स्वस्थ रहता है मन

शांत और एकाग्र बनता है, तथा जीवन में सकारात्मकता और संतोष बढ़ता है।

योग हमें क्रोध को नियंत्रित करने, धैर्य रखने और सकारात्मक सोच विकसित करने की प्रेरणा देता है। यह व्यक्ति को आत्म-अनुशासन आत्म-विश्वास और आंतरिक शांति प्रदान करता है।
नियमित योग करने से व्यक्ति शारीरिक रूप से स्वस्थ, मानसिक रूप से मजबूत और आध्यात्मिक रूप से संतुलित बनता है, जिससे उसका जीवन सुखी और सफल होता है।

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योग एवं शारीरिक शिक्षा में सूर्य नमस्कार: इसके समग्र लाभ का विषय गत अध्ययन

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सार

प्रस्तुत शोध-पत्र में योग एवं शिक्षा के अंतर्गत सूर्य नमस्कार के समग्र—शारीरिक, मानसिक, भावनात्मक एवं सामाजिक—लाभ का विस्तृत विश्लेषण प्रस्तुत किया गया है। सूर्य नमस्कार भारतीय योग परंपरा की एक प्राचीन, वैज्ञानिक एवं सुव्यवस्थित साधना है, जिसकी दार्शनिक पृष्ठभूमि वेद, उपनिषद तथा पतंजलि योगसूत्र में निहित योग-दर्शन पर आधारित है। सूर्य नमस्कार बारह क्रमबद्ध आसनों का समन्वित रूप है, जिसमें श्वास-प्रश्वास, शारीरिक गतियों तथा मानसिक एकाग्रता का संतुलित संयोजन होता है। इस शोध-पत्र का उद्देश्य सूर्य नमस्कार की सैद्धांतिक आधारभूमि को स्पष्ट करते हुए उसके बहुआयामी प्रभावों का विश्लेषण करना है। अध्ययन में यह पाया गया है कि सूर्य नमस्कार न केवल मांसपेशीय शक्ति, लचीलापन, रक्त संचार, श्वसन क्षमता एवं पाचन क्रिया में सुधार करता है, बल्कि मानसिक तनाव को कम करने, एकाग्रता एवं स्मरण शक्ति को बढ़ाने तथा भावनात्मक संतुलन स्थापित करने में भी सहायक सिद्ध होता है। इसके अतिरिक्त, यह अभ्यास अनुशासन, आत्मनियंत्रण, आत्मविश्वास तथा सामूहिकता की भावना को विकसित कर सामाजिक समरसता को भी प्रोत्साहित करता है।

वर्तमान समय में विद्यार्थियों में तनाव पूर्ण जीवनशैली और मानसिक असंतुलन जैसी समस्याएँ बढ़ रही हैं, इन सब में सुधार के लिए सूर्य नमस्कार एक सरल, सुलभ एवं कम समय में अधिक लाभ प्रदान करने वाली समग्र स्वास्थ्य-पद्धति के रूप में उभरकर सामने आता है। यह शरीर, मन और आत्मा के संतुलन को स्थापित करते हुए समग्र व्यक्तित्व विकास का मार्ग प्रशस्त करता है। अतः योग शिक्षा के पाठ्यक्रम में सूर्य नमस्कार का समावेशन विद्यार्थियों के सर्वांगीण विकास के लिए अत्यंत आवश्यक एवं प्रासंगिक है।

मुख्य शब्द: योग शिक्षा, सूर्य नमस्कार, शारीरिक शिक्षा, मानसिक स्वास्थ्य, समग्र विकास, सैद्धांतिक अध्ययन

प्रस्तावना

शिक्षा प्रणाली में शारीरिक शिक्षा को विद्यार्थियों के समग्र विकास का एक अनिवार्य एवं सुदृढ़ आधार माना जाता है। शिक्षा का उद्देश्य केवल बौद्धिक उन्नति तक सीमित नहीं है, बल्कि शारीरिक सुदृढ़ता, मानसिक संतुलन, भावनात्मक परिपक्वता तथा नैतिक मूल्यों के विकास को भी सुनिश्चित करना है। वर्तमान समय में तकनीकी प्रगति, डिजिटल उपकरणों पर बढ़ती निर्भरता तथा प्रतिस्पर्धात्मक शैक्षिक वातावरण के कारण विद्यार्थियों की जीवनशैली अधिकतर निष्क्रिय होती जा रही है। इसके परिणामस्वरूप तनाव, मोटापा, शारीरिक दुर्बलता, चिंता, अवसाद एवं मानसिक असंतुलन जैसी समस्याएँ तेजी से बढ़ रही हैं।

ऐसी परिस्थितियों में योग शिक्षा एक समग्र, प्राकृतिक एवं वैज्ञानिक समाधान प्रस्तुत करता है। योग न केवल शारीरिक व्यायाम का माध्यम है, बल्कि यह मन और शरीर के संतुलन की एक पद्धति है, जो व्यक्ति के आंतरिक एवं बाह्य विकास को समान रूप से प्रभावित करती है। योग को व्यवस्थित करने का श्रेय महर्षि पतंजलि को दिया जाता है, जिन्होंने पतंजलि योगसूत्र के माध्यम से योग के सिद्धांतों एवं अभ्यासों को सूत्रबद्ध किया। आधुनिक काल में स्वामी विवेकानंद ने योग को वैश्विक मंच पर प्रतिष्ठित किया और इसे केवल आध्यात्मिक साधना न मानकर एक व्यावहारिक जीवन-पद्धति के रूप में प्रस्तुत किया। उनके प्रयासों से योग को अंतरराष्ट्रीय स्तर पर स्वीकार्यता प्राप्त हुई और आज यह विश्वभर में स्वास्थ्य एवं जीवन-शैली सुधार का प्रभावी साधन माना जाता है।

इसी योग परंपरा के अंतर्गत सूर्य नमस्कार एक अत्यंत महत्वपूर्ण एवं लोकप्रिय अभ्यास है। यह बारह क्रमबद्ध आसनों का समन्वित समूह है, जिसमें श्वास- क्रिया, शारीरिक लय और मानसिक एकाग्रता का संतुलित संयोजन होता है। सूर्य नमस्कार शरीर की प्रमुख मांसपेशियों, तंत्रिका तंत्र, श्वसन तंत्र तथा अंतःस्रावी ग्रंथियों को सक्रिय करते हुए सम्पूर्ण शारीरिक प्रणाली को सुदृढ़ करता है। साथ ही यह मानसिक शांति, आत्मनियंत्रण और सकारात्मक दृष्टिकोण के विकास में सहायक होता है।

अतः शारीरिक शिक्षा के परिप्रेक्ष्य में सूर्य नमस्कार का समावेशन अत्यंत प्रासंगिक एवं आवश्यक है। यह न केवल विद्यार्थियों के स्वास्थ्य संरक्षण का प्रभावी साधन है, बल्कि उनके सर्वांगीण व्यक्तित्व विकास की दिशा में एक महत्वपूर्ण कदम भी है।

अध्ययन का उद्देश्य

प्रस्तुत शोध-पत्र का मुख्य उद्देश्य योग शिक्षा के अंतर्गत सूर्य नमस्कार की सैद्धांतिक एवं व्यावहारिक उपयोगिता का समग्र विश्लेषण करना है। अध्ययन का लक्ष्य केवल इसके शारीरिक लाभ तक सीमित न रहकर, इसके बहुआयामी प्रभावों—मानसिक, भावनात्मक, सामाजिक एवं शैक्षिक—का व्यापक मूल्यांकन करना है। इस संदर्भ में अध्ययन के प्रमुख उद्देश्य निम्नलिखित हैं—

1. **सूर्य नमस्कार की सैद्धांतिक पृष्ठभूमि का अध्ययन करना**
    i. सूर्य नमस्कार की उत्पत्ति, ऐतिहासिक विकास एवं दार्शनिक आधार का विश्लेषण करना।
    ii. इसके सिद्धांतों को पतंजलि योगसूत्र तथा प्राचीन योग-दर्शन के संदर्भ में समझना।
    iii. योग परंपरा में सूर्य नमस्कार के स्थान एवं महत्व को स्पष्ट करना।
2. **इसके शारीरिक, मानसिक एवं सामाजिक लाभों का विश्लेषण करना**
    i. शारीरिक स्तर पर मांसपेशीय शक्ति, लचीलापन, रक्त संचार, श्वसन क्षमता एवं पाचन क्रिया पर इसके प्रभावों का अध्ययन।
    ii. मानसिक स्तर पर तनाव-नियंत्रण, एकाग्रता, स्मरण शक्ति एवं भावनात्मक संतुलन पर इसके प्रभावों का विश्लेषण।
    iii. सामाजिक स्तर पर अनुशासन, आत्मविश्वास, सहयोग की भावना एवं सांस्कृतिक चेतना के विकास में इसकी भूमिका का परीक्षण।
3. **योग शिक्षा में इसकी प्रासंगिकता स्पष्ट करना**
    i. वर्तमान शैक्षिक परिप्रेक्ष्य में योग शिक्षा की आवश्यकता को रेखांकित करना।
    ii. विद्यालयी वातावरण में सूर्य नमस्कार के अभ्यास की उपयोगिता एवं व्यवहारिकता का अध्ययन।
    iii. विद्यार्थियों के समग्र व्यक्तित्व विकास में इसकी भूमिका को स्पष्ट करना।
4. **आधुनिक शारीरिक शिक्षा में इसके समावेशन की आवश्यकता पर प्रकाश डालना**
    i. वर्तमान जीवनशैली से उत्पन्न स्वास्थ्य समस्याओं के समाधान के रूप में सूर्य नमस्कार की उपयोगिता को प्रस्तुत करना।
    ii. शारीरिक शिक्षा कार्यक्रमों, प्रार्थना सभाओं, खेल-पूर्व वार्म-अप एवं स्वास्थ्य जागरूकता कार्यक्रमों में इसके समावेशन की संभावनाओं का विश्लेषण।
    iii. शिक्षा नीति एवं पाठ्यक्रम में इसे एक नियमित एवं अनिवार्य अभ्यास के रूप में शामिल करने की आवश्यकता पर विचार करना।

इस प्रकार, अध्ययन का व्यापक उद्देश्य यह सिद्ध करना है कि सूर्य नमस्कार योग शिक्षा का एक प्रभावी, वैज्ञानिक एवं समग्र साधन है, जो विद्यार्थियों के सर्वांगीण विकास में महत्वपूर्ण योगदान दे सकता है।

सूर्य नमस्कार की सैद्धांतिक पृष्ठभूमि

सूर्य नमस्कार भारतीय योग परंपरा का एक सुव्यवस्थित, वैज्ञानिक एवं दार्शनिक आधार का अभ्यास है। यह 12 आसनों का क्रमबद्ध संयोजन है, जिसमें श्वास- क्रिया, शारीरिक गति, मानसिक एकाग्रता तथा ऊर्जा-संतुलन का समन्वित रूप से अभ्यास किया जाता है। प्रत्येक आसन/मुद्रा शरीर के विभिन्न अंगों एवं तंत्रों को सक्रिय करता है और समग्र स्वास्थ्य की दिशा में कार्य करता है।

सूर्य नमस्कार की वैचारिक पृष्ठभूमि भारतीय वैदिक परंपरा में निहित है। वेद में सूर्य को जीवन, ऊर्जा और चेतना का स्रोत माना गया है। सूर्य को केवल एक भौतिक ग्रह नहीं, बल्कि प्रकाश, शक्ति एवं प्राण के प्रतीक के रूप में स्वीकार किया गया है। इसी प्रकार उपनिषद में सूर्य को आत्मा एवं ब्रह्म के प्रतीक के रूप में वर्णित किया गया है, जो आंतरिक चेतना के जागरण का संकेत देता है। योग के शास्त्रीय स्वरूप को व्यवस्थित रूप देने वाले महर्षि पतंजलि ने पतंजलि योगसूत्र में शरीर, मन और आत्मा के सामंजस्य को योग का मूल उद्देश्य बताया है—**"योगश्चित्तवृत्तिनिरोधः।"** अर्थात् चित्त की वृत्तियों का निरोध ही योग है। सूर्य नमस्कार इसी सिद्धांत को व्यवहारिक रूप में प्रस्तुत करता है, क्योंकि इसके अभ्यास के दौरान श्वास, गति और ध्यान का संतुलन मन को स्थिर और एकाग्र बनाता है। सैद्धांतिक दृष्टि से सूर्य नमस्कार केवल आसनों की श्रृंखला नहीं, बल्कि हठयोग, प्राणायाम एवं ध्यान का समन्वित अभ्यास है। हठयोग प्रदीपिका में वर्णित हठयोग की परंपरा शरीर को शुद्ध एवं सशक्त बनाकर उच्चतर आध्यात्मिक चेतना की ओर अग्रसर होने पर बल देती है। सूर्य नमस्कार इसी प्रक्रिया का प्रारंभिक एवं प्रभावी माध्यम है। इसके अतिरिक्त, सूर्य नमस्कार में प्रत्येक आसन के साथ विशेष श्वास-क्रिया जुड़ी होती है—कहीं श्वास लेना, कहीं छोड़ना—जिससे प्राणशक्ति (जीवन ऊर्जा) का संतुलन बना रहता है। योग-दर्शन के अनुसार शरीर और मन का संतुलन ही स्वास्थ्य की मूल

आधारशिला है। जब शरीर सक्रिय, श्वास नियंत्रित और मन एकाग्र होता है, तब व्यक्ति शारीरिक एवं मानसिक रूप से संतुलित रहता है। सूर्य नमस्कार इसी संतुलन को स्थापित करने की एक सुसंगठित पद्धति है।

अतः सैद्धांतिक रूप से सूर्य नमस्कार भारतीय योग-दर्शन, आध्यात्मिक परंपरा तथा स्वास्थ्य-विज्ञान के समन्वय का उत्कृष्ट उदाहरण है, जो व्यक्ति के बहुआयामी विकास की आधारशिला रखता है।

सूर्य नमस्कार के समग्र लाभ

सूर्य नमस्कार एक समन्वित योगाभ्यास है, जो व्यक्ति के शारीरिक, मानसिक, भावनात्मक एवं सामाजिक आयामों को एक साथ प्रभावित करता है। सैद्धांतिक दृष्टि से यह अभ्यास केवल शारीरिक क्रिया नहीं, बल्कि शरीर, प्राण और चित्त के संतुलन की वैज्ञानिक प्रक्रिया है। इसके नियमित अभ्यास से व्यक्ति के व्यक्तित्व में बहुआयामी सकारात्मक परिवर्तन दृष्टिगोचर होते हैं।

(क) शारीरिक लाभ

सूर्य नमस्कार के प्रत्येक चरण में शरीर की विभिन्न मांसपेशियाँ सक्रिय होती हैं, जिससे मांसपेशियों की लचीलापन एवं शक्ति में वृद्धि होती है। आगे झुकने, पीछे झुकने और खिंचाव की क्रियाओं से शरीर के ऊपरी एवं निचले भाग का संतुलित व्यायाम होता है।इसके अतिरिक्त, इस अभ्यास के दौरान गतिशीलता और श्वास के समन्वय से **रक्त संचार में सुधार** होता है, जिससे शरीर के प्रत्येक अंग तक पर्याप्त ऑक्सीजन और पोषक तत्व पहुँचते हैं। इससे हृदय एवं श्वसन तंत्र सुदृढ़ होता है तथा **श्वसन क्षमता में वृद्धि** होती है।

सूर्य नमस्कार के विभिन्न आसन उदर क्षेत्र पर सकारात्मक प्रभाव डालते हैं, **जिससे पाचन तंत्र की सक्रियता** बढ़ती है और गैस, कब्ज जैसी समस्याओं में कमी आती है। साथ ही, यह अभ्यास शरीर की **अंतःस्रावी ग्रंथियों (Endocrine Glands)** के संतुलन में सहायक होता है, जिससे हार्मोनल संतुलन बना रहता है। नियमित अभ्यास से शरीर की **प्रतिरोधक क्षमता (Immunity)** में वृद्धि होती है, जिससे व्यक्ति रोगों के प्रति अधिक सक्षम बनता है। इस प्रकार सूर्य नमस्कार संपूर्ण शारीरिक स्वास्थ्य को सुदृढ़ एवं संतुलित बनाने में महत्वपूर्ण भूमिका निभाता है।

(ख) मानसिक लाभ

सूर्य नमस्कार में श्वास- क्रिया और गति का समन्वय मानसिक शांति एवं स्थिरता प्रदान करता है। नियमित अभ्यास से **तनाव एवं चिंता में कमी** आती है, क्योंकि यह तंत्रिका तंत्र को संतुलित करता है और मानसिक उत्तेजना को नियंत्रित करता है।यह अभ्यास मस्तिष्क में रक्त प्रवाह को बढ़ाकर **एकाग्रता एवं स्मरण शक्ति में वृद्धि** करता है। विद्यार्थियों के लिए यह विशेष रूप से उपयोगी है, क्योंकि इससे अध्ययन में ध्यान केंद्रित करने की क्षमता विकसित होती है।सूर्य नमस्कार मानसिक स्पष्टता प्रदान करता है, जिससे निर्णय लेने की क्षमता में सुधार होता है और व्यक्ति सकारात्मक दृष्टिकोण अपनाता है। **सकारात्मक सोच का विकास** व्यक्ति के आत्मविश्वास और जीवन दृष्टि को सुदृढ़ बनाता है।

विश्व स्वास्थ्य संगठन के अनुसार मानसिक स्वास्थ्य समग्र स्वास्थ्य का अभिन्न अंग है। इस दृष्टिकोण से सूर्य नमस्कार मानसिक संतुलन स्थापित करने का एक प्रभावी एवं प्राकृतिक साधन है।

(ग) भावनात्मक एवं सामाजिक लाभ

सूर्य नमस्कार के नियमित अभ्यास से व्यक्ति में **आत्मविश्वास** एवं आत्म-संतोष की भावना विकसित होती है। शारीरिक सुदृढ़ता और मानसिक स्थिरता के कारण व्यक्ति अपने कार्यों में अधिक दक्ष और आश्वस्त महसूस करता है। यह अभ्यास **अनुशासन एवं आत्मनियंत्रण** की भावना को प्रबल करता है, क्योंकि इसे नियमित समय और विधि से करना आवश्यक होता है। इस प्रकार यह विद्यार्थियों में सकारात्मक जीवनशैली का निर्माण करता है। विद्यालयों में जब सूर्य नमस्कार का अभ्यास सामूहिक रूप से किया जाता है, तो विद्यार्थियों में **सामूहिकता की भावना** विकसित होती है। वे सहयोग, सहभागिता और एकता के महत्व को समझते हैं। इसके अतिरिक्त, सूर्य नमस्कार भारतीय सांस्कृतिक परंपरा से जुड़ा होने के कारण विद्यार्थियों में **सांस्कृतिक मूल्यों के प्रति जागरूकता** उत्पन्न करता है। इससे उनमें अपनी परंपराओं के प्रति सम्मान और गौरव की भावना विकसित होती है।

अतः सैद्धांतिक विश्लेषण से स्पष्ट होता है कि सूर्य नमस्कार एक समग्र अभ्यास है, जो व्यक्ति के शारीरिक, मानसिक, भावनात्मक और सामाजिक जीवन को संतुलित एवं सशक्त बनाता है।

योग शिक्षा में सूर्य नमस्कार की प्रासंगिकता

योग शिक्षा में सूर्य नमस्कार की प्रासंगिकता अत्यंत महत्वपूर्ण है। शिक्षा प्रणाली में केवल बौद्धिक विकास को ही पर्याप्त नहीं माना जा सकता, क्योंकि विद्यार्थी का वास्तविक विकास तभी संभव है जब उसका शारीरिक, मानसिक, भावनात्मक तथा नैतिक पक्ष भी समान रूप से सुदृढ़ हो। आज की भागदौड़ भरी जीवनशैली, बढ़ती प्रतिस्पर्धा और तकनीकी निर्भरता के कारण विद्यार्थियों में तनाव, एकाग्रता की कमी, शारीरिक निष्क्रियता तथा स्वास्थ्य संबंधी समस्याएँ बढ़ रही हैं। ऐसे समय में योग शिक्षा एक संतुलित और प्रभावी समाधान प्रस्तुत करती है। सूर्य नमस्कार योग की एक समन्वित क्रिया है, जिसमें बारह आसनों का क्रमबद्ध संयोजन होता है। यह न केवल शरीर को लचीला और सशक्त बनाता है, बल्कि श्वास-प्रश्वास की प्रक्रिया को संतुलित कर मानसिक शांति और एकाग्रता भी बढ़ाता है। नियमित अभ्यास से रक्त संचार में सुधार होता है, पाचन तंत्र सुदृढ़ होता है तथा प्रतिरोधक क्षमता में वृद्धि होती है। साथ ही, यह विद्यार्थियों में अनुशासन, आत्मनियंत्रण और सकारात्मक सोच का विकास करता है। भारतीय शिक्षा मंत्रालय द्वारा विद्यालयों में योग शिक्षा को विशेष प्रोत्साहन दिया जा रहा है। शिक्षा मंत्रालय ने नई शिक्षा नीतियों में भी स्वास्थ्य और योग को महत्वपूर्ण स्थान दिया है। विद्यालयों की प्रार्थना सभाओं में सूर्य नमस्कार को सम्मिलित करने से दिन की शुरुआत ऊर्जा, उत्साह और सकारात्मकता के साथ होती है। खेल गतिविधियों से पूर्व इसे उष्मिकरण (Warm-up) के रूप में करने से शरीर व्यायाम के लिए तैयार हो जाता है और चोटों की संभावना कम होती है। इसके अतिरिक्त, दैनिक स्वास्थ्य कार्यक्रमों में सूर्य नमस्कार को शामिल करने से विद्यार्थियों में नियमित व्यायाम की आदत विकसित होती है।

इस प्रकार, सूर्य नमस्कार केवल एक शारीरिक अभ्यास नहीं, बल्कि समग्र शिक्षा का सशक्त माध्यम है। यह विद्यार्थियों के सर्वांगीण विकास—शारीरिक सुदृढ़ता, मानसिक एकाग्रता, भावनात्मक संतुलन तथा नैतिक जागरूकता—में महत्वपूर्ण भूमिका निभाता है। अतः शिक्षा प्रणाली में योग शिक्षा और विशेष रूप से सूर्य नमस्कार को अनिवार्य रूप से स्थान दिया जाना चाहिए।

चर्चा

सैद्धांतिक विश्लेषण से स्पष्ट होता है कि सूर्य नमस्कार योग शिक्षा का एक अत्यंत प्रभावी और व्यावहारिक माध्यम है। यह केवल एक शारीरिक व्यायाम नहीं, बल्कि शरीर, मन और भावनाओं के समन्वित विकास की एक समग्र प्रक्रिया है। सूर्य नमस्कार की विशेषता यह है कि इसमें विभिन्न आसनों का क्रमबद्ध संयोजन होता है, जो शरीर के प्रत्येक अंग और तंत्र को सक्रिय करता है। कम समय में संपूर्ण शरीर को ऊर्जावान बनाने की इसकी क्षमता इसे विद्यालयी दिनचर्या के लिए विशेष रूप से उपयुक्त बनाती है। सूर्य नमस्कार के नियमित अभ्यास से मांसपेशियाँ सुदृढ़ होती हैं, शरीर में लचीलापन आता है तथा रक्त संचार सुचारु होता है। यह पाचन तंत्र, श्वसन तंत्र और तंत्रिका तंत्र पर सकारात्मक प्रभाव डालता है। साथ ही, नियंत्रित श्वास-प्रश्वास की प्रक्रिया मन को शांत और स्थिर बनाती है। विद्यार्थियों के संदर्भ में यह विशेष रूप से महत्वपूर्ण है, क्योंकि एकाग्रता, स्मरण शक्ति और मानसिक संतुलन उनके शैक्षणिक प्रदर्शन को सीधे प्रभावित करते हैं। आधुनिक जीवनशैली की चुनौतियाँ—जैसे मानसिक तनाव, शारीरिक निष्क्रियता, असंतुलित दिनचर्या, अत्यधिक स्क्रीन-टाइम और प्रतिस्पर्धात्मक दबाव—विद्यार्थियों के समग्र स्वास्थ्य पर प्रतिकूल प्रभाव डाल रही हैं। सूर्य नमस्कार इन समस्याओं का सरल और प्रभावी समाधान प्रस्तुत करता है। यह शरीर को सक्रिय बनाकर आलस्य और थकान को दूर करता है, वहीं मानसिक तनाव को कम कर सकारात्मक ऊर्जा का संचार करता है। नियमित अभ्यास से आत्मविश्वास, आत्मानुशासन और समय-प्रबंधन जैसी जीवनोपयोगी क्षमताओं का भी विकास होता है। शैक्षिक दृष्टि से भी यह अभ्यास महत्वपूर्ण है, क्योंकि यह विद्यार्थियों में नियमितता और अनुशासन की आदत विकसित करता है। समूह में सूर्य नमस्कार करने से सामूहिकता, सहयोग और एकता की भावना मजबूत होती है। इसके अतिरिक्त, यह भारतीय सांस्कृतिक विरासत से विद्यार्थियों को जोड़ता है और प्रकृति के प्रति सम्मान एवं कृतज्ञता का भाव उत्पन्न करता है।

अतः चर्चा से यह निष्कर्ष निकलता है कि सूर्य नमस्कार केवल स्वास्थ्यवर्धक क्रिया नहीं, बल्कि योग शिक्षा का एक ऐसा सशक्त साधन है जो शिक्षा प्रणाली को अधिक संतुलित और प्रभावी बना सकता है। यह विद्यार्थियों को शारीरिक रूप से सशक्त, मानसिक रूप से एकाग्र और नैतिक रूप से सजग बनाने में महत्वपूर्ण भूमिका निभाता है। इसलिए विद्यालयी पाठ्यक्रम और दैनिक दिनचर्या में सूर्य नमस्कार को उचित स्थान देना समय की आवश्यकता है।

निष्कर्ष

उपरोक्त विवेचना के आधार पर यह स्पष्ट होता है कि सूर्य नमस्कार, योग शिक्षा का एक समग्र, वैज्ञानिक एवं अत्यंत प्रभावशाली अंग है। यह केवल व्यायाम की एक पद्धति नहीं, बल्कि शरीर, मन और आत्मा के संतुलित विकास का सशक्त माध्यम है। सूर्य नमस्कार का नियमित अभ्यास विद्यार्थियों के शारीरिक स्वास्थ्य को सुदृढ़ बनाता है, मांसपेशियों में लचीलापन और शक्ति प्रदान करता है तथा शरीर की कार्यक्षमता को बढ़ाता है। इसके माध्यम से रक्त संचार, पाचन क्रिया और श्वसन तंत्र में सुधार होता है, जिससे संपूर्ण स्वास्थ्य बेहतर होता है। मानसिक दृष्टि से यह अभ्यास एकाग्रता, स्मरण शक्ति और सकारात्मक चिंतन को विकसित करता है। आज के प्रतिस्पर्धात्मक और तनावपूर्ण वातावरण में विद्यार्थियों के लिए मानसिक संतुलन बनाए रखना एक बड़ी चुनौती

है। सूर्य नमस्कार मन को शांत, स्थिर और ऊर्जावान बनाकर उन्हें **आत्मविश्वास एवं आत्मनियंत्रण** प्रदान करता है। इससे वे अपनी पढ़ाई और अन्य गतिविधियों में अधिक प्रभावी प्रदर्शन कर सकते हैं।

भावनात्मक विकास की दृष्टि से भी सूर्य नमस्कार महत्वपूर्ण भूमिका निभाता है। नियमित अभ्यास से **विद्यार्थियों में धैर्य, सहनशीलता और अनुशासन** जैसे गुण विकसित होते हैं। समूह में किए जाने पर यह सहयोग, सामूहिकता और सामाजिक समरसता की भावना को भी प्रोत्साहित करता है। साथ ही, यह भारतीय सांस्कृतिक परंपरा से जुड़ाव का माध्यम बनकर **नैतिक मूल्यों और प्रकृति के प्रति कृतज्ञता की भावना** को सुदृढ़ करता है। वर्तमान समय में जब विद्यार्थियों की जीवनशैली अधिकतर निष्क्रिय होती जा रही है और स्वास्थ्य संबंधी समस्याएँ बढ़ रही हैं, तब सूर्य नमस्कार एक सरल, सुलभ और प्रभावी समाधान प्रस्तुत करता है। इसे किसी विशेष उपकरण या अधिक समय की आवश्यकता नहीं होती, इसलिए इसे विद्यालयों की दैनिक दिनचर्या में सहजता से शामिल किया जा सकता है।

अतः यह निष्कर्ष निकाला जा सकता है कि **सूर्य नमस्कार के नियमित अभ्यास से विद्यार्थियों का शारीरिक, मानसिक, भावनात्मक एवं सामाजिक विकास संतुलित रूप से संभव है।** इसलिए आवश्यक है कि इसे विद्यालयों के पाठ्यक्रम में अनिवार्य रूप से सम्मिलित किया जाए, ताकि भावी पीढ़ी स्वस्थ, अनुशासित, जागरूक और सक्षम नागरिक के रूप में विकसित हो सके।

संदर्भ सूची

- पतंजलि योगसूत्र – महर्षि पतंजलि द्वारा रचित यह ग्रंथ योग दर्शन का मूल आधार है, जिसमें अष्टांग योग तथा मानसिक अनुशासन के सिद्धांतों का विस्तृत वर्णन मिलता है।
- हठयोग प्रदीपिका – स्वात्माराम द्वारा रचित यह प्राचीन ग्रंथ हठयोग की प्रमुख क्रियाओं, आसनों, प्राणायाम तथा साधना पद्धतियों का विस्तृत विवरण प्रस्तुत करता है।
- वेद – भारतीय संस्कृति के प्राचीनतम ग्रंथ, जिनमें जीवन, प्रकृति, आध्यात्म और स्वास्थ्य संबंधी मूल सिद्धांतों का उल्लेख मिलता है।
- विश्व स्वास्थ्य संगठन (WHO) – वैश्विक स्वास्थ्य मानकों और शारीरिक-मानसिक स्वास्थ्य के महत्व पर प्रकाशित रिपोर्टें एवं दिशा-निर्देश।
- शिक्षा मंत्रालय – विद्यालयी शिक्षा में योग एवं शारीरिक शिक्षा को प्रोत्साहित करने संबंधी नीतियाँ एवं दिशा-निर्देश।
- भगवद्गीता – श्रीकृष्ण द्वारा अर्जुन को दिए गए उपदेशों में योग, कर्म और आत्मसंयम के सिद्धांतों का विस्तृत वर्णन।
- घेरंड संहिता – हठयोग से संबंधित एक महत्वपूर्ण ग्रंथ, जिसमें योगाभ्यास की विधियों और शारीरिक-मानसिक शुद्धि पर प्रकाश डाला गया है।
- NCERT (राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद) – योग शिक्षा एवं शारीरिक शिक्षा से संबंधित पाठ्य सामग्री और दिशा-निर्देश।
- यूनेस्को (UNESCO) – समग्र शिक्षा, स्वास्थ्य और शारीरिक गतिविधियों के महत्व पर प्रकाशित वैश्विक रिपोर्टें।
- योग वशिष्ठ – योग, आत्मज्ञान और मानसिक शांति से संबंधित दार्शनिक विचारों का विस्तृत ग्रंथ

YOGA-PERFORMANCE AND RECOVERY MODULATOR IN ATHLETIC TRAINING

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Abstract:

Elite sport increasingly recognizes that peak performance emerges not solely from mechanical conditioning but from integrated psychophysiological regulation. Within this paradigm, yoga has evolved from a traditional contemplative discipline into a structured performance-support modality. The present analytical review examines yoga as a neuromuscular, biomechanical, and autonomic regulatory intervention within athletic training systems. Drawing upon interdisciplinary evidence from exercise physiology, motor control, sports psychology, and rehabilitation science, the paper evaluates how yogic postures, breath regulation, and attentional practices influence musculoskeletal efficiency, recovery kinetics, hormonal balance, and injury susceptibility.

Yoga enhances intermuscular coordination, optimizes movement economy, improves vagal tone, reduces stress-mediated catabolism, and supports connective tissue resilience. Additionally, psychological variables including attentional control, emotional regulation, and self-efficacy demonstrate measurable improvement among athletes incorporating structured yoga protocols. Rather than functioning as a passive stretching adjunct, yoga is conceptualized here as an adaptive modulation system influencing load tolerance and tissue recovery capacity. The article proposes a sport-specific integration framework aligned with contemporary periodization models.The findings support yoga as a low-risk, high-transfer training supplement capable of improving performance sustainability and reducing cumulative injury burden in competitive populations.

Keywords: Yoga-based conditioning, neuromuscular efficiency, athletic recovery, injury risk reduction, movement economy, psychophysiological adaptation

Conclusion:

The present review establishes yoga as a scientifically grounded, performance and recovery modulator within competitive athletic training. By simultaneously targeting neuromuscular coordination, autonomic regulation, hormonal balance, and connective tissue resilience, yoga transcends its identity as a passive stretching practice and emerges as an active conditioning supplement. Its capacity to improve movement economy, attentional control, and self-efficacy positions it as a low-risk, high-transfer tool suitable for integration across all phases of periodized training. Athletes and practitioners who incorporate structured yoga protocols stand to benefit from enhanced load tolerance, reduced injury burden, and sustained performance output. As sport science continues to evolve, yoga warrants deeper empirical investigation to fully quantify its role as a comprehensive modulator of both physical and psychological athletic adaptation.

Introduction:

The physiological demands placed upon competitive athletes have intensified due to higher training volumes, congested competition calendars, and early specialization. While advancements in strength conditioning and sports analytics have optimized output variables, the incidence of overuse injuries, chronic fatigue syndromes, and psychological burnout remains substantial. This paradox highlights a systemic gap: insufficient integration of recovery biology and movement quality within traditional conditioning models. Yoga provides a multidimensional intervention capable of influencing both structural and regulatory systems of the human body. Its classical foundations, described in the *Yoga Sutras of Patanjali*, emphasize disciplined embodiment and breath-mediated control of psychophysiological processes. When reframed through contemporary scientific paradigms, these principles correspond to autonomic balance, fascial elasticity, and attentional regulation.

Neurophysiological Mechanisms Relevant to Athletic Training:

Yoga-based interventions influence athletic performance through measurable neurophysiological pathways. Pranayam enhances vagal afferent activity, increasing parasympathetic tone and heart rate variability (HRV), which

are key indicators of recovery readiness and autonomic balance (Pascoe & Bauer, 2015). The improved vagal modulation reduces sympathetic overactivation commonly associated with high-intensity training, thereby facilitating hormonal recovery and reducing systemic inflammation. Additionally, mindful movement patterns characteristic of yoga improve sensorimotor integration by strengthening cortical representation of joint position and movement accuracy (Schmalzl et al., 2015). Enhanced proprioceptive processing contributes to refined motor coordination, reduced neuromuscular noise, and greater movement efficiency. Neurocognitive benefits, including improved attentional regulation and emotional control, further stabilize performance under competitive stress. Collectively, these mechanisms position yoga as a neuroregulatory adjunct that optimizes adaptation, supports central nervous system recovery, and enhances overall athletic training responsiveness.

Autonomic Regulation and Recovery Readiness:

High-intensity athletic training relies heavily on sympathetic nervous system activation to generate rapid force production, heightened alertness, and explosive muscular output. While this acute sympathetic response is essential for competitive performance, prolonged dominance without adequate recovery can disrupt hormonal balance, elevate cortisol levels, and delay tissue repair. Yogic breathing techniques, particularly slow diaphragmatic and rhythmic pranayama practices, stimulate vagal afferent pathways and enhance parasympathetic activation. This shift improves heart rate variability (HRV), widely recognized as a reliable indicator of autonomic recovery readiness and adaptive capacity. Enhanced vagal modulation contributes to:

- Accelerated clearance of metabolic by-products such as lactate
- Restoration of endocrine equilibrium, supporting anabolic repair processes
- Attenuation of pro-inflammatory signaling pathways. Through these mechanisms, yoga-based respiratory regulation functions as a neurophysiological reset tool that optimizes recovery efficiency and supports sustained athletic adaptation.

Cortical Efficiency and Motor Control:

The slow, consciously regulated movement patterns commonly practiced in yoga promote adaptive communication between sensory receptors and motor pathways. When athletes transition gradually between postures, they continuously recalibrate balance, muscle tension, and joint alignment. This repeated sensory feedback strengthens neural encoding of body position within the motor cortex and cerebellar networks, thereby refining movement awareness (Schmalzl et al., 2015). With improved neural efficiency, excessive or poorly timed muscle activation—often responsible for movement inefficiency—declines. This refinement enhances coordination accuracy during sport-specific skills such as cutting, landing, or rotational movements. Furthermore, enhanced proprioceptive sensitivity supports joint stabilization under dynamic loading conditions, decreasing reliance on compensatory movement strategies that may overload connective tissues (Granacher et al., 2011). Through these neuroadaptive mechanisms, yoga-based training contributes to precision control, efficient force transfer, and reduced cumulative mechanical stress, thereby supporting long-term athletic durability.

Biomechanical Contributions to Performance:

Yoga-based conditioning contributes to athletic performance by improving structural alignment, force transmission, and movement efficiency. Many athletic injuries and performance limitations arise from asymmetrical loading patterns and restricted joint mobility. Through sustained postural holds and controlled eccentric engagement, yoga promotes balanced muscular development and optimal joint positioning. This alignment reduces unnecessary shear forces and enhances kinetic chain integration across multiple segments of the body (Granacher et al., 2011).

Yoga also influences fascial elasticity and tissue extensibility. Slow, tension-based stretching combined with breath regulation supports adaptive remodelling of connective tissue, allowing more efficient storage and release of elastic energy during dynamic activities such as sprinting or jumping. Improved flexibility, when paired with active stability, enhances stride mechanics and joint control without compromising strength (Ross & Thomas, 2010). And balance-oriented postures further enhance intermuscular coordination, promoting joint stability under multidirectional loads. By optimizing mechanical efficiency and reducing compensatory movement patterns, yoga-based training supports performance sustainability and lowers cumulative biomechanical stress in competitive athletes.

Fascial Elasticity and Load Distribution:

Efficient generation and transfer of athletic force rely on the integrity of the myofascial network, which functions as a continuous tension-distributing system across body segments. When fascial pathways are restricted or dehydrated, force transmission becomes mechanically inefficient, increasing localized stress. Yoga-based movement patterns that integrate controlled lengthening with active isometric stabilization stimulate fascial mechanoreceptors and enhance tissue pliability. This combination of tensile loading and mindful breathing may support improved fascial hydration and elasticity, thereby optimizing kinetic chain coordination (Schleip et al., 2012).In contrast to passive static stretching, sustained yogic postures require low-intensity muscular engagement while maintaining regulated respiration. Such loading characteristics are associated with gradual connective tissue adaptation and neuromuscular recalibration rather than temporary range-of-motion gains (Behm et al., 2016). Through these mechanisms, yoga-based conditioning may enhance elastic recoil efficiency, improve force distribution across joints, and reduce excessive strain accumulation during high-velocity athletic tasks.

Joint Stability through Co-Activation:

Balance-focused yoga postures require simultaneous activation of opposing muscle groups to maintain joint alignment under unstable conditions. This agonist–antagonist co-contraction improves dynamic stability by enhancing joint stiffness and neuromuscular timing. Such coordinated stabilization is particularly relevant for injury-prone regions in sport. For example, improved quadriceps–hamstring co-activation supports anterior cruciate ligament (ACL) protection by reducing excessive anterior tibial translation. Similarly, enhanced peroneal activation contributes to ankle stability during rapid directional changes, lowering inversion injury risk. At the shoulder complex, balanced rotator cuff engagement improves glenohumeral control, decreasing strain during overhead movements and repetitive loading tasks (Granacher et al., 2011).

Core Integration and Spinal Protection:

Yoga-based postural training places consistent emphasis on axial elongation and activation of deep segmental stabilizers. Through controlled alignment and breath-synchronized engagement, muscles such as the transverse abdominis and multifidus are recruited to maintain neutral spinal positioning. These deep stabilizers function as intrinsic support structures, enhancing intersegmental control and distributing compressive forces more evenly across the vertebral column. Improved activation of these muscles increases trunk stiffness without excessive superficial tension, thereby enhancing load transfer efficiency during compound movements. By improving spinal stability under dynamic loading conditions, yoga-informed core engagement strategies contribute to reduced lumbar strain and improved biomechanical resilience (Granacher et al., 2011).

Yoga as a Recovery Catalyst:

Recovery is a decisive component of athletic adaptation, as physiological improvements occur during regenerative phases rather than during training stress itself. Yoga facilitates recovery by modulating autonomic balance, enhancing circulation, and supporting endocrine regulation. Slow breathing practices stimulate parasympathetic activation, which promotes cardiovascular stabilization and improves heart rate variability—an indicator of recovery readiness (Pascoe & Bauer, 2015). Gentle-mobility-focused sequences improve venous return and lymphatic flow, assisting in the clearance of metabolic by-products accumulated during high-intensity exercise. This circulatory enhancement may reduce perceived muscle soreness and accelerate tissue repair processes. Furthermore, yoga-based relaxation techniques attenuate hypothalamic–pituitary–adrenal (HPA) axis overactivation, helping normalize cortisol levels and restore anabolic–catabolic equilibrium.

Psychologically, guided relaxation and mindfulness practices decrease cognitive fatigue and emotional strain, which are critical contributors to delayed recovery. By integrating physiological and psychological restoration mechanisms, yoga functions as an active recovery modality that supports sustained performance and reduces cumulative training stress.

Hormonal Regulation:

Sustained elevations in cortisol, commonly observed during periods of intense training and psychological stress, can suppress protein synthesis, impair immune responsiveness, and delay connective tissue repair. When catabolic activity predominates for prolonged durations, the balance between tissue breakdown and regeneration becomes

disrupted, potentially compromising performance adaptation. Breath-focused relaxation practices characteristic of yoga modulates stress reactivity by influencing hypothalamic–pituitary–adrenal (HPA) axis activity. Slow, diaphragmatic breathing enhances parasympathetic signaling and attenuates excessive cortisol secretion, thereby supporting restoration of anabolic–catabolic equilibrium (Pascoe & Bauer, 2015). By stabilizing endocrine responses and reducing systemic stress load, yoga-based respiratory regulation creates a physiological environment more conducive to muscle repair, immune resilience, and efficient post-exercise recovery.

Sleep Optimization:

Sleep architecture plays a critical role in physiological restoration, particularly through slow-wave sleep stages that are closely associated with pulsatile growth hormone secretion and neural repair processes. Adequate deep sleep supports protein synthesis, synaptic recovery, and metabolic regulation essential for athletic adaptation (Dattilo et al., 2011). Disruptions in sleep structure, common during periods of heavy training or competition stress, can therefore compromise recovery efficiency. Evening restorative yoga practices—characterized by slow breathing, supported postures, and relaxation techniques—have been associated with reduced sleep onset latency and improved subjective sleep quality. Mind–body interventions such as yoga enhance parasympathetic dominance before bedtime, facilitating smoother transition into restorative sleep phases (Ross et al., 2013). Improved sleep continuity subsequently contributes to enhanced perceived recovery and performance readiness among athletes.

Fatigue Reduction:

Mindful body scanning and paced breathing practices influence central fatigue by regulating cortical arousal and autonomic balance. Central fatigue is strongly affected by perceived effort and neural drive rather than peripheral muscle exhaustion alone. Interoceptive attention enhances awareness of muscular tension and facilitates voluntary downregulation of unnecessary neural activation. Simultaneously, slow breathing increases vagal activity and stabilizes psychophysiological responses to stress, contributing to reduced perceived exertion (Schmalzl et al., 2015).Such kind of neurocognitive modulation enables a more efficient psychological reset between competitions, improving attentional control, emotional steadiness, and readiness for subsequent performance demands.

Injury Risk Mitigation:

Injury susceptibility in athletes often develops from repetitive microtrauma, persistent movement asymmetries, and diminished proprioceptive control under fatigue. When neuromuscular coordination declines, joint loading patterns become inefficient, increasing strain on ligaments and connective tissues. Yoga-based training counters these risk factors through symmetrical posture sequencing that corrects lateral imbalances and improves force distribution. Slow, controlled transitions promote eccentric strength adaptations that enhance tendon stiffness and load tolerance. Additionally, balance-focused practices improve proprioceptive acuity and dynamic joint stabilization, which are critical for injury prevention in high-demand sports (Hewett et al., 2006).

Beyond mechanical factors, yoga-mediated stress regulation reduces excessive muscular co-contraction and cognitive overload, both of which can impair movement precision. By integrating structural alignment with neural regulation, yoga functions as a multidimensional injury-mitigation strategy within athletic conditioning programs.

Psychological Adaptation and Performance Stability:

Athletic performance is strongly influenced by cognitive resource allocation and emotional regulation. Limited attentional bandwidth under competitive pressure can impair decision-making speed and technical execution. Yogic attentional practices—such as focused breathing and single-pointed concentration—train sustained attention and reduce cognitive distraction, thereby improving task-specific focus and lowering performance anxiety (Gard et al., 2014). By enhancing meta-awareness and emotional control, athletes are better able to maintain composure during high-stress competitive situations. According to the self-efficacy framework proposed by Albert Bandura, repeated mastery experiences strengthen an individual's belief in their capability to execute required actions. Structured and progressive yoga practice provides incremental skill acquisition and bodily control experiences, reinforcing confidence and perceived competence. This cyclical mastery process contributes to psychological resilience, competitive steadiness, and improved performance consistency.

Integration into Periodized Training

Yoga can be periodized in alignment with annual training plans to maximize adaptation without compromising sport-specific conditioning. During the **pre-season**, sessions may emphasize mobility refinement, postural correction, and low-load neuromuscular activation to prepare tissues for increased training intensity. This phase supports joint range optimization and foundational stability development.In the **competitive season**, shorter recovery-oriented sessions (approximately 20–30 minutes) focusing on breath regulation, gentle mobility, and relaxation can assist in autonomic rebalancing and fatigue management between matches. Such sessions prioritize restoration rather than additional loading (Bishop et al., 2008).During the **post-season**, longer restorative sequences may target residual asymmetries, accumulated tension, and movement compensations developed over the competitive cycle. This structured integration ensures yoga complements strength and conditioning programs rather than interfering with progressive overload principles.

Conclusion:

Yoga provides meaningful contributions to athletic conditioning by enhancing neuromuscular coordination, flexibility, and movement efficiency. Through controlled postures combined with regulated breathing, yoga improves joint alignment and intermuscular synchronization, allowing athletes to perform technical movements with reduced mechanical strain and improved energy economy. These adaptations support efficient force transfer across the kinetic chain and minimize unnecessary muscular tension during high-intensity tasks. It promotes autonomic balance by stimulating parasympathetic activity and reducing excessive sympathetic dominance. This shift supports hormonal regulation, particularly by moderating stress-related cortisol responses, thereby facilitating muscle repair and immune stability. Breath-centered relaxation and restorative sequences may also enhance sleep quality and reduce perceived fatigue, contributing to improved readiness between training sessions and competitions. It plays a preventive role in injury management. Emphasis on bilateral symmetry, eccentric control, and proprioceptive awareness enhances joint stability and reduces compensatory movement patterns. Strengthening deep stabilizing musculature and improving connective tissue resilience can lower the risk of overuse injuries, particularly in the lumbar spine, knee, and shoulder regions. When strategically integrated within structured training programs, yoga complements strength and conditioning cycles rather than interfering with them. Its adaptable nature across pre-season, competitive, and recovery phases supports sustainable performance development. Future research should examine sport-specific applications and long-term adaptation patterns in elite athletic populations.

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A STUDY OF EFFECT OF DYNAMIC SURYANAMASKARA ON THE EXPLOSIVE STRENGTH OF SENIOR CLASS SCHOOL STUDENTS

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Abstract:

Active participation in games and sports can aid with a variety of natural skills including jumping, running, and other powerful motions that are critical for improving performance. While sports performances mostly demand high lower limb fitness and strength, having strong legs can help correct muscle imbalances and accelerate the rate of recovery (Schlumberger, A., 2006). The purpose of this study was to determine the effects of 8 weeks of Dynamic Suryanamaskara on explosive strength of school students using the AARPHAD youth fitness test item, the standing broad jump (SBJ). The study included 50 students (ages 16 to 18) from Holy Heart Sen. Sec. Schools in Haryana who had never received structured training before. The participants were subsequently subdivided and assigned to either an experimental or control group at randomly. The health-related fitness variable chosen for the study was explosive leg strength. The training session was given to the experimental group for eight weeks as 30 min pieces of training for five days a week, while the control group continued only their prior normal routine. Further to assess the findings, data was collected twice during the pre and post-test before and after training of the group. When the data was evaluated, it was discovered that the eight-week suryanamaskara training showed statistically significant effect in the post-tests for explosive leg strength performances when compared to the pre-test results (P 0.05). Furthermore, as compared to the control group's post-test results, the experimental group's explosive leg strength performances in the post-test were statistically significant in terms of more improvement (P 0.05). The significant difference between the experimental and control groups using ANCOVA. ANCOVA revealed a significant difference in the experimental group after eight weeks when compared to its baseline. The study showed that this training programme may be effective for improving health-related fitness via variable explosive leg strength.

Key Words: Suryanamaskara, Explosive strength, Standing Broad Jump, Fitness

Introduction

People's level of physical fitness is shown to substantially decline as a result of the intense efforts to stop the disease's spread. Further analysis reveals that a robust physique allows for efficient and unrestricted movement while using the least amount of energy (Cronkleton, 2019). Having said that, it also entails instilling a stable, self-assured, effective, and functional body. Upper and lower body strength can be broadly categorized as the body's overall strength. Additionally, this study decides to focus its investigation on lower body strength. Explosive strength is the neuromuscular system's capacity to demonstrate strain in the quickest amount of time (Verhoanski, 1979). In his definition of explosive strength, Zatziorsky (1995) introduced the idea of reversible strength.

This study focuses specifically on lower body strength. Explosive strength refers to the neuromuscular system's capacity to generate force in the shortest possible time (Verkhoshansky, 1979). Zatsiorsky (1995) introduced the concept of reversible strength as part of explosive strength, involving two phases: eccentric (muscle lengthening under stretch) and concentric (muscle shortening). The concentric phase should activate as quickly as possible right after the eccentric stretch.

Aging triggers skeletal and functional changes in the body, leading to muscle mass and strength loss (Porter, 1998; Lexell, 2008). A home-based exercise program can help counteract this by building strength involvement, especially for frail elderly and youngsters' persons who may not have access to a gym or fitness centre. (Aagaard, 2008). In sports, generating high power often makes or breaks athletic success (Stone, 1993). Pairing resistance or power training with explosive drills can help athletes unleash even greater output. Explosive activities hone an athlete's knack for rapid acceleration at near-maximal intensities (Schmidtbleicher, 1993). Yoga ranks among the most natural, accessible exercises out there—practiced worldwide by folks of all genders, ages, and fitness levels. Research shows it sharpens both physical prowess and mental well-being. From the Sanskrit "Yuj," it means uniting your individual consciousness with the universal whole—essentially, awakening to your true self, life's essence, and deeper purpose (Singh, 2018). Sun salutations ramp up your heart rate into cardio endurance territory, with studies showing yogis match runners' fitness levels. Yoga also works well as a complementary therapy for easing depression, anxiety, and insomnia (Choi, 2018). Past studies confirm yoga interventions boost balance, flexibility, and strength

in teen girls (Fillmore, 2010), enhance abdominal power (Kalimuthu, 2011), and improve cardiorespiratory fitness along with body composition (Boraczyński, 2020).

Furthermore, research on the suryanamaskara training programme on health-related fitness variables such explosive power is sparse. We hypothesized that using all of the scientific material provided above as motivation, there would be an effective benefit from suryanamaskara training intervention on explosive leg strength compared to the control group. We expected that the short-term online vinyasa training programme designed and implemented in this study would have a good effect on the above-mentioned components' performance. Study Purpose The goal of the study was to see if suryanamaskara training affected school-aged children's explosive leg strength.

Methodology

Study participants fifty students consented to participate in the study. School children aged 16 to 18 years old who had no prior experience with an organised suryanamaskara training programme or a history of systematic training took part in the study. One of the inclusion criteria for the subjects in this study was the absence of any previous training that could have influenced the training or data collecting. The subjects were split into two groups, one experimental group (suryanamaskara) and the other for the control group (daily routine), each with an equal number of participants. They completed a written consent form after hearing about the approach and its risks during the intervention/data collection. The study was carried out in accordance with the Helsinki Declaration's ethical criteria for human research. Study organization Two sessions were held prior to the start of the suryanamaskara programme intervention to familiarise the subjects with the test methodologies. During familiarisation sessions, the individuals were informed about the data collection and training intervention procedures. The training intervention lasted eight weeks and consisted of 30 30-minute training sessions. One micro-cycle lasted seven days and included five training sessions (Monday, Tuesday, Wednesday, Thursday, and Friday; Table 1), all of which were overseen and supervised by the researchers. The classes were 30 min in duration each and were conducted in the morning from 7:45 AM to 8:15 AM so as not to disturb their scheduled school programmes. A special appeal was made to the subjects so that they do not miss any of their classes. The training intervention was created with the goal of increasing explosive leg strength with activities that were as enjoyable as possible. The tests were done twice: once before training (0 weeks) and again after training (8 weeks). The standing broad jump, an AARPHAD juvenile fitness test item, was used to assess the school children's explosive leg strength (SBJ). Standing Broad Jump. The subjects' explosive strength was measured using the standing broad jump. The participants were told to stand a few inches behind the take-off line, flex their knees, and swing their arms backwards, which would allow them to jump forward. The three most successful tests were documented and analysed. The measurements were taken in centimetres. Under the supervision of the researcher, the test was conducted.

Table-1. Example of a training session during intervention group

S.No.	Test	Total Time (minutes)
1	Opening Prayer	2
2	Loosening Exercises	6
3	Dynamic Suryanamaskar	20
4	Relaxing	2
	Total	**30**

The Suryanamaskar training followed a hands-on method, taught and supervised directly by the researcher alongside the physical education teacher. Each step got a clear explanation and live demo first, then participants practiced while receiving on-the-spot corrections. Additional guidance came during the program.

The demographic information is as follows.

Table-2. Demographic information for the experimental and control groups of school children

Group	Age(years)	Gender	Number of Participants	Percentage
Experimental	16-18	Male	25	50
Control	16-18	Male	25	50
		Total	**50**	**100**

Statistical analysis data analysed using IBM SPSS software (version 23), and the study was pre-test and post-test group design. The analyses were conducted on two groups (experimental and control) at statistical significance level 0.05. Furthermore, the standing broad jump was used as the study's instrument for data collection.

Results

According to the post-tests, the Suryanamaskar training applied for 8 weeks had statistically significant effects on explosive leg strength performances compared to the pre-test (P 0.05). Furthermore, when the experimental and control groups' post-test results were compared, the experimental group's explosive leg strength performances in the results of the post-tests were statistically significantly better (P 0.05) than the results of the control group's post-tests. ANCOVA was used to find a significant difference between the experimental and control groups. It revealed a significant difference between the experimental and control groups after 8 weeks. (Table4 and Table5).

Table-3. Descriptive statistics for the standing broad jump after training Group

Group	Mean	Std. Devi.	N
Experimental	157.14	9.85	25
Control	158.82	9.58	25
Total	157.98	9.71	50

Table-3 shows that the mean of the experimental group was 157.14, and the standard deviation was 9.85. However, for the control group, the mean was158.82, and the standard deviation was 9.58.

Table-4. Adjusted means and standard errors for the standing broad jumps of the different groups

Group	Mean	Std. Error	Lower bound	Upper bound
Control	155.123	0.49	154.117	156.126
Experimental	158.850	0.49	157.847	159.856

a. Covariates appearing in the model were evaluated at the following values: Pre-SBJ = 154.5100. b. Values were rounded.

Table 4 displays the adjusted means and standard errors for the outcome variable across treatment groups. After accounting for the covariate, we calculated pre-treatment means for all groups—these differ from the raw values in Table 3. ANCOVA's key advantage here: it adjusts post-test differences to offset initial score variations, effectively isolating each treatment's true impact on the outcome by removing the covariate's influence.

Table -5. ANCOVA analysis of the standing broad jump after training

Source	Type I Sum of Squares	Df	Mean Square	F	Sig.
Pre-test	2362.61	1	2362.61	661.61	.00
Groups	102.98	1	102.98	28.837	.00
Error	96.43	47	3.571		
Corrected Total	2562.05	49			

a. R Squared = 0.962 (Adjusted R Squared = 0.960)

b. Computed using alpha = 0.05

Table 5 shows a significant F-statistic for the standing broad jump ($p = 0.00 < 0.05$), letting us reject the null hypothesis of no group differences at the 5% level. This confirms real differences in adjusted post-treatment means for Suryanamaskara training across groups. The pre-test (covariate) F-value was also significant, highlighting uneven starting points between experimental and control groups—exactly why ANCOVA adjusted the means to fairly isolate the training's effects.

Discussion

Your study abstract effectively bridges a research gap in yoga's child-specific effects, demonstrating through ANCOVA that an 8-week Suryanamaskar program significantly boosted explosive leg strength in sedentary school children compared to controls, aligning with broader literature on yoga's motor, physical, cognitive, and social

benefits (Galantino 2008; Woodyard 2011; Bubela 2014) despite prior uncertainties, and mirroring Singh (2012) findings on physiological improvements in 18-24-year-old female athletes from similar 8-week training. While the intervention's 5-day-weekly structure provided ample stimulus for novices, enhancing reproducibility would involve detailing sample size, age range, strength measures (e.g., vertical jump), effect sizes, and limitations like potential selection bias. These results underscore Suryanamaskar's value as a low-cost, school-integrable tool to combat sedentariness and foster holistic development amid rising childhood yoga adoption. This study excerpt effectively links an 8-week program—delivered five days a week—to significant gains in explosive leg strength among sedentary schoolchildren, outperforming controls via a novel stimulus absent in their prior routines, much like Malipatil (2017) found yoga and physical exercises boosted leg power and agility in 300 diverse 14-16-year-olds (with physical training slightly superior). The intervention's success in novices aligns with training principles where unfamiliar stimuli yield rapid adaptations, while Petros (2016) adds depth by suggesting systematic yoga enhances identity management and intrinsic motivation, fuelling greater effort. To strengthen this discussion, quantify effect sizes from your analysis, clarify the explosive strength metric (e.g., vertical jump), note online delivery's accessibility advantages, and address limitations like sample demographics or adherence tracking, positioning yoga as a scalable, engaging tool for school fitness amid rising childhood sedentariness.

This discussion synthesizes yoga's proven benefits, linking your explosive leg strength gains in sedentary schoolchildren to prior evidence like Pal (2009) on significant (P=0.001) improvements in muscle strength, endurance (e.g., chest press), and flexibility (wrist, hip, knee, ankle) from sun salutations, plus Tekur (2008) showing yoga's edge over exercise for pain relief and spinal flexibility in chronic low-back pain patients. These align with Choi (2018), where 8 weeks of yoga boosted cardiovascular health, psychological well-being, stress reduction, and fitness in inactive young adults, supporting vinyasa as a holistic tool for children's physical, mental, and emotional development when delivered playfully.

Study aptly highlights the efficacy of a 8-week, five-day-a-week suryanamaskara yoga program in significantly enhancing explosive leg strength and dynamic body balance in school children, providing a potent stimulus for sedentary youth where even a short intervention proved sufficient. This positions suryanamaskara as an accessible, scalable tool for school curricula, with promising avenues for future research including its impact on physiological markers like oxygen consumption, metabolic responses, energy expenditure across varying speeds/durations, and complementary fitness components such as static balance to support holistic child development.

Conclusion

Researcher can conclude that eight-week suryanamaskara training programme is effective in improving explosive leg strength of school children. This study further encourages researchers to perform a larger scale study on similar factors. Moreover, from the prospect of health-related physical fitness, it is well accepted that yoga practice as a home-based exercise programme, resulted in significant improvements in explosive leg strength. In addition, the fact that it is simple and easy to follow may encourage a large section of society to participate. The study also showed a very effective method of training in which one can stay indoors, requiring almost no equipment and only a small space to keep oneself fit and continue a healthy lifestyle. In the era of technology, staying healthy must be encouraged. Statistically, we conclude that after implementation of a "8-week online suryanamaskara training programme for the standing broad jump was significant. According to the findings of the study, yoga could be beneficial for improving health related fitness, specifically explosive leg strength. Coaches and teachers could use yoga training programmes since it will contribute to the players' gross motor and skill development. Future research is needed to evaluate how effectively yoga addresses the demands of other population.

Conflicts of interest – The author of the study declares no conflict of interest.

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A STUDY OF THE EFFECT OF YOGIC INTERVENTION ON ANXIETY DEPRESSION AND STRESS (ADSS) AMONG FEMALE PRISONERS

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Abstract

The jail environment is frequently linked to psychological suffering because of the limited freedom, family separation, social shame, emotional trauma, and uncertainty. Mental health conditions like stress, anxiety, and depression are particularly common among female inmates. Yoga, which uses physical postures, breathing exercises, and meditation techniques to enhance psychological well- being, is regarded as an effective non-pharmacological therapeutic. The current study sought to determine how a one-week yoga intervention affected female inmates between the ages of twenty and fifty in terms of anxiety, depression, and stress (ADSS). Purposive sampling was used to choose 20 female inmates in all. The study used an experimental design with pre-test and post-test phases. The Anxiety Depression Stress Scale (ADSS) was used to measure psychological factors both before and after the intervention. The yoga intervention was conducted for seven days in a row, with a 60-minute session each time. Prayer, loosening exercises, Pragyayog, pranayama methods like Bhramari, and relaxation techniques like Shavasana were all part of the intervention. The same instrument was used for a post-test evaluation following the conclusion of the one-week yoga session. Descriptive statistics (mean and standard deviation) and inferential statistics (paired t-test) were used in data analysis to ascertain the significance of changes between pre-test and post-test scores. According to the results, the individuals' levels of stress, anxiety, and sadness significantly decreased after the yoga intervention. According to the findings, female inmates' psychological well-being and emotional stability may benefit from even a brief yoga practice. The study comes to the conclusion that yoga might be a useful rehabilitation technique for enhancing mental well-being and lowering psychological discomfort in correctional environments. Frequent yoga practice may help incarcerated women develop self-control, emotional equilibrium, and general wellbeing.

Keywords: Female Prisoners, Anxiety, Depression, Stress, Yogic Intervention

1. Introduction

Although prisons are places intended for both punishment and rehabilitation, they frequently subject their inmates to extreme psychological hardship. Emotional instability among inmates is caused by a number of factors, including limited freedom, being away from family, overcrowding, and uncertainty about the outcome of legal proceedings. Due to past trauma, societal shame, and a lack of coping mechanisms, female inmates are more vulnerable psychologically.

According to research, those who are incarcerated often experience chronic stress, anxiety, and despair. Their behavior, emotional health, and chances of recovery are all adversely impacted by these psychiatric disorders. As a result, there is an increasing need for low-cost, efficient interventions that can enhance the mental health of prisoners.

1. Objectives of the Study

1. To evaluate female inmates' anxiety levels using the ADSS scale.
2. To use the ADSS scale to gauge the degree of depression among female inmates.
3. To evaluate female inmates' stress levels using the ADSS scale.
4. To investigate the impact of a week-long yoga program on female inmates' stress, anxiety, and sadness.

2. Hypothesis

H1: The experimental group's anxiety levels will significantly decrease following the yoga session.
H2: Following a yoga intervention, the experimental group's depression levels will significantly decline.
H3: The experimental group's stress levels will significantly decrease following the yoga session.

3. Methodology

3.1 Research Design

The study adopted a **pre-test and post-test control group experimental design**.

3.2 Participants

The study consisted of **20 female prisoners** aged between **20 and 50 years** selected from a correctional institution. The participants were divided into two groups:

- **Experimental Group:** 10 subjects
- **Control Group:** 10 subjects

The experimental group received the yogic intervention, whereas the control group did not receive any yoga training during the study period.

3.3 Sampling Technique

Participants were selected using **purposive sampling method** based on inclusion criteria and willingness to participate.

3.4 Inclusion Criteria

- Female prisoners aged between **20–50 years**
- Willing to participate in the study
- Physically able to perform yoga practices

3.5 Exclusion Criteria

- Prisoners suffering from severe physical illness
- Individuals undergoing psychiatric treatment
- Prisoners unwilling to participate

4. Research Tool

The **Anxiety Depression Stress Scale (ADSS)** developed by **Pallavi Bhatnagar et al.** was used for measuring psychological variables.

The scale measures three psychological components:

1. **Anxiety**
2. **Depression**
3. **Stress**

The questionnaire consists of multiple items designed to assess emotional and psychological states. Participants responded to the questionnaire before and after the intervention.

Yogic Intervention Protocol

The experimental group participated in a **one-week yogic intervention program** designed to improve psychological well-being and emotional balance. The intervention included selected practices known for their calming and stress-reducing effects.

Duration: 1 Week **Session Time:** 60 minutes daily

Components of Yogic Intervention

1. Pragya Yoga

Pandit Shriram Sharma Acharya developed Pragya Yoga, a holistic yogic practice that combines mantra chanting, rhythmic breathing, and physical exercises to balance the body and mind. It is intended to enhance mental, spiritual, and physical health as well as awaken inner consciousness (Pragya). Chanting the Gayatri mantra, which aids in mental purification and emotional stability, and synchronized breathing with basic yoga poses are key components

of the practice. Pragya Yoga is thought to be a useful technique for lowering stress, enhancing mental clarity, and cultivating positive personality qualities.

2. Bhramari Pranayama

Bhramari Pranayama, is a technique that produces a humming sound by slowly inhaling and then exhaling. The parasympathetic nervous system is stimulated by the vibration generated throughout the practice, which aids in lowering tension, anxiety, and sadness.

3. Shavasana

In the deep relaxation method known as shavasana (corpse posture), the practitioner lies down in a comfortable supine position and concentrates on total mental and physical relaxation. This exercise eases tense muscles, calms the mind, and enhances emotional control.

The yogic intervention was conducted under supervision for the experimental group, while the control group continued their normal routine activities without yoga practice.

Statistical Analysis

To evaluate the effectiveness of the yogic intervention, the Anxiety Depression Stress Scale (ADSS) developed by Pallavi Bhatnagar was administered before and after the intervention.
The following statistical methods were used:

- Mean
- Standard Deviation
- Independent and Paired **t-test**

Results - Table 1

Mean and Standard Deviation of Anxiety Scores

Group	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value
Control Group	10	21.30	3.10	20.90	3.00	0.42
Experimental Group	10	22.10	3.25	15.20	2.85	4.96*

Significant at 0.05 level

Interpretation:

After engaging in Pragya Yoga, Bhramari Pranayama, and Shavasana, the experimental group's anxiety scores significantly decreased, whereas the control group did not.

Table 2
Mean and Standard Deviation of Depression Scores

Group	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value
Control Group	10	23.40	3.40	22.90	3.10	0.51
Experimental Group	10	24.10	3.20	16.80	2.70	5.12*

Significant at 0.05 level

Interpretation:

The depression scores decreased significantly among the experimental group after the yogic intervention.

Table 3
Mean and Standard Deviation of Stress Scores

Group	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value
Control Group	10	22.60	3.00	22.10	2.80	0.47
Experimental Group	10	23.30	3.15	16.40	2.60	5.38*

Significant at 0.05 level

Interpretation:

The results reveal a significant decrease in stress levels among female prisoners in the experimental group after practicing the yogic intervention.

Discussion

The current study's findings show that a brief yoga intervention that included Shavasana, Bhramari Pranayama, and Pragya Yoga considerably decreased stress, anxiety, and depression among female inmates. These results corroborate other studies showing that yoga can improve emotional balance, calm the nervous system, and regulate breathing, all of which have a good impact on mental health.

In order to lessen psychological stress, Bhramari Pranayama creates vibrations that engage the parasympathetic nervous system and stimulate the vagus nerve. Similar to how Shavasana generates profound relaxation and lowers physiological arousal, Pragya Yoga encourages rhythmic breathing and mental focus. The combination of these yoga techniques seems to be beneficial for enhancing the mental health of women who are incarcerated.

Conclusion

The current study finds that a one-week yoga program that includes Shavasana, Bhramari Pranayama, and Pragya Yoga considerably lowers stress, anxiety, and sadness among female inmates. Thus, yoga-based interventions might be regarded as a useful instrument for enhancing emotional stability and mental health in prisons.

COMPARISON OF MUSCLE ACTIVATION DURING TRACK START AND GRAB START IN SWIMMING

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Abstract

Background: The swimming start is a crucial determinant of race performance, and different start techniques may impose distinct neuromuscular demands. Understanding muscle activation patterns during the track start and grab start can provide biomechanical insight for technique selection and training.

Purpose:

The purpose of this study was to compare surface electromyography (EMG) muscle activation patterns between the track start and grab start techniques in swimming.

Methods:

Fifteen male trained swimmers (n = 15) performed both track start and grab start techniques under controlled conditions. Surface EMG activity was recorded from the gluteus maximus, vastus lateralis, gastrocnemius, erector spinae, and anterior deltoid muscles during the block phase. EMG signals were normalized to maximum voluntary contraction (%MVC). Paired t-tests were used to compare muscle activation between techniques, with statistical significance set at $p < 0.05$.

Results:

Significant differences in muscle activation were observed for all examined muscles ($p < 0.001$). The track start demonstrated significantly greater activation of the gluteus maximus (82.9 ± 2.8 vs 68.7 ± 2.6 %MVC), vastus lateralis (74.7 ± 2.5 vs 63.2 ± 2.2 %MVC), and gastrocnemius (72.0 ± 2.6 vs 60.3 ± 2.4 %MVC) compared with the grab start. In contrast, erector spinae (68.5 ± 2.3 vs 60.0 ± 1.8 %MVC) and anterior deltoid (63.9 ± 2.1 vs 54.3 ± 1.9 %MVC) activation were significantly higher during the grab start.

Conclusion:

The findings indicate that the track start emphasizes lower-limb muscle activation, whereas the grab start relies more heavily on trunk and upper-limb musculature. These distinct neuromuscular strategies highlight important biomechanical differences between swimming start techniques and provide practical implications for training and performance enhancement.

Keywords: Swimming start, track start, grab start, surface EMG, muscle activation, biomechanics

Introduction:

In competitive swimming, race performance is influenced not only by swimming technique and physiological capacity but also by the effectiveness of the start.(Baldassarre et al., 2017; McGibbon et al., 2018; Smith et al., 2002). The start phase can account for a substantial portion of total race time, particularly in sprint events, where even small performance gains can determine competitive outcomes. Consequently, optimizing start technique has become a key focus in swimming biomechanics and coaching practice.

Two commonly used start techniques in swimming are the track start and the grab start.(Breed & Young, 2003; Dassoff et al., 2017; Juergens, 1994; Welcher et al., 2008) The track start is characterized by a staggered foot position on the starting block(Čoh et al., 2006; Harland & Steele, 1997; Henry, 1952; Schot & Knutzen, 1992; Valamatos et

al., 2022), allowing swimmers to generate force asymmetrically, while the grab start involves a parallel foot placement and greater forward trunk flexion. Previous biomechanical studies have suggested that the track start may provide advantages in block clearance time and horizontal velocity; however, both techniques continue to be used across different levels of competition. Understanding the neuromuscular demands associated with each start technique is essential for informed technique selection and targeted training.

Surface electromyography (EMG) is a valuable tool for examining muscle activation patterns during explosive athletic movements(Deshi et al., 2023a, 2023b; Deshi & Das, 2023). By quantifying the timing and magnitude of muscle activation, EMG provides insight into the neuromuscular strategies underlying movement performance. In swimming starts, effective coordination between lower-limb, trunk, and upper-limb muscles is required to generate maximal propulsion while maintaining balance and stability on the starting block.

Lower-limb muscles such as the gluteus maximus, vastus lateralis, and gastrocnemius play a critical role in producing the powerful hip extension(deshi & mishra, 2024), knee extension, and ankle plantarflexion necessary for an effective push-off. Meanwhile, trunk and upper-limb muscles, including the erector spinae and deltoid, contribute to postural control, force transmission, and body positioning during take-off. Differences in technique may therefore lead to distinct muscle activation patterns, influencing start efficiency and overall performance.

Despite the importance of the swimming start, limited research has directly compared muscle activation patterns between the track start and grab start using surface EMG. A clearer understanding of these neuromuscular differences would provide valuable biomechanical evidence to support coaching decisions and training program design.

Therefore, the purpose of this study was to compare surface EMG muscle activation patterns of selected lower-limb, trunk, and upper-limb muscles during the track start and grab start techniques in swimming. It was hypothesized that the track start would demonstrate greater lower-limb muscle activation, while the grab start would exhibit increased trunk and upper-limb muscle activity.

Methodology

Participants

Fifteen male competitive swimmers (n = 15) aged 18–23 years voluntarily participated in the study. All participants were actively training and competing at Laxmibai National Institute of Physical Education. Inclusion criteria included a minimum of three years of competitive swimming experience and familiarity with both start techniques. Participants with a history of lower-limb or spinal injury within the past six months were excluded. Written informed consent was obtained from all participants.

Experimental Design:

A within-subject experimental design was used. Each participant performed three valid trials of the track start and three trials of the grab start in randomized order to minimize learning and fatigue effects. Adequate rest was provided between trials.

Instrumentation:

Surface EMG was recorded using a multi-channel EMG system synchronized with a force plate mounted beneath the starting block. EMG signals were sampled at 1000 Hz and filtered using a band-pass filter (20–450 Hz). Motion capture was used to identify movement phases.

Muscle Selection and EMG Placement:

EMG electrodes were placed on the dominant side over the gluteus maximus, vastus lateralis, biceps femoris, gastrocnemius, erector spinae, and deltoid muscles, following SENIAM guidelines. Skin preparation included shaving, abrasion, and cleaning with alcohol to reduce impedance.

Statistical Analysis:

EMG signals were rectified and normalized to maximum voluntary contraction (%MVC). Mean muscle activation during the push-off phase was calculated. Paired t-tests were used to compare muscle activation between track and grab starts, with significance set at $p < 0.05$.

Results:

Table 1. Comparison of Surface EMG Muscle Activation (%MVC) Between Track Start and Grab Start Techniques in Swimming:

Muscle	Track Start Mean ± SD	Grab Start Mean ± SD	Mean Difference	t-value (df=14)	p-value
Gluteus Maximus	82.9 ± 2.8	68.7 ± 2.6	14.67	77.21	< 0.001
Vastus Lateralis	74.7 ± 2.5	63.2 ± 2.2	11.53	65.34	< 0.001
Gastrocnemius	72.0 ± 2.6	60.3 ± 2.4	11.67	62.81	< 0.001
Erector Spinae	60.0 ± 1.8	68.5 ± 2.3	−8.53	−59.42	< 0.001
Deltoid (Anterior)	54.3 ± 1.9	63.9 ± 2.1	−9.60	−61.88	< 0.001

Table 1 presents a comparison of normalized muscle activation (%MVC) between the track start and grab start techniques in swimming. Paired t-test analysis revealed statistically significant differences in muscle activation across all examined muscles ($p < 0.001$).

Lower-limb muscles demonstrated significantly greater activation during the track start. Gluteus maximus activity was markedly higher in the track start (82.9 ± 2.8% MVC) compared with the grab start (68.7 ± 2.6% MVC), with a mean difference of 14.67% MVC ($t(14) = 77.21$, $p < 0.001$). Similarly, vastus lateralis and gastrocnemius activation were significantly greater during the track start, indicating enhanced knee extension and ankle plantarflexion during the push-off phase.

In contrast, trunk and upper-limb muscles exhibited significantly higher activation during the grab start. Erector spinae activation increased from 60.0 ± 1.8% MVC in the track start to 68.5 ± 2.3% MVC in the grab start ($t(14) = -59.42$, $p < 0.001$). Likewise, anterior deltoid activity was significantly higher during the grab start (63.9 ± 2.1% MVC) compared with the track start (54.3 ± 1.9% MVC), reflecting greater reliance on trunk extension and upper-limb contribution.

Overall, the results indicate that the track start emphasizes lower-limb muscle activation, whereas the grab start relies more heavily on trunk and upper-limb musculature, highlighting distinct neuromuscular strategies between the two start techniques.

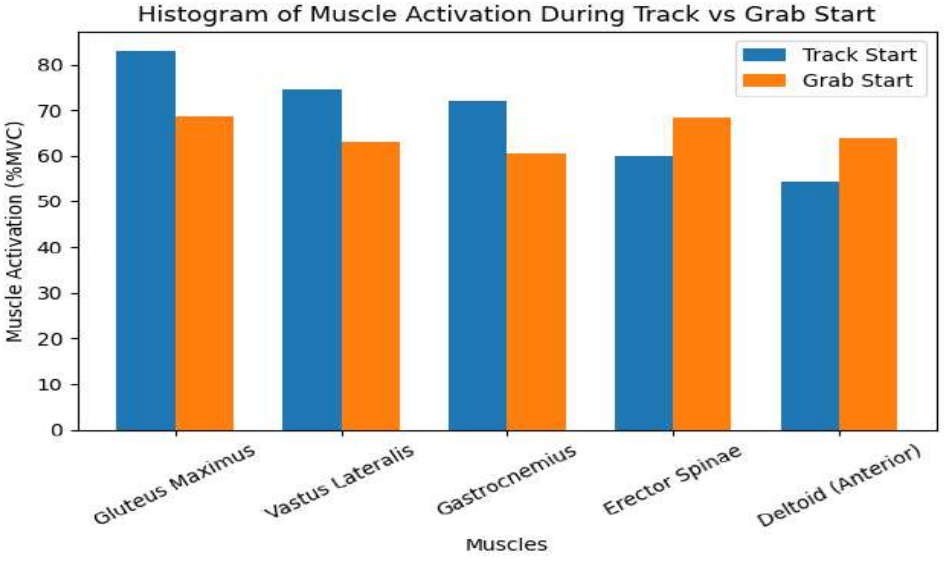

Figure 1. Histogram of Surface EMG Muscle Activation During Track Start and Grab Start in Swimming:

Figure 1 illustrates the comparison of mean normalized muscle activation (%MVC) between track start and grab start techniques. The track start shows higher activation of lower-limb muscles, while the grab start demonstrates greater trunk and upper-limb muscle activation.

Discussion:

The purpose of this study was to compare muscle activation patterns between the track start and grab start techniques in swimming using surface electromyography. The primary findings indicate that the two start techniques employ distinct neuromuscular strategies. Specifically, the track start was characterized by significantly greater activation of lower-limb muscles, whereas the grab start demonstrated higher activation of trunk and upper-limb musculature.

The significantly greater activation of the gluteus maximus, vastus lateralis, and gastrocnemius during the track start highlights the importance of lower-extremity force production during this technique. These muscles are primarily responsible for hip extension, knee extension, and ankle plantarflexion, which collectively contribute to a powerful forward and upward propulsion off the starting block. The staggered foot position in the track start likely facilitates more effective utilization of the stretch–shortening cycle and improved force direction, resulting in greater lower-limb muscle recruitment.

In contrast, the grab start showed significantly higher activation of the erector spinae and anterior deltoid muscles. This suggests a greater reliance on trunk extension and upper-limb involvement during the initiation of the dive. The symmetrical foot position and forward trunk lean in the grab start may require increased stabilization and force generation from the trunk and shoulder musculature to compensate for reduced lower-limb dominance. Such a strategy may be less effective for generating horizontal propulsion but may assist in maintaining balance during take-off.

These findings align with biomechanical principles of swimming starts, which emphasize the role of lower-body power in achieving faster block clearance and improved entry velocity. From a neuromuscular efficiency perspective, the track start appears to promote a more optimal distribution of force production by prioritizing large, powerful lower-limb muscles, while the grab start relies more on upper-body contribution.

Despite the significant findings, the study has certain limitations. The sample size was relatively small, and only selected muscles were analyzed. Additionally, EMG recordings were limited to the block phase and did not include underwater activity. Future research should include larger samples, bilateral muscle analysis, kinetic variables such as ground reaction forces, and performance measures such as start time and entry velocity to further elucidate the effectiveness of swimming start techniques.

Conclusion:

The present study concludes that the track start and grab start techniques in swimming exhibit significantly different muscle activation patterns. The track start is characterized by greater activation of lower-limb muscles, indicating superior utilization of lower-body power during the push-off phase. In contrast, the grab start relies more heavily on trunk and upper-limb muscles, reflecting a compensatory neuromuscular strategy.

These findings suggest that the track start may be biomechanically more efficient for generating propulsion and may provide performance advantages during competitive swimming starts. Coaches and athletes can use this information to guide technique selection and design targeted strength and conditioning programs focusing on lower-limb power development. Overall, understanding the neuromuscular demands of swimming start techniques can contribute to improved performance and more effective training interventions.

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EFFECT OF SELECTED PHYSICAL VARIABLES ON BONUS SKILL PERFORMANCE OF LNIPE KABADDI PLAYERS

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Abstract

Kabaddi is a high-intensity fast pased combative sport that require a combination of physical fitness and technical skill for effective performance. Bonus skill is crucial for scoring point among offensive skills. However, limited research has examined the influence of physical characteristics on bonus skill performance. Therefore, the purpose of this study was to investigate the effect of selected physical variables on bonus skill performance among kabaddi players.

Ten female and male inter-college level kabaddi raiders aged from 18-25 years were selected using purposive sampling. Selected physical variables include agility and lower extremity explosive strength. Standardized tools such as standing broad jump and shuttle run test were used for data collection. Bonus skill performance was evaluated through expert rating. Descriptive statistics were used to characterize the variables, and point-biserial correlation was applied to determine the relationship between variables and bonus skill performance.

The analysis of the data revealed that 70% of players successfully executed the bonus skill and there was no significance correlation was found between selected physical variable and bonus skill performance. Level of significance was $p>0.05$. correlation values indicating week relationship which was ranged from -0.280 to 0.152.

The conclusion was that bonus skill performance is more influenced by timing, tactical awareness, technical efficiency and master over the skill rather than isolated physical characteristics further research with biomechanical analysis and large sample is suggested.

Keywords: kabaddi, physical variables, bonus skill, skill performance, explosive strength and physical fitness.

1. Introduction:

Skill can be defined as the ability of an individual to do any task without occurrence of errors. If an individual is skillful then he will require less amount of force and time to complete any task and if an individual is having lack of skill, then he will require more force as well as time to do the same task which a skillful person is doing by exerting less force as well as less time.

Kabaddi is an aggressive group game, played with positively no gear, in a rectangular court, either out alfresco or indoor with seven players on the ground in each side. Each side takes substitute risks at offense and safeguard. The fundamental thought of the game is to score centers by going after into the opponents' court and reaching anything number of defenders as could be anticipated considering the present situation without getting found out on a solitary breath. During play, the players on edge side are called 'Antis' while the player of the offense is known as the 'Raider'. Kabaddi is maybe the main confrontational game in which assault is a singular endeavor while guard is a collective endeavor. The assault in Kabaddi is known as a 'Raid'. The antis contacted by the plunderer during the assault are announced out in the event that they don't prevail in when their side scores point against the opposite side during their striking turn or on the other hand assuming the excess players prevail with regards to getting the adversary's looter (Devaraju. K & Needhiraja, 2012).

There are so many skills have been made in Kabaddi. These skills can be classified into two categories: Offensive Skills and Defensive Skills.

Offensive Skills: - Those Skills which are performed by the raider when he goes to opponent's side to take a point/s for his team, comes under the category of offensive skills and their names are given below: -

- ❖ Bonus
- ❖ Running Hand Touch
- ❖ Side Kick

- ❖ Toe touch
- ❖ Dubki

Defensive Skills: - Those Skills which are performed by a team to tackle a raider of opponent's team when he comes to their side to take point for his team, comes under the category of defensive skills and their names are given below: -

- ❖ Ankle Hold
- ❖ Dive
- ❖ Thigh Hold
- ❖ Waist Hold
- ❖ Push Attack

Bonus is an offensive skill which is used by the raider during raid. While performing this skill, the raider completely crosses the bonus line. One point will be awarded to the raider for successful bonus.

2. Material and Method

Participants

10 female and male raiders were selected for this study by purposive sampling technique who at least participated in inter-college level competition. The age of the subjects was range between 18-25 years. All the subjects have knowledge and training experience in kabaddi.

Description of Sampling Plan

Raider

The subjects were selected from LNIPE. A prior permission was taken from coaches of kabaddi from LNIPE before data collection. It was well thought-out that they possess decent level of bonus skill. The purpose of the study was explained by the researcher to the subjects and they were requested to involve in the testing procedure whole-heartedly and at most sincerity to put their best during each trial.

Selection Of Variables

Based on previous studies, conversation with experts and scholar's own understanding and keeping the feasibility criterion in mind, total 7 variables (2 physical + 5 anthropometrical) were selected in this study.

DESCRIPTION OF SELECTED TOOLS AND THEIR MEASURING UNITS

1	Bonus Skill Performance	Rating Scale	Point
7	Explosive Strength	Standing Broad Jump	Centimeter
8	Agility	Shuttle Run (Recorded by stopwatch)	Second

Criterion Measures:

1. The performance of the bonus skill was measured by objective evaluation. Three experts were selected for this purpose and they were coaching diploma holders.
2. Shuttle run was measured in seconds.
3. Explosive Strength was measured in centimeter.

Administration of Test And Data Collection

All the participants were informed in details about research protocol and the basic characteristics of the study. No special motivation technique was castoff to encourage the players before data collection. All the participants executed the same protocol under the same circumstances and were guided by researcher. The measurement of lower extremity explosive strength was done by standing broad jump test. To measure the performance of the bonus skill of raiders, instructions were given to raiders that they have to raid in opponents side and perform a bonus skill. Appropriate time was given to raiders and defenders for general and specific warm-up. Match situation was created and raiders were asked to raid (Figure-3.2). Three raids were given to every raider and best one was considered.

Collection of data:
3 trials were given to each raider.
For successful bonus 1 point was be given.
For unsuccessful bonus 0 point were given to the raider.

FIGURE-1.1
SUBJECT PERFORMING BONUS SKILL

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Bonus Skill (0=Unsuccessful, 1=Successful)	10	0.700	0.483	0	1
Explosive Strength	10	2.25	0.355	2.026	2.534
Agility (s)	10	10.0	0.725	8.76	11.1

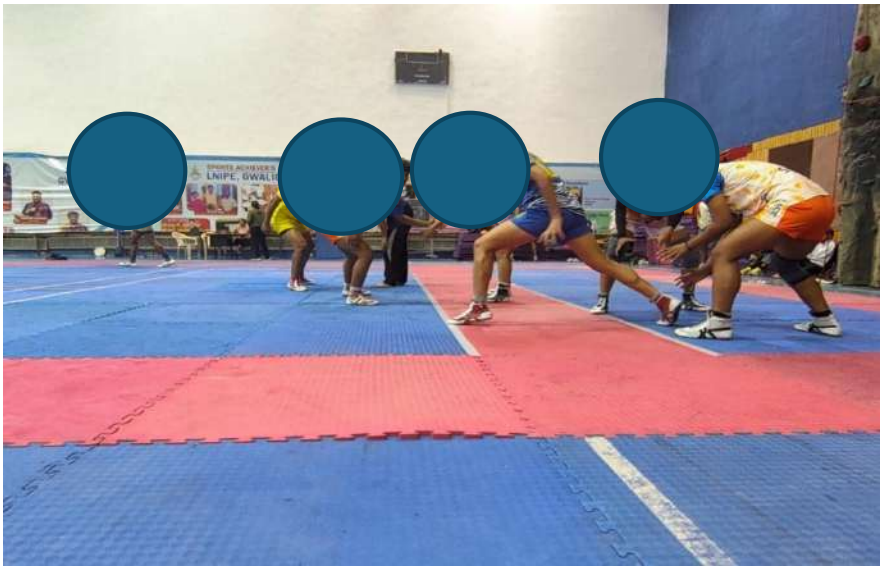

FIGURE-1.2
MESUREMENT OF LOWER EXTREMITY EXPLOSIVE STRENGTH

After the completion of data collection process, researchers contacted with kabaddi experts and explained them about the purpose of this study and also about their role to give rating to the subjects according to their performance. Rating scale was given to each expert before starting the evaluation process (Table-1.1). The recorded videos of subjects' performances were shown to three experts for rating purpose. All experts were having diploma of coaching in kabaddi and also having participation in national level competitions. The inter-rater reliability of experts was tested by using Cohen's Kappa inter-rater reliability test and Kappa's coefficient was found significant (Kvålseth, 1989). The average of the total scores given by the subjects was taken as final performance score of the subjects

Measurement of Explosive Strength

Explosive strength of the subject was measured by standing broad jump test. Appropriate time for warm-up was given to the subject. Before performing a test, demonstration was given to the subject. A distance covered by the subject in a jump was measured by measuring tape in centimeters. Three trials were given to the subject and best one was taken as his final score (Figure 1.2).

Measurement of Agility

Agility of the subject was measured by shuttle run test. Appropriate time for warm-up was given to the subject. Before performing a test, demonstration was given to the subject. Two cones were placed at 10 meters apart. Subject ran back and forth between two 10-meter markers as fast as possible, and the performance was recorded by time or total shuttles completed (40meters). Two trials were given to the subject and best one was taken as his final score (Figure 1.3).

FIGURE-1.3
MEASUREMENT OF AGILITY

3. Statistical Technique

Two characterize the level of physical variables of Kabaddi players, **Descriptive statistics** was used.

To study the relationship between physical variable and bonus scale performance of LNIPE kabaddi players, **Pearson Correlation** was used.

The significance was set at 0.05 level.

Section-I

Descriptive Statistics of Anthropometrical, Physical and Bonus skill of Kabaddi Players of LNIPE

Bonus Skill Performance: Of the 10 players, **7 (70.0%)** were successful in the bonus skill, and **3 (30.0%)** were unsuccessful.

Physical Variables: The mean agility was 10.0±0.725 seconds, and the mean standing broad jump distance was 2.28± 0.355 meters.

Section -II

Point-Biserial Correlation: - The point-biserial correlation coefficient (r_{bp}), which is equivalent to Pearson's r when one variable is dichotomous, was used to assess the relationship between the anthropometrical and physical variables and the Bonus Skill performance.

Table: 2
Correlation Coefficient between Physical Variables with the Performance of Bonus Skill

Variables	Pearson's r (rpb)	p-value
Agility	0.152	0.675
Standing Broad Jump	-0.200	0.579

None of the physical variables showed a **statistically significant correlation** with the performance of the bonus skill ($p > 0.05$). Thus, the null hypothesis that there is no significant correlation between physical variables with the performance of bonus skill is accepted. It may, therefore be said that all predictors with the Bonus Skill is very low and statistically non-significant ($p > 0.43$).

The correlation coefficients (rpb) are all small in magnitude, ranging from -0.280 to 0.152, indicating a **weak** linear relationship between each predictor and bonus skill performance.

Section –III

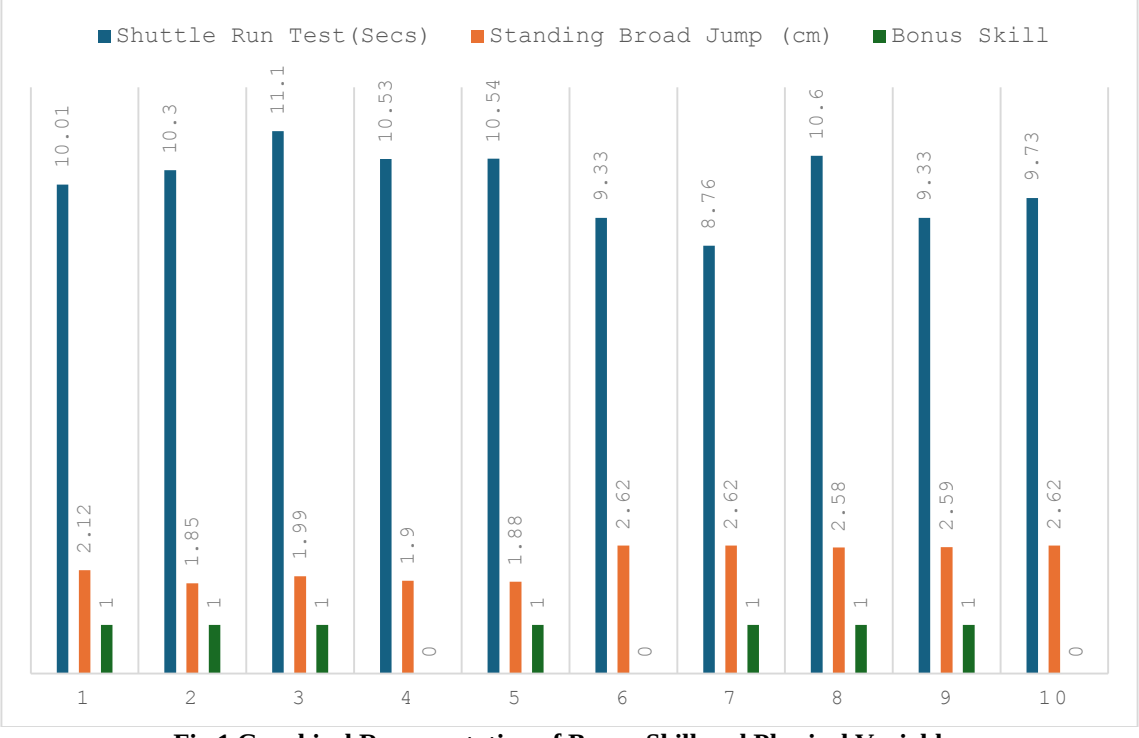

Fig.1 Graphical Representation of Bonus Skill and Physical Variables

The bottom row of plots shows the relationship between each variable and the **Bonus Skill** (which is a binary variable, 0 or 1). These plots appear as flat, scattered horizontal lines across the 0 and 1 levels of the Bonus Skill. This visually supports the correlation table's finding that the Pearson's r for all predictors with the Bonus Skill is very low and statistically non-significant ($p > 0.43$). The fitted lines are essentially flat, confirming that none of the continuous variables, on their own, clearly predict the binary outcome.

Descriptive Statistics of Physical and Bonus skill of Kabaddi Players of LNIPE

Bonus Skill Performance: Of the 10 players, **7 (70.0%)** were successful in the bonus skill, and **3 (30.0%)** were unsuccessful.

Physical Variables: The mean agility was 10.0±0.725 seconds, and the mean standing broad jump distance was 2.28± 0.355 meters.

Agility and Explosive Strength: In a study on male Kabaddi players, **Yallappa (2020)** found that the correlations between **Agility** and **Explosive Power** (along with speed) with performance were **not statistically significant**, aligning with the non-significant rpb values for Agility and Standing Broad Jump in this study.

5. Conclusion

Based on the findings and statistical analysis, the following conclusions were drawn:

1. **Physical fitness variables**, namely agility and explosive strength, also did not demonstrate a significant impact on successful bonus skill execution.
2. The success of the bonus skill appears to be less dependent on physical qualities and more influenced by technical efficiency, tactical awareness, reaction timing, raiding strategy, and opponent behaviour**.**
3. All three null hypotheses of the study were accepted.

4. Findings indicate that isolated anthropometric or physical factors alone cannot be considered strong predictors of bonus skill performance, at least within the small sample examined.

Recommendations

Based on the study findings, literature review, and limitations, the following recommendations are proposed:

1. Focus more on **technical mastery, timing, footwork precision, and situational awareness**, as these may influence bonus skill performance more than anthropometric factors.
2. Integrate **video analysis and biomechanical feedback** during training to enhance movement efficiency.
3. Include **opponent-based tactical drills**, as bonus skill success depends heavily on defensive formations and gaps.
4. Perform regular practice of **feinting, body-weight shifting, and controlled low-centre movements** to improve success rate of bonus skill.
5. Work on improving **decision-making under pressure**, which plays a major role in raid outcomes.
6. Conduct studies with a **larger sample size** to increase statistical power and generalizability.
7. Include **more biomechanical variables** such as centre of mass displacement, joint angles, ground reaction forces, and reaction time.
8. Compare **successful and unsuccessful raiders** across multiple performance levels (college, national, and professional).
9. Use **3D motion analysis systems, force plates, or wearable sensors** to capture detailed kinematic and kinetic data.

APPENDIX – A
Raw Score of Anthropometrical, physical and Bonus Skill

S.N.	SHUTTLE RUN TEST (second)	STANDING BROAD JUMP TEST (CM)	BONUS SKILL
1	10.01	2.12	1
2	10.30	1.85	1
3	11.10	1.99	1
4	10.53	1.90	0
5	10.54	1.88	1
6	9.33	2.62	0
7	8.76	2.62	1
8	10.60	2.58	1
9	9.33	2.59	1
10	9.73	2.62	0

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EFFECT OF SURYA BHEDANA PRANAYAMA ON PULMONARY FUNCTIONS IN URBAN WOMEN OF DELHI-NCR.

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Abstract

Introduction:

The Pingala Nadi is activated by the yoga breathing technique Surya Bhedana Pranayama. This results in the production of heat and energy, which stimulates the masculine processes. By consistently practicing this pranayama, the muscles that facilitate respiration will become more robust. The muscles in our lungs and respiratory system get stronger when we breathe.

Aim:

The objective of the present study is to examine the effect of Surya Bhedana on the pulmonary function of metropolitan women in the Delhi-NCR area.

Material and Methods:

Fifty women between the ages of 30 and 50 participated in a two-month pranayama training program. The people who participated were between 39.3 ± 2.9 years old (mean ± standard deviation). Fifty women did the Surya Bhedana breathing exercise, six days a week for two months. They gave us their tidal volume (TV), vital capacity (VC), inspiratory reserve volume (IRV), and expiratory reserve volume (ERV), and we noted them down. For the test, we used t-tests with matched students. All of the data analysis we did with the help of the SPSS tool.

Results:

After completing a thirty-minute pranayama training program over two months. The VC has gone up from 2825 ± 92.8 to 3208 ± 84.9. TV has gone up from 472 ± 53.5 to 568 ± 40. 5. IRV also shows that values have gone up from 1433 ± 51.6 to 1566 ± 47. 3. The ERV values also went up, from 802 ± 49.3 to 998 ± 45. 2.

Conclusions:

The results of the current investigation demonstrate that TV, VC, IRV, and ERV exhibited substantial increases following two months of the pranayama training program.

Key Words: Tidal Volume, Vital Capacity, Inspiratory Reserve Volume, Expiratory Reserve Volume, Pulmonary Functions, Pranayama

Introduction

"Prana" can signify "breath," "breathing," "life," "energy," or "vigor." It tells you when to take certain breaths that provide you vitality or life. "Ayama" means to stretch, lengthen, broaden, constrain, control, and prolong. As a result, "pranayama" refers to the control and extension of breathing (Iyengar, 1981).

According to Patanjali's Yoga Sutras (Ch. 2, Sutras 49-51), pranayama is the intentional inhaling and exhaling of breath while sustaining a stable position (Madhvacharya & Patañjali, 2008). The "Shiva Samhita" explains that pranayama is sometimes referred to as Vayu sadhana, which is another word for breath workout.

During pranayama, one intentionally retains breath for extended durations. Inhaling primal energy is termed “inhalation,” while the act of holding one's breath to savor it is referred to as retention. When the lungs are devoid

of air, an individual's energy, or "I," is transmitted to the primal energy, or Atma. Upon exhalation, all of your thoughts and emotions depart from your body. Pranayama enhances decision-making, clarifies cognition, and fortifies willpower.

The phrase "pulmonary function" refers to the physiological assessment of the respiratory system, encompassing the measurement of airway resistance, lung capacity, and additional indicators indicative of the presence and severity of lung impairment.

In countries with limited resources, those that rely on coal and biomass for residential cooking and heating, air pollution significantly contributes to respiratory problems. Government, industry, and the private sector must collaborate at local, national, and international levels to mitigate air pollution and enhance respiratory health protection for all (Kurt et al., 2016).

The Hatha Yoga Pradipika provides the definition and method of Surya Bhedana Pranayama: the yogi should gently inhale through the right nostril after assuming a comfortable position. The next step is to hold your breath until it diffuses to the tips of your nails and hair roots. Then, slowly release the breath through your left nostril (Muktibodhananda Saraswati & Satyānanda, 2011).

The practice of Suryanadi pranayama promptly diminished ventilatory capacities and volumes while augmenting PEFR, vital capacities, and flow rates, hence improving respiratory efficiency and perhaps averting COPD (Keerthi et al., 2013).

Research indicated that breathing exercises markedly enhanced spirometric outcomes and substantially diminished dyspnea, wheeze, nocturnal symptoms, and reliance on rescue medications in asthma patients undergoing optimum therapy (Agarwal et al., 2017).

Material and methods

Fifty healthy women from the Delhi-NCR region were randomly selected for a two-month pranayama training program. Individuals having a history of pranayama, tobacco use, substance abuse, or chronic illnesses such as diabetes, asthma, hypertension, cardiovascular disease, or renal disease were excluded. A comprehensive clinical history was considered before selecting the individuals.

The participants were instructed to practice pranayama for 30 minutes each day under the guidance of a qualified yoga instructor. We measured Vital Capacity (VC), Tidal Volume (TV), Inspiratory Reserve Volume (IRV), and Expiratory Reserve Volume (ERV) before and after a two-month yoga training program.

A respirometer was utilized to assess the parameters. The results were examined using the student's paired t-test. The SPSS application is used for all statistical research.The Suryabhedana pranayama is used for the pranayama training program:

1. Upon achieving a comfortable posture, the yogi should gently inhale through the right nostril. The subsequent phase is retaining breath until it permeates the hair follicles and nail extremities. Subsequently, exhale gradually from your left nostril ||H.Y. P-2.48-50||

The pranayama training schedule

1. Prayer
2. Suryabhedana Pranayama: 15 minutes
3. Rest for 3 minutes.
4. Again, Suryabhedana Pranayama: 15 minutes
5. Prayer: Shanti Mantra

The results were presented as the mean and standard deviation. The paired t-test was employed to assess the significance of the study parameters using SPSS version 15.0. A P value under 0.05 was employed to determine statistical significance.

Results

This study's results showed that pranayama had a beneficial effect on lung function. After practicing pranayama, the post-readings of a variety of parameters, including vital capacity (VC), tidal volume (TV), inspiratory reserve

volume (IRV), and expiratory reserve volume (ERV), indicated a significant increase ($p<0.005$). When you do Surya Bhedana pranayama, you breathe in through your right nostril and out through your left. It warms the body, boosts energy, and may improve the lungs by letting in more oxygen.

Effects of pranayama on the pulmonary health of urban women of Delhi-NCR

Parameters:	Pre-yoga	Post-yoga	p-value
Tidal Volume (TV)	472 ± 53.5	568 ± 40.5	P<0.05
Vital Capacity (VC)	2825 ± 92.8	3208 ± 84.9	P<0.05
Inspiratory Reserve Volume (IRV)	1433 ± 51.6	1566 ± 47.3	P<0.05
Expiratory Reserve Volume (ERV).	802 ± 49.3	998 ± 45.2	P<0.05

The values for VC, TV, IRV, and ERV all went up a lot, as shown in the table above. If the p-value was less than 0.005, it was considered statistically significant.

The data show that pulmonary function has improved, with all four main lung volumes showing progress. These changes probably mean that the respiratory system is better able to help air pass through the lungs. Higher levels of VC, TV, IRV, and ERV mean that the lungs can hold more air and are better at deep breathing. There are many possible reasons for these improvements, such as better lung compliance, stronger respiratory muscles, better alveolar function, or the success of a treatment. The changes in the standard deviations show that the measurements are becoming more accurate and consistent, with occasional differences between results but overall improvements across the board. Therapy or exercise that is meant to improve breathing often causes this kind of increase in lung volume.

Discussion

Breathing techniques like Surya Bhedana assist in clearing out toxins, debris, and secretions from the bronchial tree and the alveoli. This method clears up the respiratory system and the air. The word "Suryabhedana" is made up of two parts: "Surya," which means "sun," and "Bhedana," which means "piercing" or "penetrating." The easiest approach to execute the Surya Bhedana Pranayama is to breathe in via the right nostril, hold the breath, and then breathe out through the left nostril.

Pingala Nadi is an energy channel that starts in the Muladhara chakra and ends in the right nostril, connecting the two. Surya Bhedana Pranayama opens up the Pingala Nadi, which controls how much physical activity we can do and reflects the masculine solar energy. People think that doing this technique provides the body vitality and sun energy, which may help with too much cooling in the body, especially during the cooler Vata or Kapha seasons. A study indicates that the effects of RNB and LNB are not significantly different after acute exposure (15 minutes) or after training (8 weeks). Both breathing techniques, meanwhile, produce a predominant parasympathetic response (Jain et al., 2005). Researcher Telas suggests that following the right nostril resulted in a considerable increase in oxygen consumption (Telles et al., 1996). Shankar and Das determined in their research report that yoga, pranayama, and/or breathing techniques may benefit children with uncontrolled, mild to moderate chronic asthma, but not those with acute, severe asthma (Sankar & Das, 2018). For persons with COPD, pranayama may improve their subjective health perception, disease severity, and functional status; nevertheless, there is no significant enhancement in FEV1, and airflow limitation is generally irreversible and tends to deteriorate (Gupta et al., 2014). Inspiratory muscle training and hypoventilation training have demonstrated efficacy in decreasing medicine consumption, notably the use of beta-adrenergic inhalers (Ritz & Roth, 2003).

Pranayama may improve oxygenation and delay the onset of symptoms related to chronic obstructive pulmonary disease (COPD). Pranayama and Om chanting have demonstrated efficacy in augmenting respiratory muscle endurance and facilitating enhanced utilization of the alveolo-bronchial tree (Chaudhary et al., 2024). Kaminsky said that people with chronic obstructive pulmonary disease (COPD) who have symptoms may get a lot of help from pranayama. This idea has to be tested in larger clinical trials in the future (Kaminsky et al., 2017). Yoga breathing called pranayama was shown to improve lung function in healthy people within six weeks. Both a higher peak expiratory flow rate and a higher forced expiratory volume got better, according to the study (Kupershmidt & Barnable, 2019). While RNB lowers arterial and ventilatory reaction times, it raises blood pressure, heart rate, vital capacity, and peak expiratory flow rate. More study with people who have heart and lung problems is needed to fully understand its clinical value (Bargal et al., 202). Competitive swimmers' respiratory endurance is improved by

yogic breathing techniques (Hakked et al., 2017). A study indicates that UNB and ANB procedures starting by the right nostril (SB and SN) elicit a state of alertness by stimulating the sympathetic nervous system, enhancing ascending reticular activity, and exerting central effects at the primary thalamo-cortical level (Bhavanani et al., 2014).

In the study, we promoted structured pranayama techniques (Suryanadi, Bhastirka, and Kapalabhati pranayama), classified as heated pranayama, which were performed three times weekly for a duration of twelve weeks. Post-intervention, the bronchial asthma patients exhibited enhancements in pulmonary function test parameters and a transition in autonomic tone from sympathetic to parasympathetic, although the findings lacked statistical significance (Saha et al., 2024). Pranayama practice enhanced pulmonary function measures such as FVC, FEV1, FEV1/FVC, and MVV over a duration of 10 to 30 days. Therefore, pranayama may be considered an optimal lifestyle change for the prevention of lung disorders and the enhancement of lung function (Manaspure & Fadia, n.d.).
The findings of this study indicate that ANB can be prescribed to improve cardiorespiratory efficiency. The data indicate that respiration is enhanced

Conclusion

Based on the results, we can say that lung function has improved a lot. The increase in the values of VC (Vital Capacity), TV (Tidal Volume), IRV (Inspiratory Reserve Volume), and ERV (Expiratory Reserve Volume) that were measured shows this.

1. **TV (Tidal Volume):**

Starting Value: 472 ± 53.5
Final Value: 568 ± 40.5
Change: 568 mL - 472 mL = 96 mL increase
Tidal Volume (TV) is the amount of air that is breathed in or out during normal breathing. When TV goes up, it means that the average amount of air exchanged with each breath has gone up. The rise in tidal volume from 472 mL to 568 mL means that the person can now take somewhat deeper breaths. This could be because their lungs are more flexible, their respiratory muscles are stronger, or some other factor that makes breathing easier. The standard deviation has gone up a little, which could mean that people's performances are different. The drop in standard deviation (from 53.5 to 40.5) shows that the improvement in IRV was pretty much the same for everyone.

2. **VC (Vital Capacity):**

Starting Value: 2825 ± 92.8
Final Value: 3208 ± 84.9
Change: 3208 - 2825 = 383 mL Increase
Vital Capacity (VC) is the most amount of air a person can breathe out after taking the deepest breath they can. An increase in vital capacity shows that the lungs are better at holding and getting rid of air. The increase in VC from 2825 mL to 3208 mL and the decrease in the standard deviation from 92.8 to 84.9 show that lung capacity has improved and that the results are more consistent among patients. This could mean that the lungs are working better or that the person has gone through successful rehabilitation or treatment that has made their lungs bigger.

3. **IRV (Inspiratory Reserve Volume):**

Starting, value was 1433 ± 51.6.
Last Value: 1566 ± 47.3
Change: 1566 - 1433 = 133 mL more than before
Inspiratory Reserve Volume (IRV) is the maximum amount of air that can be inhaled after a normal breath. The increase in IRV from 1433 mL to 1566 mL shows that the lungs can take deeper breaths, which could mean that the respiratory muscles are stronger, the lungs are more flexible, or the alveoli are working better. The standard deviation went down from 51.6 to 47.3, which means that the improvement in IRV was about the same for everyone.

4. **ERV (Expiratory Reserve Volume):**

Starting Value: 802 ± 49.3
Final Value: 998 ± 45.2
Change: 196 mL increase
The Expiratory Reserve Volume (ERV) is the amount of air that can be pushed out after a normal exhalation. The rise in ERV from 802 mL to 998 mL means that the person can now exhale more air during a normal exhalation. This could be because their lungs are working better or their breathing muscles are more efficient. The small increase

in the standard deviation (from 49.3 to 45.2) shows that the data is more consistent, but it still shows a general trend of improvement.

It would appear from these findings that there is an improvement in pulmonary function, which is most likely the result of enhanced lung compliance, respiratory muscle strength, or other treatment procedures. This improvement is based on the findings as shown here. Overall, the findings suggest that there have been positive changes in lung volumes, which may be connected with improved respiratory health or the efficacy of the medication that is being investigated to establish its effectiveness. All of these factors are being considered.

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EFFECT OF YOGA ON PSYCHOLOGICAL VARIABLES AMONG SPORTS PERSONS: A SYSTEMATIC REVIEW

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Abstract

Background: Modern competitive sports demand high levels of mental resilience. Yoga, an ancient Indian practice, has emerged as a complementary mind–body intervention to enhance psychological well-being among sports persons.

Objective: This review aims to synthesize current evidence regarding the impact of yoga on psychological constructs in sports persons.

Methods: A systematic search was conducted across PubMed, Scopus, Google Scholar, Shodhganga etc online and offline libraries. Out of 120 initially identified records, 7 high-quality studies met the final inclusion criteria for qualitative synthesis.

Results: The included studies comprised randomized controlled trials and quasi-experimental designs involving athletes from India, the United States, China, Europe, and mixed international samples. Yoga interventions ranging from 6 to 24 weeks showed significant improvements in psychological variables, particularly anxiety reduction, stress management, mindfulness, emotional regulation, concentration, and self-confidence.

Conclusion: Integrated yoga modules are effective adjuncts to physical training for optimizing peak performance and psychological health in sports persons. However, methodological limitations and heterogeneity across studies highlight the need for further high-quality research.

Keywords: Yoga, Psychological variables, Athletes, Sports persons, Anxiety, Stress, Systematic review

Introduction

Optimal sports performance is influenced not only by physical conditioning and technical skills but also by psychological preparedness. Psychological variables such as anxiety, stress, emotional control, attention, self-confidence, and mental resilience play a decisive role in competitive success. Athletes frequently encounter psychological challenges arising from competition pressure, performance expectations, injuries, and training demands, which may adversely affect both performance and well-being.

Conventional sports psychology interventions primarily rely on cognitive-behavioral techniques, mental skills training, and counseling. While effective, these approaches often address psychological functioning in isolation from physical processes. In contrast, holistic mind–body practices such as yoga integrate physical movement, controlled breathing, relaxation, and meditation, offering a comprehensive approach to psychological regulation.

Yoga, originating from ancient Indian philosophy, has gained global recognition as a therapeutic and performance-enhancing practice. Scientific evidence suggests that yoga may modulate stress response systems, improve emotional regulation, enhance attentional control, and promote psychological balance. These effects are particularly relevant for sports persons who operate under high cognitive and emotional demands.

Although several studies have examined the effects of yoga among athletes, findings are dispersed across different sports, countries, and psychological constructs. Moreover, previous reviews have often focused on physical or clinical outcomes rather than athlete-specific psychological variables. Therefore, a systematic synthesis of contemporary evidence is warranted. This review aims to critically evaluate research conducted between 2015 and 2025 on the effects of yoga on psychological variables among sports persons.

Methods

Search Strategy

A systematic literature search was conducted following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Electronic searches were performed in the following databases:

- PubMed
- Scopus
- Web of Science
- SPORTDiscus
- Google Scholar

The search period was restricted to **2016 – 2025**.

Search terms included combinations of:

Yoga, Yogic Intervention, Pranayama, Meditation and Athletes, Sports persons, Players and Psychological variables, Anxiety, Stress, Mindfulness, Mental toughness, Self-confidence, Self Efficacy

Eligibility Criteria

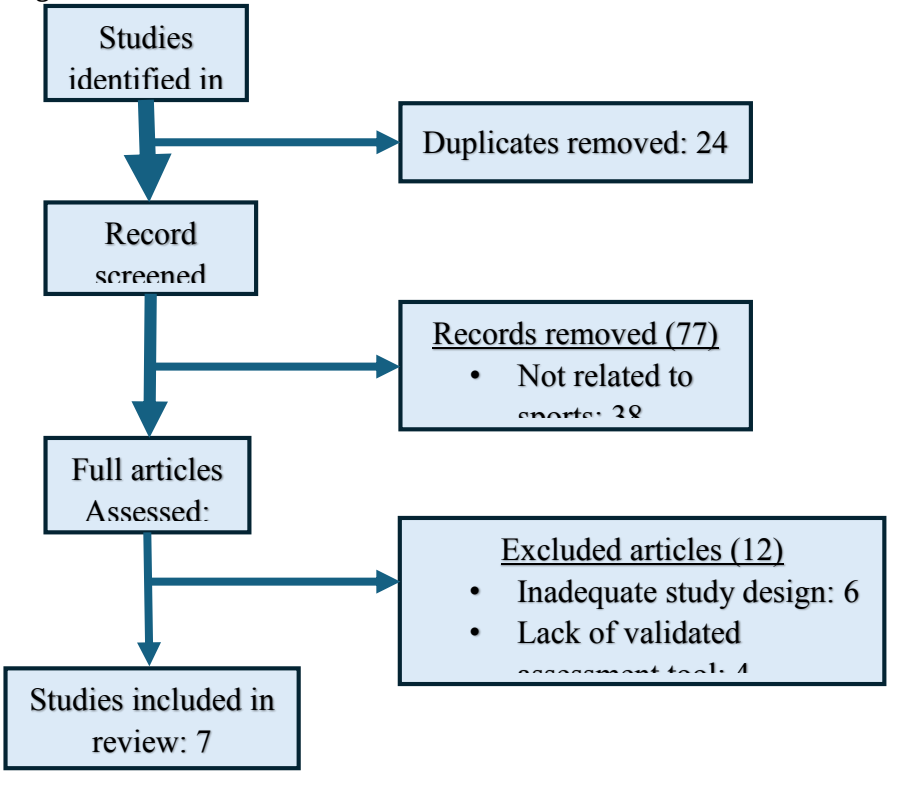
Inclusion Criteria

- Participants: Sports persons or athletes (competitive, collegiate, or elite level)
- Intervention: Yoga-based practices (asana, pranayama, meditation, or integrated yoga modules)
- Outcomes: Psychological variables measured using standardized tools
- Study design: Randomized controlled trials or quasi-experimental studies
- Language: English
- Publication period: 2016–2025

Exclusion Criteria

- Review articles, editorials, conference abstracts
- Studies on non-athlete populations
- Studies assessing only physical or physiological outcomes
- Studies without a yoga-based intervention

Prisma Flow Diagram



Results
Summary of the findings

Author	Country	Participants / Sport	Study Design	Duration	Yoga Intervention	Psychological Variables	Assessment Tools	Key Findings
Chatterjee & Bandyopadhyay (2016)	India	University athletes	Experimental	6 weeks	Yogic practices (asana, pranayama, relaxation)	Psychological well-being, anxiety	Ryff's Psychological Well-Being Scale, STAI	Significant improvement in psychological well-being and reduction in anxiety
Saha & Chowdhury (2019)	India	Competitive athletes	Experimental	8 weeks	Integrated yoga practices	Attention, anxiety	Six-Letter Cancellation Test, STAI	Improved attention and reduced anxiety levels
Smith et al. (2019)	USA	Collegiate athletes	Quasi experimental	12 weeks	Yoga-based mind–body training	Stress, emotional regulation	Perceived Stress Scale (PSS), Emotion Regulation Questionnare (ERQ)	Reduced stress and improved emotional regulation
Baltzell et al. (2020)	USA	Competitive athletes	Controlled intervention study	6 weeks	Mindfulness-based yoga training	Mindfulness, performance anxiety	Five Facet Mindfulness Questionnaire (FFMQ), CSAI-2	Increased mindfulness and reduced performance anxiety

Abbreviations:

STAI – State Trait Anxiety Inventory; PSS – Perceived Stress Scale; CSAI-2 – Competitive State Anxiety Inventory; SCAT – Sports Competition Anxiety Test; MAAS – Mindful Attention Awareness Scale; ERQ – Emotion Regulation Questionnaire; RCT – Randomized Controlled Trial; Ryff's Psychological Well-Being Scale.

Overall, all included studies reported positive psychological effects of yoga compared to baseline or control conditions.

Discussion

Xu et al. (2022)	China	University athletes	Quasi-experim ental	12 weeks	Structur ed yoga session s	Mindfuln ess	Mindful Attention Awareness Scale (MAAS)	Significant enhancement in mindfulness post-intervention
Saraswati et al. (2024)	India	Recreational athletes	Experi mental	4 weeks	Yoga including pranaya ma and meditati on	Stress, anxiety, mindfuln ess	PSS, SCAT, MAAS	Significant reductions in stress and anxiety with improved mindfulness
Saraswati et al. (2025)	India	Young athletes	Rando mized Controll ed Trial	4 weeks	Yoga-ba sed intervent ion	Psychol ogical well-bein g, psycholo gical flexibility	PSS, AAQ-II, WHO-5	Yoga group showed superior psychological well-being compared to controls

The findings of this systematic review indicate that yoga-based interventions positively influence psychological variables among sports persons. Reductions in anxiety and stress were the most consistently reported outcomes, followed by improvements in mindfulness, emotional regulation, concentration, and self-confidence.

The observed benefits may be attributed to yoga's integrative mechanisms, including autonomic nervous system regulation, breath control, enhanced body awareness, and attentional focus. These mechanisms are particularly relevant for athletes facing competitive pressure and cognitive load.

The inclusion of international studies strengthens the generalizability of findings, demonstrating that yoga's psychological benefits are not limited to cultural or regional contexts.

Practical Implications

- Yoga can be incorporated as a **psychological conditioning tool** in athletic training programs
- Particularly beneficial for **precision sports** (e.g., shooting, archery) and **high-pressure competitions**
- Can serve as a **cost-effective, non-pharmacological intervention**
- Suitable for injury rehabilitation and off-season mental recovery

Research Gaps and Future Directions

- Lack of large-scale randomized controlled trials
- Inconsistent yoga protocols across studies
- Limited sport-specific psychological assessments
- Absence of long-term follow-up data
- Need for objective neuropsychological and physiological correlates

Future research should focus on standardized yoga modules, sport-specific interventions, and longitudinal designs.

Conclusion

This systematic review provides evidence that yoga-based interventions significantly improve psychological variables among sports persons. Yoga emerges as a valuable complementary practice for enhancing mental well-being and supporting athletic performance. However, further high-quality research is required to establish standardized guidelines for its application in sports psychology.

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EFFECTS OF STRUCTURED PRACTICES IN YOGA ON THE ENHANCEMENT, PREVENTION, AND POST INJURY REDUCTION IN COMPETITIVE FOOTBALL PLAYERS

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Abstract

Neuromuscular fatigue, autonomic imbalance, and High-intensity football training often because all enhanced exposure to non-contact injuries. Despite the traditional recovery interventions like Integrative approaches are cryotherapy, compression therapy as well as active recovery. Interventions aimed at neurophysiological regulation are relatively unexploited. The present study shows the value of instructed yogic procedures to increase the parameters of recovery and decrease injury risk measures among professional football players. Male athletes (18-25 years) n=30 football players were randomly selected to an experimental group (regular training and 6 weeks yogic intervention) and team train regularly. It was a yogic protocol comprising of selected asanas, pranayama sessions, and relaxation sessions led by a guide during five days a week. Pre- and Dynamic balance (Y Balance) and flexibility (sit-and-reach test) were some of the post-intervention tests perceived muscle soreness and delayed onset muscle soreness (DOMS). It was the assumption that the yogic intervention group would be statistically significant greater increase in recovery indices and neuromuscular stability than the control group. The results indicate that guided yoga techniques can be an evidence-based complement of sports training, which helps enhance the preparation of performance and injury mitigation in. football competitive environments.

Introduction

Football is among the physically demanding sports of the modern athletic setting. Players must do sustained high-intensity sprints, intermittent accelerations and decelerations, acute swings and twigs, air fights, and aerobic running exercises on a usual basis. Ninety-minute match. Such repetitive bombarding activities exert a lot of stress on the. Neuromuscular, metabolic and cardiovascular systems of athletes. As a result, football players are often tired, sore muscles, uncoordinated, and prone to injury traumas especially in the case of hard training sessions and competitions. Because of these physical needs, recovery has taken a very important aspect of contemporary training programs. Proper recovery helps athletes to have physiological balance, optimal performance, degree of risk, and decrease the risk of harm. Sports scientists and coaches therefore include various healing methods like the use of cryotherapy, use of hydrotherapy, massage therapy, compression, clothing, deep tissue massage, and active recovery measures. The main aim of these strategies is to target muscular restoration and receipt of metabolic waste after strenuous physical activities. However, modern studies indicate that other factors besides muscular repair affect recovery including physiological and psychological mechanisms. The autonomic nervous system takes part in significant part in stabilizing the equilibrium between sympathetic functioning, which is linked with agitation and stress, physical activity, and parasympathetic response, which is related to relaxation and rest. When athletes are maintained in an extended sympathetic condition as a result of constant high-intensity training recovery delay may occur in the processes and the danger of being injured may also be high. Yoga has come out in this respect as a possible supplementary technique in enhancing recovery in athletes. Yoga is a traditional Indian practice, which combines physical poses (asanas), breathing exercises (pranayama) and relaxation techniques. The practices are used to achieve a harmony between the body and the mind whilst improving bodily and psychological health. In the case of athletes, yoga can have a number of physiological. benefits such as better flexibility, more joint movement, better balance and improvement neuromuscular coordination. Also, it is possible that the pranayama practice activates the parasympathetic nervous system, allowing recovery to go faster and to be more relaxed. Psychological benefits improved concentration and better emotional control can be achieved with the help of reduced stress, help in better athletics. Nevertheless, although yoga is gaining popularity in sports conditioning programs, scientific studies into its effectiveness in football specific recovery is left behind. Most of the available research has been on general health outcomes as opposed to performance related variables of relevancy with football players. Hence the need to conduct the research to determine whether or not organized yogic activities have a potential of benefiting recovery and preventing injuries in professional football players.

Literature Review

An increase in body of research emphasizes the significance of flexibly, neuromuscular stability and prevention of sports injuries by recovery management. The increase in muscle elasticity is enhanced by flexibility training and extend joint range of motion which enables athletes to make dynamic movements more efficiently and impaired mechanical tension. Greater malleability is specifically essential in football, where players are expected to do

explosive movements like sprinting, kicking, and directional sudden movement's changes. The research on the effects of stretching interventions has shown that frequent flexibility muscular performance could be enhanced by training and the chances of muscle strains could be minimized by training. Similarly, neuromuscular conditioning programs have been found to increase balance and coordination, that are significant in preventing injuries. Yoga is extensive research in terms of holism vie against physical and mental illness. Studies have shown that ordinary yoga practice is capable of resulting in substantial development in flexibility, muscular endurance, balance and postural control.

These advantages are especially cost saving in football players whose stability on lower limbs is a great concern and coordinated movements. Breathing exercises involved in the yoga practices also act on the autonomic nervous System. Controlled breathing patterns under pranayama have proven to induce parasympathetic effects, slow down the heart rate, and relax the body. These exercises can stimulate physiological reactions and hasten the recovery of intense exercise. Psychological stress is also another factor that will affect athletic performance and recovery. Competitive athletes suffer from psychological burnout because of the training requirements, traveling hours, and competency. Due to yoga, relaxation and mindfulness practices have been found to alleviate anxiety levels and enhance the psychological well-being of athletes. The other significant point in injury prevention consists of balance and proprioception. Balance is a dynamic test like Y 3Balance Test are usually employed when testing the neuromuscular stability and to detect asymmetries between limbs. Yogic postures often demand body positioning and stabilization of a variety of body positions.

The joints that can enhance the proprioception and neuromuscular coordination. Although previous researches establish the usefulness of yoga regarding the overall fitness and psychological well-being of the mind, minimal studies have been done on its use in the context of football training. Therefore, investigating the effects of the yoga-based recovery interventions on football players have been a significant direction of sports science research.

Methodology

The current research followed a randomized controlled experimental design in the process of studying the impact of programmed yoga exercises of recovery measurements and trauma predisposition of competitive football players. There were thirty male football players between 18 and 25 years old willing to participate in the research the study. All participants were at least three years of experience in competitive playing physically accepted to get involved in intense physical activities. All athletes were pre-participated in made aware about the aim and the methods of the study. The participants were randomly split into two teams comprising of fifteen players each. The control group observed their normal football no special intervention training schedule. The same was also done with the experimental group. Football training program but also had a six weeks yoga intervention. The yoga program was supplied 5 days/week and lasted between 30-35 minutes per session. Every session had three key components as asanas, pranayama, and relaxation techniques. Part of the asana consisted of Surya Namaskar, Bhujangasana, Pawanmuktasana, Ardha Matsyendrasana and hamstring stretching postures. These exercises were chosen to enhance flexibility, increase the mobility of the spine, and increase stabilization muscles. Pranayama was done using Anulom-Vilom breathing, Bhramari breathing, and diaphragmatic breathing that is aimed at the enhancement of relaxation and the control of autonomic nervous system activity. A relaxation practice known as guided Yoga Nidra was the last part of every session needed to decrease the mental stress and help in recovery. There were a number of performance variables which were |human|>pre- and post six-week intervention. The ability to be flexible was measured through the sit & reach test, and dynamic balance was determined by the Y Balance Test. Heart rate one minute after exercise recovery was recorded. Perceived exertion was assessed in terms of Borg the scale of rating Perceived exertion post-workout was measured using a scale, as well as delayed onset muscle soreness visual scale. Paired sample and independent were used to evaluate the data collected. Sample t tests. The statistical significance level was set at p h under 0.05.

Expanded Discussion

The conclusions of the current research also prove the priority of the incorporation of holistic recovery methods into high-performance sports settings. The athletes playing football are subjected to repetitive periods of strenuous training and playing football that causes cumulative physiological stress. The unchecked development and accumulation of stress may result in chronic fatigue, diminished neuromuscular coordination, and ability to attain injury unless proper strategies are established.

The effects of yoga on the autonomic nervous system can be considered one of the fundamental ways in which this practice can have a beneficial effect on the process of recovery. The high intensity training sessions are usually a

stimulation of the sympathetic nervous system that is a system that readies the body to the physical activities through the stimulation of the heart rate, blood pressure and metabolism rate. Although such activation is necessary to promote performance, with continuous sympathetic activity that is not followed by parasympathetic rest there is a risk of overtraining and even worsening performance. Anulom-Vilom and Bhramari pranayama are considered to be a stimulant of the vagal system, which further activates the parasympathetic dominant nervous system and induces physiological relaxation. This Driss leads to better recovery of heart rate, lower levels of stress and better metabolism in the body after strenuous activities.

The other significant advantage witnessed in the design was the process of gain in flexibility by the experimental group. Elasticity is an important physical characteristic of football players since it helps them have increased joint flexibility and will minimize chances of muscle strains on explosive actions. Football involves quick turning, running at high speeds with, kicking and leaping. Inflexibility of hamstring muscles, hip flexors and lower back muscles can enhance mechanical strain exerted on joints and soft tissues than otherwise in such movements.

It is also implied by the fact that yoga can make the processes of recovery more efficient since the perceived exertion by the athletes who practiced yoga became lower. Perceived exertion is a measure of physiological exhaustion as well as psychological stress that occurs during training. When athletes are more efficient at recovering between sessions athletes might find the same training workload to be less challenging. This effect could be partly facilitated by the relaxation aspect of yoga, and especially by Yoga Nidra which is a form of yoga that alleviates mental exhaustion and aids psychological rest. Competitive athletes are particularly in need of mental recovery as the athletes usually face pressure associated with the performance expectations and the results of the competition.

Besides physiological recovery, yoga can be applied to help support psychological resilience among athletes. Sporting events that are characterized by competitiveness tend to generate a lot of stress, anxiety, and emotional stress. These are psychological reasons that may have a negative impact on performance, focus and ability to make decisions during matches. Yoga practices that involve mindfulness and breathing exercises can assist athletes in gaining a higher level of emotional control and mental attention. Better concentration and mental clarity may also indirectly lead to better performance because athletes will be able to remain composed when a situation is high-pressure at the match.

The ancient methods of recovery like cryotherapy, massage therapy and hydrotherapy largely focus on physical recovery processes. Although these techniques are useful in the attenuation of muscular pain and inflammatory conditions, it does not seem targeting the psychological exhaustion and autonomic disequilibrium. Yoga, however, involves various elements of physical, respiratory and mental training thereby permitting it to work out on many facets of recovery at the same time.

Limitations of the Study

Despite the encouraging results of the current study in terms of the usefulness of yogic practices in football recovery, there are some limitations that should be admitted. The small sample size of thirty participants can be seen as one of the limitations. Although the findings were statistically significant, bigger sample sizes would enhance the importance of the findings concerning more people in sports.

The other weakness is that the sample considered men who were between 18 and 25 and also that were football players. Consequently, the results do not always seem to be applicable to women, younger athletes, and elite level professional players. It is desirable that different population groups be incorporated in future research so that the possibility of similar benefits being realized across different demographics and competitive levels can be established. The intervention program adopted was restricted to six weeks. Despite the fact that this time was enough to witness changes in flexibility, balance, and indicators of recovery, more prolonged intervention can demonstrate some other physiological changes. The potential of yoga in the long-term in other significant variables is of muscle strength, endurance capacity, hormonal responses, and inflammatory markers.

Also, the research mainly depended on functional performance indicators as well as on the subjective indicators like perceived exertion and muscle soreness. Although such measures are common in studies of sports science, using other physiological markers would allow getting a more efficient picture of the mechanisms of recovery. Subsequent researches can be involved by measuring cortisol, heart rate variability, and inflammatory cytokines or biomarkers of muscle damage.

Future Research Directions

The research studies on the effect of yoga on sports performance and recovery in future ought to be extended to include more complex research designs. The external validity of the findings would be better if studies have larger sample sizes and involve many teams. Researchers can also study the outcomes of yoga practices on various positions of play in football because the requirements among the played are different among defenders, midfielders and forwards.

The other field that research is likely to develop is the combination of yoga with other recovery measures. As an example, one study may find out whether yoga plus cryotherapy or hydrotherapy have synergistic results in recovery and injury prevention. Moreover, the comparison of yoga programmes involving the recovery with conventional stretching programmes would help to draw a more accurate idea about the special advantages of the use of yogic practices.

Football Training Programs Use

In practical terms, it is possible and healthy to have yoga in football training programs. Yoga classes do not need any machinery and can be practiced anywhere, as a training field, a gym, or an indoor area. A formal yoga class of about 25-30 minutes may be incorporated as a post training session or a rest day session.

Sports scientists and coaches can come up with yoga programs that are directly aimed at the requirements of football players. As an example, the yoga can be dedicated to the mobility of hips, the flexibility of hamstrings and the sports mobility of the spine, and the stability of lower limbs. These are the physical attributes that are especially pertinent to the biomechanical requirements of football.

Besides physical gains, yoga sessions may also be used as a mental rest-tool in the overly busy competition regimes. Breathing and relaxation exercises are some activities that a player can undergo to be less stressed during or after a crucial game. This is one of the aspects of mental recovery that can help an individual make better decisions and have a better focus when playing competitively.

Results

The study findings have shown that there were significant improvements among the athletes that took part in the yogic intervention. The score of flexibility have risen significantly in the experimental group and this implies that routine of yoga exercises improved elasticity of the muscles and motion of the joints.

This was also the case with the balance performance among athletes in the experimental group. The scores of Y Balance Test showed that there are more reach distances and less asymmetry among limbs, which indicates enhanced nerve-muscle performance. There was a significant improvement of heart rate recovery in the subject individuals who practiced yoga, which implies an amplified autonomic regulation and quicker physiological recovery of intense exercise. Athletes of the experimental group also reported reduced perceptions of effort of training. Lower RPE results indicate that yoga can help to achieve better recovery efficiency and decrease physical exhaustion. Furthermore, participant's yoga practice was reported to have lower incidences of delayed onset muscle soreness as compared to the control group, which implies a greater recovery time between the training sessions.

Discussion

The results of this research paper reference the possible benefits of encompassing yoga in football training programs. The flexibility gains that were seen in the experimental group could be attributed to the elasticity and expanding elements of yoga poses. Increased heart rate recovery implies increased symmetry of the activity of sympathetic and parasympathetic nervous systems. Breathing Vagus nerve stimulation can be gained through techniques like Anulom-Vilom and diaphragmatic breathing stimulating the activation of the parasympathetic system and accelerated healing, enhancement in dynamic balance, signify increased proprioception and muscle co-ordination. These adaptations are especially needed when a player plays football where single the single legs movements are done frequently and the legs are required to be thin swift movement of direction at matches. Less perceived effort and muscle decreased muscle levels soreness are also another indication of the healing powers of yoga. Meditation exercises can assist in decreasing. stress hormones and help in body and psyche reparation. Overall, the data points to the effectiveness of yoga as a form of training to be utilized in the field of football conditioning programs.

Practical Implications

The results of this research have significant practical significance to the coaches and sports scientists as well as conditioning and strength experts. There are short yoga sessions that take about thirty minutes be made part of post training regimes to improve recovery. Yoga is an inexpensive healing strategy which has minimal equipment requirement and could be conducted in any form of training environments. Flexibility, balance, and neuromuscular may be enhanced with a regular yoga practice, thus decreasing the risk of injuries. Also, yoga can be improved in psychological aspects like relaxation and mental concentration, which are a key requirement of High level athletic activity.

Conclusion

Organized yoga influences increase the items of flexibility, recovery indicators and neuromuscular items competitiveness stability in competitive footballers. The introduction of yoga into the training of football players represents a comprehensive intervention strategy because it focuses on physiological and psychological recovery aspects of sports performance. Further studies could be done on longer intervention effects and also include more physiological measures like hormonal reaction and inflammatory markers to know more about the significance of yoga in sport recovery and injury prevention

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KINEMATIC ANALYSIS OF MALLAKHAMB POSTURES: INTEGRATION OF YOGIC PRINCIPLES FOR CORE STABILITY AND INJURY PREVENTION

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Abstract

Background: Mallakhamb is a traditional Indian sport that integrates yoga, gymnastics, and wrestling, requiring high levels of strength, flexibility, balance, and core stability. Although its physical demands are substantial, limited biomechanical research has examined joint kinematics in specific postures. Quantitative evaluation of joint angles and variability can enhance understanding of neuromuscular control and injury prevention. This study aimed to compare the joint angle characteristics of three moderate-level Mallakhamb postures like Uthita Padahastasana, Straddle, and Payacha Frara (Leg Frara) using marker less motion capture.

Materials and methods: Eight national-level male Mallakhamb athletes (mean age: 22.25 ± 1.90 years) participated in this descriptive cross-sectional study. Each athlete performed three trials of the selected postures. Video recordings were captured using an iPhone 13 (1080p, 60 fps). Two-dimensional joint angles of the knee, hip, shoulder, and elbow were extracted using MediaPipe (v0.10.11). Mean and standard deviation values were calculated to assess joint alignment and angular variability, where lower variability indicated greater postural stability.

Results: Uthita Padahastasana showed greater variability, particularly at the hip (SD = 23.29°) and shoulder (SD = 20.93°), indicating higher dynamic stabilization demands. The Straddle posture demonstrated relatively consistent joint alignment with lower variability across joints. Payacha Frara exhibited the least variability, especially at the elbow (SD = 1.92°) and shoulder (SD = 2.67°), reflecting superior neuromuscular control and isometric stability.

Conclusion: Distinct kinematic differences exist among moderate-level Mallakhamb postures. Dynamic stabilization demands decrease progressively from Uthita Padahastasana to Payacha Frara. Marker less motion capture provides an effective tool for biomechanical evaluation, supporting performance optimization and injury prevention in Mallakhamb.

Keywords: Mallakhamb, Kinematic Analysis, Core Stability, Marker less Motion Capture, Joint Angle Variability

1. Introduction

Mallakhamb is an ancient Indian traditional sport that blends gymnastics, yoga, and wrestling elements, where athletes perform intricate aerial postures and balances on a vertical wooden pole or rope, requiring exceptional strength, flexibility, and concentration. It emphasizes strength, flexibility, balance, endurance, and mental focus, often described as a holistic physical discipline rooted in ancient Indian physical culture. The earliest literary reference dates to the 12th century in the Manasollasa by King Someshvara III, with possible earlier archaeological evidence from ancient pottery (Nag, 2022). Derived from the words malla (wrestler) and khamb (pole), it originated as a training aid for Indian wrestlers to build physical attributes essential for combat sports. Revived in the 19th century by Balambhatt Dada Deodhar in Maharashtra, Mallakhamb has evolved into a competitive discipline promoting holistic fitness and cultural heritage (Menon, S. et.al, 2024).

Pole Mallakhamb, the foundational and most traditional variant, involves performers executing a combination of wrestling-inspired grips, gymnastic flips, yoga asanas, and acrobatic balances on a fixed vertical wooden pole (typically sheesham or teak, 2.6–2.8 m above ground for seniors, smeared with castor oil to reduce friction and enhance grip challenges). Originating as a strength-building exercise for wrestlers referenced in the 12th-century *Manasollasa*, it symbolizes combat through static and dynamic holds, farara (extended plank-like positions), and intricate transitions that develop exceptional upper body strength, core stability, and proprioception (Sharma, 2022). In modern competitions, routines last approximately 90 seconds, judged on difficulty, execution, grace, and compulsory/obligatory elements, with the pole replicating an opponent's mass and resistance (Mallakhamb Federation of India, 2022).

Rope Mallakhamb, an aerial and more fluid variant (historically performed on cane but now using cotton rope due to material availability), requires athletes to perform climbs, inversions, balances, and dynamic poses on a suspended vertical rope (5–5.5 m long, 1.8–2 cm thick, hung from a 5.8–6 m structure), relying heavily on toe grip, flexibility, and controlled swinging without knots (Burtt, 2010) (Mallakhamb Federation of India, 2022). Evolving to address practical constraints while preserving Mallakhamb's hybrid influences from wrestling, yoga, and colonial gymnastics, it is often predominantly practiced by women and girls in competitive formats, emphasizing agility, coordination, and artistic expression through movements like farara variations and inverted hangs (Nag, 2022). Research highlights its benefits for speed of movement, vital capacity, and respiratory function, with performances scored similarly on mastery and creativity (Bal, 2012).

The kinematic analysis of these postures focusing on motion descriptors such as joint angles, velocities, and trajectories provides a scientific lens to understand their biomechanical demands and potential for enhancing physical performance (Bayskar, et.al, 2025). By integrating yogic principles, including asanas (postures), pranayama (breath control), and meditative focus, this analysis aims to optimize core stability while mitigating injury risks, aligning traditional practices with contemporary sports science.

Core stability, defined as the ability to control trunk positioning for efficient force generation and transfer, is central to Mallakhamb's dynamic holds and transitions. Yogic postures activate key core muscles, such as the transversus abdominis and external obliques, through co-contractions that increase intra-abdominal pressure and support lumbo-pelvic-hip complex integrity (Rathore, M., et.al, 2017). In Mallakhamb, postures like scorpion pose or shoulder bridge require sustained isometric engagement of these muscles, akin to yoga's boat pose or plank variations, fostering endurance and postural control (Işıklar, 2023). Biomechanical studies reveal that such integrations enhance muscle activation patterns, with yoga maneuvers like triangle pose demonstrating superior hip and knee range of motion (ROM) up to 90.5° in hip sagittal flexion while promoting dynamic stability (Whissell, E., et.al , 2021).

Injury prevention is a critical outcome of this synergy. Yogic principles counteract these by emphasizing alignment, breath awareness, and progressive loading, reducing overload on vulnerable areas like the spine and knees. For instance, kinematic evaluations of asanas such as Vrikshasana show reduced centre of pressure sway, improving balance and neuromuscular coordination to prevent falls or strains (Punam, 2025). This approach not only bolsters resilience but also informs evidence-based training protocols for athletes, minimizing conditions like osteoarthritis through controlled adduction moments and enhanced flexibility.

Ultimately, the kinematic analysis of Mallakhamb postures, enriched by yogic integration, underscores a holistic framework for physical education and rehabilitation, promoting sustainable health benefits in modern contexts.

The objective of this study was to quantitatively compare the postural control strategies of Uthita Padahastasana, Straddle and Payacha Frara (Leg Frara) by analysing the mean joint angle and angular variability of the knees, hips, shoulders, and elbows, using MediaPipe marker less motion capture. These three are the moderate level of elements in mallakhamb and as an intermediary step to more advanced mallakhamb.

Materials and methods

Participants

The investigation involved Eight highly accomplished Mallakhamb athletes (mean age: 22.25± 1.90 years; body mass: 64.87 ± 7.45 kg; stature: 173.87 ± 6.49 cm). All participants were recruited from the Lakshmibai National Institute of Physical Education, Gwalior, Madhya Pradesh, India, and had achieved at least national-level competitive status in Mallakhamb. They were free from any musculoskeletal injuries for a minimum of six months preceding data collection and presented no history of medical conditions or structural abnormalities affecting the upper or lower extremities.

Data Acquisition

All participants were asked to change into a langot and compression shorts, and then, body height and body mass were measured. There was a general and specific warm-up (15–20 minutes) prior to record the video. Each participant was allowed to select his own set of activities during the uncontrolled warm-up to prevent any effects of weariness and familiarise themselves with the data collection environment and protocols to ensure that participants move at a comfortable level of mobility.

Research Design

A quantitative, descriptive, cross-sectional design was employed for this study. The investigation followed a non-experimental approach, focusing on objectively describing and analysing the kinematic characteristics of a specific group of practitioners (N=8) performing selected mallakhamb. Each subject was recorded performing the three selected postures, and the data was processed using a marker less motion capture method (MediaPipe) to extract biomechanical variables from 2D video footage.

A (iPhone 13) camera was used to record video of all trials. The camera was set to record at 1080p resolution and 60 frames per second to ensure sufficient temporal and spatial resolution for the motion capture analysis. The camera was mounted on a static tripod positioned 4.3 meters from the participant, perpendicular to the sagittal plane of movement. Kinematic data was extracted from the video files using a custom Python script utilizing Google's MediaPipe library (v0.10.11). The MediaPipe pose-land marker model was used, as it provides 33, 2D body landmarks from which joint angles can be reliably calculated.

Statistical Technique

The raw angular data extracted from the Python script was exported to Microsoft Excel (.xlsx) for statistical analysis. Descriptive statistics, Mean is calculated to determine the average angle maintained during the 3 trials and standard deviation is calculated to assess the consistency of the performance. A lower standard deviation indicated higher stability (less fluctuation), while a higher standard deviation indicated instability. Annotated images (Frames) were generated to visually represent the landmark detection and angular alignment.

Results

Table No 1: Descriptive statistics for Uthita Padahastasana

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Knee Angle	8	32.01	137.57	169.58	160.357	10.34384
Hip Angle	8	69.79	24.37	94.15	52.9595	23.28851
Shoulder Angle	8	56.41	8.07	64.48	37.6416	20.92637
Elbow Angle	8	48.16	87.66	135.82	106.885	14.20563

The table 1, presents the descriptive statistics of joint angles during Uthita Padahastasana (N = 8). The mean knee angle was 160.36° (SD = 10.34°), indicating moderate variability in knee extension. The hip angle demonstrated a mean value of 52.96° (SD = 23.29°), reflecting substantial inter-individual variation. Similarly, the shoulder angle showed a mean of 37.64° (SD = 20.93°), suggesting considerable dispersion among participants. The elbow angle had a mean of 106.89° (SD = 14.21°). Among all measured variables, hip and shoulder angles exhibited greater variability compared to knee and elbow angles.

Table No 2: Descriptive statistics for Straddle

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Knee Angle	8	15.08	162.70	177.79	169.6089	4.66224
Hip Angle	8	18.29	60.97	79.26	71.1349	5.24993
Shoulder Angle	8	8.61	10.51	19.12	13.7421	2.91543
Elbow Angle	8	14.23	161.03	175.26	167.2268	5.31109

The table 2, summarizes the descriptive statistics for joint angles in the Straddle position (N = 8). The mean knee angle was 169.61° (SD = 4.66°), indicating consistent knee extension. The hip angle recorded a mean of 71.13° (SD = 5.25°), demonstrating relatively low variability. The shoulder angle showed a mean value of 13.74° (SD = 2.92°), while the elbow angle presented a mean of 167.23° (SD = 5.31°). Overall, the Straddle position displayed minimal variation across all joint angles, indicating uniformity in performance among participants.

Table No 3: Descriptive statistics for Payacha Frara (Leg Frara).

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Knee Angle	8	9.68	169.33	179.01	174.3024	3.37309
Hip Angle	8	10.73	138.56	149.29	143.6598	3.40227
Shoulder Angle	8	7.73	160.97	168.70	164.1473	2.66598

Elbow Angle	8	6.05	140.74	146.80	143.4157	1.91885

The table 3, illustrates the descriptive statistics for joint angles during Payacha Frara (Leg Frara) (N = 8). The knee angle demonstrated a mean of 174.30° (SD = 3.37°), indicating near-complete extension with limited variability. The hip angle had a mean value of 143.66° (SD = 3.40°), reflecting consistent joint positioning. The shoulder angle showed a mean of 164.15° (SD = 2.67°), and the elbow angle recorded a mean of 143.42° (SD = 1.92°). The relatively small standard deviations across all variables suggest a high level of consistency in joint alignment during this posture.

Discussions

The present study aimed to quantitatively compare joint angle characteristics and angular variability across three moderate-level Mallakhamb postures like Uthita Padahastasana, Straddle, and Payacha Frara (Leg Frara) using a marker less motion capture approach. The findings indicate clear biomechanical distinctions among the three postures, particularly in terms of joint stability and variability.

Uthita Padahastasana demonstrated comparatively higher standard deviations in hip (SD = 23.29°) and shoulder angles (SD = 20.93°), suggesting greater inter-individual variability and postural adjustment demands. This increased variability may reflect the complex balance requirements and dynamic trunk control necessary in forward-flexed inverted positions. Core stabilization literature suggests that increased angular variability often indicates higher neuromuscular demand to maintain equilibrium, especially when the center of mass shifts anteriorly (Rathore, M., et.al, 2017). Similar findings have been reported in yoga-based postural assessments, where forward bending poses require substantial lumbo-pelvic stabilization and coordinated muscle co-contraction (Işıklar, 2023)

In contrast, the Straddle position exhibited relatively lower variability across all joints, particularly at the shoulder (SD = 2.92°) and knee (SD = 4.66°), indicating greater consistency in execution. This suggests that Straddle may rely more on structural alignment and passive flexibility than on dynamic neuromuscular adjustments. Previous biomechanical analyses of yoga postures have shown that symmetrical hip abduction positions promote improved balance and reduced postural sway due to a wider base of support (Whissell, E., et.al , 2021). The reduced angular dispersion observed in Straddle aligns with these findings and indicates efficient neuromuscular control among trained athletes.

Payacha Frara (Leg Frara) demonstrated the lowest variability across all measured joints, particularly at the elbow (SD = 1.92°) and shoulder (SD = 2.67°), reflecting high stability and controlled isometric engagement. The near-complete knee extension (Mean = 174.30°) further indicates strong quadriceps activation and joint alignment consistency. Such reduced variability suggests advanced motor control and optimized force transfer through the kinetic chain. Studies on core stability emphasize that isometric holds enhance intra-abdominal pressure and trunk stiffness, thereby reducing unnecessary joint oscillations (Rathore, M., et.al, 2017). Furthermore, controlled static postures are associated with improved neuromuscular coordination and reduced injury risk (Punam, 2025)

From an injury prevention perspective, lower angular variability particularly in load-bearing joints such as the shoulder and hip may indicate efficient load distribution and reduced mechanical stress. Mallakhamb involves repetitive gripping, inversion, and suspension, placing substantial stress on the shoulder complex and lumbar spine. Integration of yogic alignment principles likely contributes to maintaining joint congruency and minimizing excessive shear forces (Işıklar, 2023). Therefore, the comparatively stable angular profiles observed in Payacha Frara and Straddle may reflect adaptive neuromuscular strategies developed through systematic training.

The use of MediaPipe marker less motion capture proved to be a practical and cost-effective method for extracting kinematic data in a field-based sports setting. Although two-dimensional analysis may not capture transverse plane dynamics, previous studies have validated its reliability for sagittal plane joint angle estimation in controlled environments (Bayskar, et.al, 2025). Thus, this methodological approach offers promising applications for performance analysis in traditional sports such as Mallakhamb.

Overall, the findings suggest that while Uthita Padahastasana demands greater dynamic stabilization, Straddle and Payacha Frara demonstrate progressively improved angular consistency and joint stability. These differences may represent a continuum of neuromuscular control development across moderate-level Mallakhamb elements.

Conclusion

The kinematic analysis conducted in this study reveals distinct biomechanical profiles among the three moderate-level Mallakhamb postures: Uthita Padahastasana, Straddle, and Payacha Frara (Leg Frara) as assessed through joint angle means and angular variability using markerless motion capture with MediaPipe. Uthita Padahastasana exhibited the greatest angular variability, particularly in the hip (SD = 23.29°) and shoulder (SD = 20.93°) joints, which points to substantial demands for dynamic stabilization and ongoing neuromuscular adaptations. This heightened variability is likely attributable to the posture's inverted and forward-flexed configuration, which necessitates robust core muscle co-contraction to maintain balance and counteract anterior displacements of the center of mass (Rathore, M., et.al, 2017). In comparison, the Straddle posture displayed moderate stability, with lower variability across joints (e.g., knee SD = 4.66°, hip SD = 5.25°), suggesting reliance on symmetrical alignment, passive flexibility, and a wider support base that minimizes postural sway and promotes efficient force transmission through the kinetic chain. Payacha Frara demonstrated the highest degree of stability, characterized by minimal variability (e.g., elbow SD = 1.92°, shoulder SD = 2.67°), near-full knee extension (mean = 174.30°), and consistent joint positioning, indicative of advanced isometric control, superior neuromuscular coordination, and enhanced trunk stiffness via increased intra-abdominal pressure during sustained holds.

These observed differences delineate a progression in neuromuscular demands from dynamic, high-variability efforts in Uthita Padahastasana toward progressively more stable, isometric postures in Straddle and especially Payacha Frara. Such a continuum aligns with core stability principles, where yogic integrations emphasizing precise alignment, controlled breathing, and progressive muscle engagement facilitate lumbo-pelvic-hip complex integrity, optimize load distribution, and reduce undue mechanical stress on vulnerable areas such as the shoulders and lumbar spine (Bliven et al., 2013). By fostering efficient muscle activation patterns and proprioceptive awareness, these elements contribute to enhanced postural control and lower injury susceptibility in high-demand activities like Mallakhamb, which involve repetitive gripping, inversions, and load-bearing transitions.

The adoption of markerless motion capture via MediaPipe proved to be a viable, accessible, and field-friendly approach for 2D kinematic evaluation in traditional sports contexts. Recent validations indicate that MediaPipe offers moderate-to-high reliability for joint angle estimation in controlled settings, with intraclass correlation coefficients often exceeding 0.85 for select movements when compared to marker-based systems, supporting its utility for performance monitoring and technique refinement despite limitations in capturing multi-planar dynamics (Akturk, et al., 2026) (Balci IC, et al., 2026).

In conclusion, this investigation contributes novel quantitative insights into Mallakhamb biomechanics, highlighting how yogic principles underpin improved core stability, joint congruence, and injury mitigation strategies. These findings can inform evidence-based training progressions, enabling coaches and practitioners to structure programs that transition athletes from dynamic stabilization challenges to isometric mastery, thereby optimizing athletic performance while minimizing risks associated with overload or misalignment. Future studies should extend to 3D analyses, incorporate electromyographic data for muscle activation profiling, and include larger, gender-diverse samples to broaden applicability and further elucidate the holistic benefits of Mallakhamb in sports science and rehabilitation frameworks.

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NUTRITIONAL MODULATION OF HYPOXIA INDUCIBLE FACTOR PATHWAYS DURING ALTITUDE TRAINING

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Abstract

Altitude training is common in endurance sports where hematological and muscular changes are brought about by low oxygen levels to improve aerobic performance. The adaptations are principally hypoxia inducible factor 1 alpha, a transcription factor that controls erythropoiesis genes, angiogenesis genes, glucose metabolism genes, and mitochondrial remodeling genes. Although hypoxic exposure is the major stimulus, recent studies show that nutritional status plays a major role in hypoxia inducible factor stabilization, signaling efficiency, and subsequent physiological adaptations. The availability of iron, carbohydrates, proteins, antioxidant balances and dietary nitrates can interact with hypoxia related molecular pathways and could either enhance performance or inhibit performance improvement. This thematic research paper will explore the physiological foundations of altitude training, the mechanism of hypoxia induction in the body in terms of molecular processes, and the impact of specific nutritional interventions on the performance of endurance adaptation. The practical uses, research gaps and directions are also discussed. The integration of nutrition and hypoxia signalling is a concept that is important to comprehend to formulate evidence-based altitude training regimens.

Keywords*:* Hypoxia Inducible Factor, Altitude Training, Hypoxic Adaptation, Erythropoiesis, Redox Signaling, Nutritional Modulation

Introduction

Altitude training is now considered as one of the most fundamental training methods among endurance athletes in order to improve aerobic capacity and increase competitive performance. Exposure to medium or high-altitude conditions causes the atmospheric pressure to decrease and this causes a hypoxia condition. This hypoxia stimulus causes a series of physiological and molecular mechanisms aimed at enhancing oxygen supply and utilization (Guerrero-Pinzon et al., 2022). Long distance runners, cyclists, swimmers, and cross-country skiers are some of the athletes who regularly use altitude camps in their training programs. One of the conceptual frameworks the adaptation to altitude is based on is the activation of hypoxia inducible factors pathways (Fallah et al., 2023). Much of the oxygen homeostasis is regulated by a transcription factor known as hypoxia inducible factor. When conditions are normoxic, hypoxia inducible factor 1 alpha is quickly degenerated. Nonetheless, in hypoxia, degradation is prevented, and it builds up and triggers erythropoiesis, angiogenesis and metabolic reprogramming genes (Karpecka-Galka et al., 2025).

Even though the environmental inductor is exposure to altitude, the scope and quality of the adaptation is highly influenced by the nutritional status. Nutrients are also not only the substrates in the energy production because they also regulate the behavior of genes and cellular signaling pathways. Adequacy of iron predetermines red blood cell production, carbohydrate nutrition affects metabolic tolerance, protein assists in tissue reconstruction, and antioxidant homeostasis influences the redox sensitive signaling pathways (Guerrero-Pinzon et al., 2022). Current developments in the field of molecular biology, exercise physiology, and sports nutrition indicate that the combined methodology that takes into account both hypoxic stimulus and dietary support is necessary (Karpecka-Galka et al., 2025). Thus, this paper examines the role of nutritional factors that may regulate hypoxia inducible factor pathways during altitude training and how a strategic nutritional plan can positively influence the endurance performance outcomes.

Physiological Basis of Altitude Training

Environmental Hypoxia and Systemic Responses

The partial pressure of oxygen reduces greatly at altitudes greater than 2000 meters. This decrease causes a decrease in the oxygen saturation of the arteries and a decrease in the oxygen supply to the muscles involved in work. The body reacts both in acute and chronic processes (Burtscher et al., 2018).

Acute responses are heightened ventilation, higher heart rate, and redistribution of blood. With time, chronic adaptations occur, e.g.:

- Increased erythropoietin secretion
- Enhanced red blood cell production
- Increased haemoglobin concentration
- Expansion of capillary networks
- Improved mitochondrial density

These changes collectively improve oxygen transport capacity and enhance endurance performance upon return to sea level.

Altitude Training Models

Common altitude training strategies include:

- **Live High Train Low:** Athletes reside at moderate altitude but perform high intensity training sessions at lower altitudes to maintain training quality.
- **Live High Train High:** Both living and training occur at altitude.
- **Intermittent Hypoxic Training:** Athletes train under simulated hypoxic conditions for short periods.

Each model induces hypoxia mediated signaling, but nutritional demands may vary depending on training load and exposure duration.

Molecular Mechanisms of Hypoxia Inducible Factor Activation

Hypoxia inducible factor is an oxygen sensitive alpha subunit with constitutive beta subunit that is a heterodimer. In the presence of normal oxygen, the alpha subunit is hydroxylated by prolyl hydroxylase enzymes to degrade it through the ubiquitin proteasome pathway (Fallah et al., 2023).

During hypoxia:

- Prolyl hydroxylase activity decreases
- Hypoxia inducible factor 1 alpha stabilizes
- Nuclear translocation occurs
- Binding to hypoxia response elements in DNA takes place
- Gene transcription is initiated Key

Genes Regulated Include:

- Erythropoietin for red blood cell production
- Vascular endothelial growth factor for angiogenesis
- Glucose transporters for enhanced glucose uptake
- Glycolytic enzymes for anaerobic metabolism
- Enzymes involved in mitochondrial adaptation

Thus, hypoxia inducible factor acts as a master regulator coordinating systemic and cellular responses to low oxygen availability.

Nutritional Modulation of Hypoxia Inducible Factor Pathways

Iron Availability and Hematological Adaptation

Iron is at the center of altitude adaptation because it is significant in the production of hemoglobin. The production of red blood cells is stimulated by erythropoietin; it needs good supplies of iron. In case of low ferritin, the

erythropoietic hypoxia response is suppressed (Caris & Santos, 2019).

Another enzyme that uses iron as a cofactor is the prolyl hydroxylase enzymes which control hypoxia inducible factor degradation. Disturbed iron status has the potential to affect the stability of hypoxia signaling pathways. Athletes especially females and distance runners are more prone to iron deficiency because of excess losses as well as insufficient intake. Serum ferritin and hemoglobin pre altitude screening should be done. When taken in a clinical indication, iron supplementation improves hematological adjustment and avoids the decrease in performance (Burtscher et al., 2018).

Carbohydrate Availability and Metabolic Regulation

Hypoxia leads to the increase in the dependence on glycolysis due to the decrease in the efficiency of oxidative phosphorylation. The hypoxia inducible factor increases the presence of glycolytic enzymes and glucose transporters to counteract the diminution of oxygen concentration. High altitude training can cause low carbohydrate availability, thereby compromising high intensity performance and recovery. Nevertheless, planned carbohydrate periodization can also increase the mitochondrial signals (Fallah et al., 2023).

It is essential to balance between metabolic adaptation and training quality. Low to moderate carbohydrate levels are useful during the extreme training at altitude as it aids performance and alleviates excessive fatigue.

Protein Intake and Muscle Protein Turnover

Exposure to high altitude has the potential to raise resting metabolic rate and muscle protein catabolism. Anabolism can be suppressed by hypoxia through activation of AMPK signaling.

Adequate protein intake supports:

- Muscle repair
- Mitochondrial protein synthesis
- Enzyme production
- Immune function

Protein requirement varies between 1.6 and 2.2 grams of protein per kilogram of body weight per day by endurance athletes training at altitude. Balanced protein intake throughout the meals promotes muscle protein synthesis and recovery (Karpecka-Galka and Fraczek, 2024).

Antioxidant Balance and Redox Signaling

Reactive oxygen species are produced during hypoxia. These are signaling mediators, which lead to the stabilization of hypoxia inducible factor and adaptation of the mitochondria. The impaired recovery and immune function might be caused by excessive oxidative stress. Nevertheless, the use of high dose antioxidant supplementation can impair adaptive signaling by neutralising reactive oxygen species that are necessary in cellular adaptations. Emphasis should be on a high fruit and vegetable intake of natural antioxidants instead of high dose supplementation. The redox balance assists in adapting and does not inhibit any beneficial signaling pathways (Viscor et al., 2023).

Dietary Nitrates and Oxygen Efficiency

Nitric oxide is produced with the help of dietary nitrates, which are typical of beetroot and leafy vegetables. Nitric oxide enhances the dilation of the vessels, blood circulation, and efficiency of the mitochondria.

Nitrate supplementation can increase endurance performance and decrease the oxygen price of exercise in hypoxic conditions. Increased muscle oxygen could be used as a complement to hematological adaptations caused by hypoxia (Stellingwerff et al., 2019).

Energy Availability and Relative Energy Deficiency

Exposure to altitude usually decreases the appetite and raises the energy expenditure levels because of high ventilation rates and thermoregulation costs. Poor energy consumption can also result in insufficient energy supply, which affects the hormonal balance and adaptation. Caloric consumption should be sufficient to maintain erythropoiesis, immune and recovery. The maladaptation could be prevented by monitoring body mass and the diet

when visiting the altitude camps (Mujika et al., 2019).

Integrated Physiological Model

Hypoxia inducible factor pathways are activated by altitude training resulting in systemic and cellular adaptations. This is affected by nutritional factors which include:

- **Iron-Dependent Erythropoiesis:** Iron is essential in red blood cells production (erythropoiesis). Hypoxia triggers erythropoietin during altitude training and enhances red blood cell production. But this process takes enough iron stores in order to synthesize hemoglobin. On the one hand, when iron levels are low, the body is unable to make sufficient hemoglobin, which lowers the oxygen delivery and decreases the advantages of altitude adaptation (Koivisto-Mork et al., 2020).
- **Availability of Glycolytic Substrates:** During hypoxia, the body uses more glycolysis (carbohydrate breakdown) to generate energy since the energy production rate that requires oxygen is inefficient. The sufficient supply of carbohydrates is such that there will be sufficient glucose to sustain this high demand of glycolysis. The low carbohydrate diet during altitude training has the potential to worsen performance, slow down recovery, and diminish quality of training (Mujika et al., 2019).
- **Protein-Mediated Tissue Remodeling:** Metabolic stress and muscle protein degradation may be enhanced by exposure to altitude. Protein intake is enough to aid in muscle repair, mitochondrial protein synthesis, and tissue overall remodelling. Adequate amount of dietary protein can maintain lean body mass and increase recovery enabling athletes to acclimatize to hypoxic training stress (Hill et al., 2011).
- **Redox Control of Signaling Pathways:** Hypoxia leads to the generation of reactive oxygen species (ROS). Despite the fact that high levels of ROS may lead to cell damage, moderate concentrations serve as signaling molecules to induce positive changes in adaptations, such as the activation of hypoxia-inducible factor pathways. Adequate antioxidant balance by natural food resources is an effective way of sustaining redox homeostasis with no interference to these critical adaptive indicators (Butterfield, 1999).
- **Vascular Adaptation through the action of Nitric Oxide:** Nitric oxide is important in the regulation of blood vessel dilation and blood flow through its actions. Dietary nitrates increase the production of nitric oxide that helps to improve the vascular activity and delivery of oxygen to the working muscles. In altitude training, higher blood flow can decrease the cost of oxygen of exercise and overall endurance adaptation, as well as supplementing optimal performance outcomes (Koivisto-Mork et al., 2020).

Practical Applications for Endurance Athletes

- **Perform Iron Screening before Exposing to Altitude:** Before starting training at altitude, it is recommended that athletes screen iron status by such parameters as serum ferritin and hemoglobin. As hypoxia increases the rate of red blood cell production, there must be sufficient iron stores to take advantage of the process of erythropoiesis. Early detection and correction of iron deficiency before exposure to altitude are beneficial to maximize the hematological adaptation process and avoids the deterioration of performance (Jimenez-Casquet et al., 2025).
- **Ensure Sufficient Carbohydrate Consumption During High-Intensity Trainings:** Hypoxia causes a greater dependence on the carbohydrate metabolism as the oxygen- dependent mechanisms of energy production are less efficient. Proper carbohydrate supplementation during high-intensity training exercises is necessary to sustain exercise performance, fatigue, and facilitate recovery. Poor carbohydrate intake can jeopardize the quality and existence of training (Michalczyk et al., 2016).
- **Make Sure that Ratio of Proteins is Adequate between Meals:** Exposure to the altitude may result in elevated metabolic loads and muscle protein degradation. Adequate daily protein, which is balanced among the meals, helps in muscle repairing, protein synthesis in the mitochondria and recovery. Timely protein intake is associated with increased muscle protein synthesis and maintenance of lean body mass in times of increased training (Hill et al., 2011).
- **Do Not overdo Antioxidants Supplement:** Despite the fact that hypoxia results in higher levels of oxidative stress, reactive oxygen species are also crucial signaling molecules that mediate adaptations. Over-antioxidant supplementation has the potential to dampen these positive signaling pathways. Thus, it can be recommended to athletes to consume most of the antioxidants through whole food sources like vegetables and fruits and not in high doses in the supplements (Butterfield, 1999).
- **Eat Nitrate-Rich Foods Strategically:** Food nitrates like beetroot and green vegetables increase the production of nitric oxide, which improves the flow of blood and oxygen efficiency. Long-term

consumption of nitrate-enriched food prior to training sessions is likely to lower the oxygen expenditure of physical activity and sustain endurance performance during hypoxia (Michalczyk et al., 2016).

- **Keep an Eye on Total Energy ingestion and Body Mass:** Exposure to altitude tends to raise energy expenditure and reduce the appetite. Low energy availability may cause impairment of the recovery, immune ability and hormonal balance due to inadequate energy intake. Frequent self-assessment of the diet and body weight can be used to balance and avoid maladaptation of energy requirements (Koivisto-Mork et al., 2020).

Research Gaps and Future Directions

Despite growing evidence, several research gaps remain:

- Long term interaction between iron supplementation and hypoxia signaling
- Effects of carbohydrate restriction on hypoxia inducible factor activation
- Nutrigenomic influences on altitude adaptation
- Sex specific responses to hypoxic training
- Molecular biomarkers for individualized nutritional prescriptions

Future research integrating omics technologies and controlled altitude simulations will enhance understanding of precision nutrition in hypoxic environments.

Conclusion

Endurance performance in altitude training is enhanced through activation of hypoxia inducible factor pathways that coordinate erythropoiesis, angiogenesis and metabolic remodelling. The molecular adaptations facilitate oxygen delivery and its use by working muscles. These responses are under the influence of nutrition. Sufficient iron helps in the synthesis of hemoglobin and production of red blood cells in the most efficient way possible, which leads to proper hematological adaptation. The adequate carbohydrate intake sustains energy equilibrium and promotes glycolytic energy breakdown in hypoxia. The ideal protein intake will help maintain muscle mass and will aid recovery under more intense metabolic load. Maintaining redox signaling by balanced intake of antioxidants does not inhibit any positive cellular response. Besides, dietary nitrates can increase oxygen efficiency and exercise economy. Evidence based nutritional approach is integrated and helps to maximize the adaptations that are induced by altitudes and decreases such risks as fatigue, sickness and unavailability of energy.

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A COMPARATIVE STUDY OF PERSONALITY CHARACTERISTICS OF YOGIC AND NON-YOGIC STUDENTS

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Abstract

Background: The purpose of this study is to investigate and contrast the personality traits of college students who perform yoga with those who do not. Students' behavior, emotional stability, social adjustment, and academic achievement are all significantly influenced by their personalities.

As a comprehensive practice that incorporates physical postures, breathing exercises, and meditation, yoga is said to have a favorable impact on mental and emotional health.

The goal of the current comparative study is to determine how yoga-practicing and non-yoga students differ in important personality attributes, such as emotional stability, self-confidence, sociability, adjustment, and stress tolerance.

Method: Two groups were created from a sample of sixty university students: 30 students regularly practicing yoga and 30 students not involved in yoga activities between age 18 and 25. A variety of personality variables were measured using standardized personality assessment instruments. To identify significant differences between the two groups, the gathered data were examined using descriptive statistical techniques and the t-test.

Result: According to the study's findings, students who do yoga typically exhibit better stress management, more self-discipline, emotional balance, and positive social behavior than their non-yoga counterparts. Conversely, it was discovered that students who did not practice yoga had significantly higher levels of anxiety, impulsivity, and poorer emotional regulation.

Conclusion: According to the study's findings, university students who regularly practice yoga benefit from the growth of good personality qualities. It implies that adding yoga courses to university curricula may improve students' mental health, academic performance, and general personality development.

Keywords: Personality, Yoga, University Students, Mental Well-Being, Overall Development.

Introduction

A person's personality has a significant impact on how they behave, feel, and interact with others. It captures the cognitive, emotion, and behavior patterns that distinguish each individual. In recent years, more emphasis has been placed on techniques that help improve psychological health and personality development. One such discipline is yoga. Yoga is an ancient discipline that began in India and has been practiced for thousands of years to achieve balance in the body, mind, and spirit. These elements combine to develop physical health, cerebral clarity, emotional balance, and spiritual awareness. Yoga is widely recognised as an effective practice for enhancing both physical and mental health. Several studies have shown that regular yoga practice can help reduce stress, anxiety, and depression while also increasing concentration, emotional regulation, and overall well-being. Yoga promotes mindfulness, self-awareness, and self-discipline, all of which help to build desirable personality traits. Individuals with frequent practice may gain more emotional stability, patience, self-control, and resilience. Students, particularly those at the university level, frequently confront a variety of hurdles, including academic pressure, competition, time management problems, and social adaptations. These elements have a substantial impact on their personality development and mental wellness. Yoga activities can help students manage stress and live a more balanced lifestyle. Yoga not only improves physical health, but it also fosters mental peace and emotional stability, all of which are necessary for healthy personality development. Despite yoga's growing popularity and potential advantages, not all students practise it frequently. As a result, those who practise yoga may have different personality characteristics than those who do not. Understanding these distinctions can provide useful insights into the role of yoga in generating healthy psychological and behavioural outcomes in students. As a result, the current study will evaluate and compare the personality of yogic and non-yogic students utilising the Big Five Personality Questionnaire. The study's goal is to determine whether regular yoga practice helps students acquire more positive personality traits by

analysing the differences between these two groups. The study's findings may assist to emphasise the necessity of bringing yoga practices into academic settings to support students' holistic development.

Methodology

Subjects for the study

In order to compare the personality traits of yogic and non-yogic participants, the study used a comparative research design.

The study included sixty university students from GGV, Bilaspur in all. Two groups of participants were created: Thirty regular yoga students and thirty non-yoga students of GGV Bilaspur, between the ages of 18 and 25, were selected.

Hypothesis

Null Hypothesis (H_0):

There is no significant difference in personality characteristics between yogic and non-yogic students.
Alternative Hypothesis (H_1):

There is a significant difference in personality characteristics between yogic and non-yogic students

Utilized Tool

THE BIG FIVE INVENTORY (BFI) questionnaire was used, John, O. P., & Srivastava, S. (1999)

Description of Measure: 44-item inventory that measures an individual on the Big Five Factors (dimensions) of personality (Goldberg, 1993). Each of the factors is then further divided into personality facets.

Scale: The Big Five Inventory (BFI) Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. Disagree strongly(1) Disagree a little(2) Neither agree nor disagree(3) Agree a little(4) Agree Strongly (5)

Scoring: BFI scale scoring ("R" denotes reverse-scored items):

1,2R,3,4,5,6R,7,8R,9R,10,11,12R,13,14,15,16,17,18R,19,20,21R,22,23R,24R,25,26,27R,28,29,30,31R,32,33,34R, 35R,36,37R,38,39,40,41R,42,43,44

Statistical Analysis

The data collected were analyzed using: Descriptive statistics (Mean, Standard Deviation), Independent Samples t-test using the SPSS 20. The level of significance was set at 0.05.
The findings are displayed in Table 1 and table 2
TABLE 1: Descriptive analysis of personality characteristics means of yogic and non yogic students.

	Group	N	Mean	Std. Deviation	Std. Error Mean
	YOGIC	30	160.5000	6.99630	1.27734
	NON-YOGIC	30	148.4667	9.33932	1.70512

The mean personality score of yogic students (160.50) was higher than that of non-yogic students (148.47). This suggests that yogic students demonstrate more positive personality characteristics compared to non-yogic students.

TABLE 2: The independent samples t-test was used to determine whether there is a significant difference between the personality scores of yogic and non-yogic students.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Score	Equal variances assumed	4.323	.042	5.648	58	.000	12.03333	2.13050	7.76867	16.29800
	Equal variances not assumed			5.648	53.753	.000	12.03333	2.13050	7.76148	16.30518

The calculated t-value is 5.648 with degrees of freedom (df = 58). .The mean difference between the two groups is 12.03, which shows that yogic students scored significantly higher than non-yogic students on personality characteristics. The significance value (0.042) is less than the level of significance (0.05)So, the null hypothesis is rejected.

Discussion

The Big Five Personality Questionnaire was used in this study to compare the personality traits of yogic and non-yogic students. The study's conclusions showed that the two groups differed significantly. According to the descriptive statistics, yogic students had a higher mean personality score (M = 160.50) than non-yogic students (M = 148.47). This suggests that students who perform yoga typically exhibit more positive personality traits than those who do not. Additionally, the results of the independent samples t-test ($t = 5.648$, $p < 0.05$) demonstrated the statistical significance of the difference between the two groups. The beneficial psychological and emotional effects of consistent yoga practice may be the reason for the higher mean score seen among yogic students. yoga is a holistic practice that promotes mental clarity, emotional balance, and physical health. Yoga facilitates the development of self-awareness, focus, and emotional control via regular practice. Openness, conscientiousness, agreeableness, extraversion, and emotional stability are some of the personality traits that are closely associated with the Big Five Personality Model. Additionally, practicing yoga encourages relaxation and lowers stress, both of which have a significant impact on personality development. Throughout their academic careers, students frequently deal with psychological difficulties, competitiveness, and pressure to perform well. They might be able to manage stress and keep their emotions stable by practicing yoga. As a result, compared to non-yogic pupils, yogic students might acquire more self-control, patience, and resilience. The results of this study are in line with a number of other studies that documented the positive impacts of yoga on personality development and mental health. Yoga and meditation techniques have been shown by researchers to increase psychological well-being, lessen anxiety, and promote emotional stability. Thus, the study's findings provide credence to the notion that yoga can be a useful instrument for encouraging students' good personality development.

Conclusion

The purpose of the current study was to compare the personality traits of students who practise yoga and those who do not. It is clear from the statistical analysis and interpretation of the gathered data that the two groups' personality traits differ significantly from one another. The findings showed that students who practiced yoga had higher personality scores than those who did not, suggesting that yoga practice has a beneficial impact on personality development. According to the research, frequent yoga practice may help people develop critical personality traits including emotional stability, self-control, openness, and improved stress management. An individual's behaviour, attitudes, and general psychological well-being are greatly influenced by these characteristics. Yoga helps people develop better mental equilibrium and emotional control by encouraging mindfulness, relaxation, and self-awareness. In the setting of student life, when academic stress and lifestyle issues are widespread, yoga can be a useful technique for enhancing mental health and promoting positive personality qualities. Educational institutions can help students incorporate yogic practices into their regular routines. Incorporating yoga into school and university curricula may improve students' attentiveness, emotional resilience, and general personal growth. Finally, the study emphasises the value of yoga as a useful activity that promotes not only physical health but also

psychological growth and personality development. Encouraging pupils to do yoga may result in increased well-being, stronger character development, and a more balanced and healthier lifestyle. Future research can investigate the long-term effects of yoga on other personality traits, broadening the breadth of this field of study.

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POLICY FRAMEWORK FOR INTEGRATING TRADITIONAL INDIAN HEALTH SYSTEMS INTO NATIONAL SPORTS PROGRAMS

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Abstract

India's classical health traditions-principally Yoga and Ayurveda-have garnered substantial international recognition for their preventive orientation, personalized therapeutic philosophy, and comprehensive conceptualization of human health. Despite this acknowledgment, contemporary sports governance in India remains predominantly anchored within modern performance science paradigms, leaving the institutional integration of traditional wellness modalities largely unaddressed. The structural disconnect between indigenous health knowledge and elite athlete development frameworks represents a significant policy gap with measurable consequences for long-term athletic sustainability. This conceptual paper proposes a multidimensional policy framework aimed at systematically embedding traditional Indian health systems within the formal architecture of national sports administration. Drawing upon integrative healthcare models and current governmental health initiatives, the paper critically evaluates existing institutional deficiencies and advances strategic, evidence-aligned recommendations encompassing inter-ministerial coordination, curriculum reform, individualized athlete wellness planning, and systematic evaluation mechanisms. The findings suggest that a carefully designed integrative model can meaningfully strengthen athletic recovery, psychological adaptability, and sustained competitive performance without undermining scientific standards of excellence. The paper ultimately argues that coherent policy commitment supported by robust scientific validation is indispensable for embedding traditional health practices within high-performance sporting ecosystems, thereby cultivating a productive synthesis between competitive achievement and holistic athlete well-being.

Keywords: Traditional Indian health systems; Yoga and Ayurveda in sports; policy integration; athlete wellness; holistic performance; national sports governance

Introduction:

Contemporary high-performance sports systems are organized around scientifically validated conditioning frameworks, wherein exercise physiology, biomechanics, sports nutrition, and applied psychology collectively constitute the operational foundations of elite athlete development. Training methodologies are increasingly data-driven, emphasizing quantifiable performance indicators including speed, muscular endurance, explosive strength, and cognitive responsiveness under competitive conditions. Within this dominant paradigm, athlete welfare is addressed through disciplinary specialization -physiotherapy for musculoskeletal management, nutritional science for metabolic optimization, and psychological intervention for competitive resilience. The institutional logic of modern sports governance is fundamentally oriented toward measurable output maximization, with health and recovery systems engineered to serve this primary objective.

Despite the apparent comprehensiveness of this scientific model, persistent challenges including overuse injuries, chronic fatigue syndromes, psychological burnout, and recovery inefficiencies continue to afflict competitive athletes across performance levels globally. These recurring problems suggest that exclusive reliance on conventional performance science frameworks may be structurally insufficient for sustaining long-term athletic health. The dominant model, while effective in optimizing performance variables in the short term, frequently underserves the integrative dimensions of athlete well-being - particularly those relating to autonomic recovery, psychological equilibrium, and connective tissue resilience. This structural gap creates a genuine opening for complementary health modalities that address precisely these underserved domains.

Classical Indian health traditions, particularly Yoga and Ayurveda, are grounded in preventive philosophy and a systemic understanding of the physiological and psychological interdependence that governs human health. Yogic practices encompassing postural conditioning, breath regulation, and contemplative techniques have demonstrated measurable effects on proprioceptive acuity, autonomic balance, neuromuscular coordination, and stress modulation. Ayurvedic frameworks, through their constitutional approach to health assessment, offer individualized wellness

protocols that account for metabolic tendencies, recovery patterns, and stress responsiveness specific to each athlete's physiological constitution. These attributes position traditional health systems not as alternatives to modern sports science, but as functional complements capable of addressing wellness dimensions that conventional models tend to inadequately serve.

Despite the growing scholarly evidence supporting traditional health integration, comprehensive institutional frameworks formally embedding these practices within national sports programs remain largely absent in India. Most implementations continue to occur at the discretionary level of individual coaches or training facilities, without standardized governance structures or systematic outcome monitoring. This policy gap underscores the urgency of developing structured, evidence-informed integration strategies capable of operationalizing traditional wellness modalities within elite sports ecosystems. The present conceptual paper responds to this need by proposing a coherent, multidimensional policy framework designed to institutionalize Yoga and Ayurveda within India's national sports governance architecture, thereby advancing athlete welfare and the broader goal of holistic competitive excellence.

Conceptual Foundation: Bridging Traditional Wisdom and Sports Science:

The conceptual premise underlying this framework rests upon a reconceptualization of athlete health as a multidimensional construct that extends well beyond biomechanical efficiency and metabolic capacity. Contemporary sports science has progressively recognized that peak athletic performance is not solely a product of physical conditioning but emerges from the integrated functioning of physiological, psychological, and regulatory systems operating in dynamic equilibrium. This understanding resonates deeply with the theoretical foundations of Yoga and Ayurveda, both of which conceptualize health as the harmonious functioning of bodily, mental, and energetic dimensions rather than the mere absence of disease or physical dysfunction.

Yoga, as systematized in classical Indian texts and elaborated through centuries of documented practice, offers a structured methodology for cultivating body awareness, breath regulation, and attentional discipline. When examined through a contemporary sports science lens, these practices correspond functionally to proprioceptive training, autonomic modulation, and psychological skills development — all of which are recognized determinants of elite athletic performance. The convergence between yogic principles and modern psychophysiological frameworks reflects the sophisticated empirical observation embedded within classical Indian knowledge systems regarding the relationship between movement quality, respiratory function, and mental regulation. This epistemological convergence provides a legitimate intellectual basis for integration beyond mere pragmatic utility.
Ayurveda contributes a complementary conceptual dimension through its constitutional framework, which classifies individuals according to dominant psychophysiological tendencies or Prakriti-and associates these constitutional profiles with specific health vulnerabilities, recovery patterns, and adaptive capacities. This individualization principle anticipates contemporary precision health approaches in sports medicine, where growing recognition of inter-individual variability in training response and recovery capacity is prompting interest in personalized athlete management protocols. The Prakriti framework, when appropriately validated and operationalized, offers a practically accessible system for individualized wellness planning that could complement physiological profiling methods currently employed within elite sports programs.

The conceptual framework advanced here therefore does not position traditional health systems as peripheral additions to existing sports programs but as epistemologically distinct yet practically compatible knowledge systems addressing the integrative and individualized dimensions of athletic health. Institutional integration requires not the subordination of traditional knowledge to modern scientific categories but a genuine interdisciplinary dialogue in which the strengths of each system are leveraged in complementary fashion. This dialogic integration model differs fundamentally from superficial incorporation; wherein traditional practices are selectively extracted and decontextualized without adequate attention to their underlying theoretical coherence and systemic logic.

India's institutional position further strengthens the conceptual case for integration. The established AYUSH governance infrastructure, the presence of accredited Yoga and Ayurvedic universities, and the government's demonstrated commitment to traditional health through national policy instruments provide an existing institutional substrate upon which a sports-specific integration framework can be meaningfully constructed. Rather than building integration capacity from the ground up, the proposed framework leverages and extends existing institutional resources, enhancing both its feasibility and its developmental efficiency.

Policy Framework for Integration:

The following framework delineates five strategically interconnected policy domains through which traditional Indian health systems can be institutionally embedded within national sports programs. Each component addresses a distinct operational dimension while contributing to the overarching objective of sustainable, holistic athlete development. The framework is designed to be sequentially implementable, with governance architecture providing the foundational conditions upon which subsequent components depend.

Institutional Collaboration and Governance Architecture:

Effective and durable integration requires the establishment of formal inter-ministerial coordination mechanisms linking the Ministry of Youth Affairs and Sports with the Ministry of AYUSH. A dedicated Integration Oversight Committee should be constituted with balanced representation from sports science professionals, traditional health practitioners, policy administrators, and athlete welfare advocates. This committee would carry responsibility for developing standardized integration guidelines, resolving jurisdictional questions between conventional and traditional practice domains, and ensuring policy coherence across national sports academies, state sports authorities, and elite training centres. Formal governance structures must be accompanied by clear accountability mechanisms, defined timelines for implementation milestones, and transparent reporting channels to prevent integration from becoming a nominal policy commitment without operational consequence.

The rationale for prioritizing governance architecture as the foundational policy component is straightforward: without structural formalization at the institutional level, integration efforts risk remaining fragmented and dependent upon individual initiative rather than systemic mandate. Historical patterns of traditional health incorporation within Indian sports programs demonstrate precisely this vulnerability — where the absence of binding governance frameworks has allowed integration to remain episodic, inconsistent, and insufficiently resourced. A formally constituted inter-ministerial governance structure transforms integration from a discretionary practice into an institutional obligation, providing the regulatory foundation upon which all subsequent framework components must rest.

Evidence Generation and Research Investment:

Sustained institutional integration requires a continuously expanding evidence base that is specifically generated within high-performance sports contexts and meets the methodological standards of contemporary sports science. The framework recommends the establishment of dedicated interdisciplinary research centers, co-located with national sports institutes, focused on examining the athletic applications of Yoga and Ayurveda under controlled and rigorous conditions. Priority research areas should encompass performance outcome measurement following structured yoga intervention across different sport disciplines, efficacy of Ayurvedic dietary and recovery protocols under competitive training loads, constitutional variability in physiological response to training stress, and longitudinal injury prevention outcomes associated with integrated wellness programs.

A critical function of this research investment is the generation of sport-specific evidence that translates favourably within the epistemic frameworks of mainstream sports science. The credibility and institutional acceptance of traditional health integration within sports programs will ultimately depend upon the quality and relevance of its supporting evidence base. Generic clinical evidence, while informative, is insufficient to secure the sustained commitment of sports administrators, performance directors, and coaching professionals who operate within rigorously evidence-driven decision environments. Sport-specific research that demonstrates measurable performance and health outcomes provides the epistemic currency necessary for integration to achieve genuine institutional legitimacy rather than merely nominal policy recognition.

Curriculum Reform and Professional Certification:

Long-term integration is contingent upon a professional workforce competently equipped to deliver traditional health interventions within sports contexts. The framework proposes the development of structured certification pathways for sports professionals encompassing foundational Ayurvedic constitutional assessment, yoga-based conditioning and recovery protocols, and interdisciplinary athlete case management competencies. These certification programs should be systematically embedded within undergraduate and postgraduate sports science curricula, with continuing professional development modules designed for practicing coaches, physiotherapists, and sport psychologists already operating within national sports programs.

Professional certification serves multiple strategic functions within the integration framework. It establishes minimum competency standards that protect athlete welfare by ensuring that traditional health interventions are delivered by practitioners with verified knowledge and supervised practice experience. It creates a recognized professional identity for integrated practice, encouraging sustained career investment in this specialization and building a growing workforce capable of supporting system-wide implementation. It also provides a quality assurance mechanism that addresses legitimate concerns within sports science communities regarding the consistency and safety of traditional health practice in high-performance contexts. Without credible certification infrastructure, integration risks being perceived as an unregulated intrusion of non-evidence-based practice into a scientifically disciplined professional domain.

Individualized Athlete Wellness Protocols:

A defining contribution of Ayurvedic philosophy to sports medicine is its sustained emphasis on individualized constitutional assessment, wherein each athlete's dominant psychophysiological profile — determined through Prakriti analysis — informs tailored health management strategies across nutrition, recovery, training load, and psychological support domains. The framework recommends incorporating Prakriti-based constitutional assessment as a supplementary component of routine athlete health profiling, developed alongside conventional physiological and psychological evaluation procedures. Individualized wellness plans derived from this integrated assessment would guide recovery modality selection, nutritional prescriptions, and adaptive training recommendations in ways that account for each athlete's specific constitutional tendencies and stress vulnerabilities.

This individualization dimension addresses a widely recognized limitation of standardized sports science protocols, which apply uniform intervention frameworks to athlete populations characterized by substantial inter-individual variability in recovery capacity, injury susceptibility, and stress responsiveness. While precision sports medicine approaches based on genomic profiling and advanced physiological monitoring are emerging, they remain resource-intensive and inaccessible within many national program contexts. Prakriti-based constitutional assessment offers a practically accessible complementary framework for individualization that could meaningfully enhance the responsiveness of athlete wellness planning to individual health profiles, without requiring the technological infrastructure that more advanced precision approaches demand.

Monitoring, Evaluation, and Adaptive Governance:

The long-term credibility and effectiveness of any integration initiative depend upon rigorous, ongoing evaluation of both implementation fidelity and outcome achievement. The framework proposes a comprehensive monitoring and evaluation system employing quantitative indicators — including injury incidence rates, recovery duration benchmarks, and physiological stress markers such as cortisol levels and heart rate variability, athlete-reported well-being scores, and competitive performance trajectories-alongside qualitative assessments capturing practitioner and athlete experiences through structured review processes.

Critically, evaluation findings must be systematically incorporated into governance mechanisms through formal feedback cycles that enable adaptive refinement of integration protocols over time. This adaptive governance dimension ensures that the framework remains dynamically responsive to emerging evidence, practitioner learning, and evolving best practices in both traditional health and contemporary sports science domains. An integration framework that lacks robust evaluation infrastructure risks institutional inertia — continuing to implement practices based on initial assumptions rather than accumulated operational evidence. Adaptive governance, grounded in systematic evaluation, provides the self-correcting mechanism through which integration can continuously improve in quality, relevance, and effectiveness across its implementation lifespan.

Conclusion:

The institutionalization of traditional Indian health systems within national sports programs represents a strategically significant and empirically defensible policy direction for India's sports governance landscape. Yoga and Ayurveda, when applied through evidence-informed protocols and embedded within coherent institutional frameworks, offer meaningful contributions to athlete recovery, injury prevention, psychological resilience, and long-term performance sustainability that extend beyond the current reach of conventional sports science models. The structural gap between available evidence and policy implementation is not a reflection of the inadequacy of traditional knowledge but rather of the absence of governance frameworks capable of translating that knowledge into standardized, accountable institutional practice.

The five-component policy framework advanced in this paper — encompassing governance architecture, research infrastructure, professional certification, individualized wellness planning, and adaptive evaluation — provides a structured operational pathway for translating integration aspiration into institutional reality. Successful realization of this framework will require sustained inter-ministerial commitment, deliberate investment in interdisciplinary research capacity, and the cultivation of a professional ecosystem capable of supporting integrated practice at scale. It will also demand intellectual openness on the part of sports science communities toward the epistemological contributions of traditional health systems — not as concessions to cultural sentiment, but as recognition of the genuine empirical sophistication embedded within India's classical health knowledge traditions.

India occupies a uniquely advantageous position to pioneer this integration model internationally, given its institutional inheritance of traditional health knowledge, its established AYUSH governance infrastructure, and its growing competitive presence in global sport. By advancing a policy framework that bridges classical wellness traditions with contemporary performance science, India has the opportunity to demonstrate that competitive excellence and holistic athlete well-being are not competing priorities but mutually reinforcing dimensions of a sustainable, forward-looking high-performance system. Future scholarship should continue building the empirical foundation through rigorous sport-specific research and comparative policy analysis, ensuring that integration advances on the basis of accumulated evidence and continuously refined practice rather than institutional momentum alone.

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A COMPARATIVE STUDY OF STRESS BETWEEN YOGIC AND NON YOGIC STUDENTS OF GURU GHASIDAS VISHWAVIDYALAYA

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Abstract

Background: Both physical and mental health are impacted by chronic stress, especially for students who are under academic pressure. Yoga is thought to reduce stress more successfully than traditional lifestyles because it incorporates physical postures, breathing techniques, and meditation.The purpose of this research work is to see the stress levels between the yogic and non-yogic students of university.

Objective: To measure the stress level of yogic and non-yogic students.

Methods: A comparative study of stress has been done between yogic and non-yogic students of ggv, Bilaspur. Total 60 sample have been taken, in which 30 students are yoga practicing and 30 are not practicing yoga, all students are studing in ggv Bilaspur, aged 18 to 25. Percieved stress questionnaire has been used in this research. To identify significant differences between the groups, data were analyzed using t-tests and descriptive statics.

Results: ccording to the findings it is revealed that there are significant differences in the stress levels of yogic and non- yogic students. Yogic students found to be less stressed than non yogic students.

Conclusion: This comparative study revealed that students who regularly practice yoga, report much reduced levels of stress, especially in psychological and emotional domains. Frequent yoga practice, which includes asanas, pranayama, and meditation, seems to improve resilience against common student issues such as performance anxiety, academic expectations, and everyday stressors. Compared to sedentary lives, yoga promotes improved stress adaptation by lowering cortisol levels and improving vagal tone through its beneficial effects on the autonomic nerve system.

Key Words: Yoga, Stess, University students, Mental health

Introduction

Due to academic competitiveness, exam pressure, job uncertainties, financial limitations, and social expectations, stress has become a ubiquitous aspect of modern student life.Students who experience chronic stress are more likely to experience anxiety, depression, sleep problems, poor academic performance, and harmful coping mechanisms including substance abuse. This public health issue has prompted a search for affordable, easily accessible therapies that can be used in educational institutions.

Yoga, a mind-body discipline that combines physical postures (asanas), breath control (pranayama), relaxation, and meditative awareness, has its roots in ancient Indian philosophy and is today practiced all over the world. The benefits of yoga on mental health outcomes, such as perceived stress, anxiety, and emotional wellness, have been increasingly shown by contemporary research, especially in populations of university students. For instance, compared to waitlist or non-intervention controls, randomized controlled trials have demonstrated that yoga programs lasting eight to twelve weeks can considerably lower psychological distress and enhance students' sleep quality.

The Perceived Stress Questionnaire (PSQ), which assesses how much people consider certain circumstances in their lives to be stressful, is frequently used to quantify perceived stress. The PSQ has demonstrated strong internal consistency, temporal stability, and construct validity in a variety of cultural contexts and student populations.It is especially well-suited for extensive stress surveys in educational settings because to its good psychometric qualities and ease of administration.

Comparative cross-sectional research that look at the differences between students who have already embraced a yogic lifestyle and those who have not are still valuable, even if intervention studies have shown that structured yoga programs can lower stress scores over time. Regular asana practice, breathing techniques, relaxation, and specific

food and lifestyle practices can all help yogic students perceive stress. Non-yogic students, on the other hand, can turn to less organized or ineffective coping strategies like social media use, inactive leisure, or sporadic exercise.
This study uses the independent samples t-test to compare the perceived stress levels of yogic and non-yogic students at a specific moment in time. Assuming approximate normality and homogeneity of variances, the independent t-test is suitable for comparing the means of a continuous variable (in this case, stress ratings) between two independent groups. The study attempts to ascertain whether the observed difference in stress between yogic and non-yogic students is statistically significant rather than the result of random variation by using the t-test at the 0.01 level of significance.

Need of the Study

Educational institutions are beginning to recognize mental health and well-being as essential elements of students' whole development, not only academic success. Yoga could be incorporated into daily routines, extracurricular activities, or wellness programs in schools and colleges due to evidence that it may lessen stress, anxiety, and emotional suffering. However, context-specific data that shows advantages for the target group are needed for implementation.

It may be possible to determine whether students who practice yoga have different stress levels than their counterparts who do not by doing a comparative study comparing yogic and non-yogic students. The promotion of yoga as a lifestyle practice rather than only as a short-term rehabilitation program can be strengthened by such findings. Additionally, it offers a straightforward statistical illustration of the possible relationship between lifestyle characteristics and student mental health outcomes using an independent t-test.

Objectives of the Study

1. To assess the level of perceived stress among yogic students using the Perceived Stress Questionnaire.
2. To assess the level of perceived stress among non‑ yogic students using the Perceived Stress Questionnaire.
3. to compare the stress levels of yogic and non‑ yogic students using an independent samples t‑ test at the 0.01 level of Questionnaire.

Methodology

Research Design

With two naturally occurring independent groups—yogic students and non-yogic students—the study uses a comparative design. The dependent variable is stress, which is operationalized as perceived stress as determined by the PSS. To ascertain whether the mean PSS scores of the two groups differ statistically significantly, the independent samples t-test is employed.

Hypotheses

Null Hypothesis (H_0): There is no significant difference in the mean stress scores of yogic and non‑ yogic students.
Alternative Hypothesis (H_1): There is a significant difference in the mean stress scores of yogic and non‑ yogic students.

Subjects of the study
The target population comprises 60 students of university age range from 18–25 years out of them 30 were regular yoga students and 30 were not .

Yogic Students: Students who have been doing yoga (asanas, pranayama, and/or meditation) on a regular basis for at least a predetermined amount of time—for instance, at least 30 minutes per session, three days a week, for at least three or six months prior to data collection.

-Non‑ Yogic Students: Students who have not attended regular yoga classes in the previous few months and who do not engage in any organized yoga practice. Yoga practice does not include sporadic stretching or non-yoga-based physical activities.

Stress: Perceived psychological stress, as determined by the total scores on the Perceived Stress questionnaire, is the definition of stress for the purposes of this study.

Used tool:

Perceived Stress Questionnaire (PSQ)

The Perceived Stress Questionnaire (PSQ) was created as a tool to evaluate the stressful situations and life events that frequently cause or worsen illness symptoms. Stress has a major impact on the regularity and quality of the sleep cycle.

Administration

It takes ten to fifteen minutes to complete the self-report pen,pencil, and paper scale.

Scoring

One of two sets of scoring instructions are given to respondents in order to complete the PSQ: the general questionnaire asks about stressful feelings and experiences throughout the past year or two, while the recent questionnaire focuses on stress within the previous month. On a scale of 1 ("almost never") to 4 ("usually"), respondents rate the frequency with which they encounter specific stress-related emotions. Greater stress levels are indicated by higher scores. Each item is added together to determine the overall score (questions 1, 7, 10, 13, 17, 21, 25, and 29 are positive and are scored in accordance with the scale's instructions).A PSQ index can be found by subtract ing 30 from the raw score and dividing the result by 90, yielding a score between 0 and 1.

Statistical Analysis

Table 1: descriptive analysis of stress means between yogic and non yogic students.

	Group	N	Mean	Std. Deviation	Std. Error Mean
	yogic	30	.3287	.11485	.02097
	Non yogic	30	.5107	.07168	.01309

The table shows that non yogic students has a higher mean (0.5107) compared to yogic students (0.3287)this suggest yogic students show lower level of stress than non yogic .

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	99% Confidence Interval of the Difference	
									Lower	Upper
Score	Equal variances assumed	1.223	.273	-7.363	58	.000	-.18200	.02472	-.24783	-.11617
	Equal variances not assumed			-7.363	48.614	.000	-.18200	.02472	-.24826	-.11574

Null Hypothesis Rejected

There is significance difference between the two groups ,the table shows sig.0.273 which is less than the p value 0.001 ,rejecting the null hypothesis .yogic students have stress mean score was lower than non yogic with the difference being highly statistically significant.

Results

According to the findings it is revealed that there are significant differences in the stress levels of yogic and non-yogic students. Yogic students found to be less stressed than non yogic students.

Discussion: The results show that students who practiced yoga had considerably lower stress levels than their friends who did not, which is consistent with earlier studies on the advantages of yoga for lowering stress. As demonstrated by undergraduate interventions where yoga groups demonstrated significant reductions in reported stress, yoga activities, including as asanas, pranayama, and meditation, probably increase parasympathetic activation, lowering cortisol and fostering emotional stability. Yoga's ability to mitigate university stressors including social demands and academics is highlighted by this comparative advantage among yogic students.

Conclusion:

Students who consistently practice yoga report much lower levels of stress, particularly in the psychological and emotional areas, according to this comparative study. Regular yoga practice, which incorporates asanas, pranayama, and meditation, appears to increase resilience against typical student problems such everyday stressors, performance anxiety, and academic expectations. By reducing cortisol levels and enhancing vagal tone through its positive effects on the autonomic nervous system, yoga promotes better stress adaptation than sedentary lifestyles. According to this study, university students who practice yoga report feeling less stressed than their non-yogic peers, confirming yoga's efficacy and accessibility as a campus wellness intervention. Frequent yoga practices increase resilience, reduce perceived stress, and enhance mental health in general. This has useful ramifications for incorporating yoga into physical education programs to avoid burnout.

The results support the promotion of yoga programs at universities, particularly in light of the growing stress levels among students, as they improve wellbeing and academic achievement. To improve generalizability, future studies should use larger, more diverse samples, longitudinal designs, and physiological markers like HRV. Yoga instruction should be given top priority by policymakers for students' overall growth in sports science and other subjects.

Suggestions for Future Research

Future researchers can build upon this comparative design in several ways:
Stronger causal conclusions on the impact of yoga on stress can be drawn by conducting longitudinal or experimental studies in which non-yogic students are randomly assigned to yoga interventions.

To get a more comprehensive picture of stress and its management, incorporate additional psychological and physiological measurements, such as anxiety, depression scales, heart-rate variability, or cortisol levels.

A Examine modifiers that might affect who gains the most from yoga, such as gender, academic stream, baseline activity level, or personality traits.

Compare different yoga program types or intensities, such as yoga with and without breath awareness or yoga versus other forms of physical activity, as shown by recent randomized trials.

Use qualitative techniques, including focus groups or interviews, to learn about students' subjective yoga experiences, perceived advantages, and obstacles to participation.Such research can guide evidence‑based policy and program development in educational institutions.

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योगाभ्यासों के माध्यम से तनाव, मानसिक स्वास्थ्य और भावनात्मक कल्याण

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सारांश

आधुनिक समय में बढ़ती प्रतिस्पर्धा, व्यस्त जीवनशैली, सामाजिक दबाव और तकनीकी विकास ने मानव जीवन को अत्यधिक गतिशील बना दिया है। इस तेज़ जीवनशैली का सबसे अधिक प्रभाव व्यक्ति के मानसिक स्वास्थ्य पर पड़ता है। परिणामस्वरूप मानसिक तनाव, चिंता, अवसाद और भावनात्मक असंतुलन जैसी समस्याएँ समाज में तेजी से बढ़ रही हैं। आज मानसिक स्वास्थ्य विश्व स्तर पर एक महत्वपूर्ण सार्वजनिक स्वास्थ्य मुद्दा बन गया है।योग एक प्राचीन भारतीय पद्धति है जो शरीर, मन और आत्मा के संतुलन पर आधारित है। यह केवल शारीरिक व्यायाम तक सीमित नहीं है बल्कि एक समग्र जीवनशैली है जो मानसिक, शारीरिक और आध्यात्मिक स्वास्थ्य को संतुलित करने का कार्य करती है। इस शोध पत्र का उद्देश्य योगाभ्यासों के माध्यम से तनाव को कम करने, मानसिक स्वास्थ्य को सुधारने और भावनात्मक कल्याण को बढ़ाने में योग की भूमिका का अध्ययन करना है।इस अध्ययन में योगासन, प्राणायाम, ध्यान और धारणा जैसे अभ्यासों के मानसिक एवं शारीरिक प्रभावों का विश्लेषण किया गया है। विभिन्न शोध अध्ययनों से यह पाया गया है कि नियमित योगाभ्यास से तनाव हार्मोन विशेषकर कॉर्टिसोल के स्तर में कमी आती है और मानसिक शांति तथा भावनात्मक संतुलन में सुधार होता है । इसके अतिरिक्त योग के अभ्यास से एकाग्रता, आत्म-नियंत्रण और सकारात्मक सोच का विकास होता है ।कोविड-19 महामारी के दौरान भी योग ने मानसिक स्वास्थ्य को बनाए रखने में महत्वपूर्ण भूमिका निभाई, जिसे विश्व स्वास्थ्य संगठन ने भी स्वीकार किया है । इस शोध के निष्कर्ष से यह स्पष्ट होता है कि योग मानसिक तनाव को कम करने, भावनात्मक स्थिरता बढ़ाने और जीवन की गुणवत्ता सुधारने के लिए एक प्रभावी और प्राकृतिक साधन है।

मुख्य शब्द: योग, तनाव प्रबंधन, मानसिक स्वास्थ्य, भावनात्मक कल्याण, योगासन

प्रस्तावना

आधुनिक जीवनशैली में तेजी से हो रहे सामाजिक, आर्थिक और तकनीकी परिवर्तनों ने मानव जीवन को अत्यधिक व्यस्त और तनावपूर्ण बना दिया है। आज के समय में व्यक्ति अपने कार्यक्षेत्र, शिक्षा, परिवार और सामाजिक जीवन के बीच संतुलन बनाने का प्रयास करता है। लेकिन लगातार बढ़ती प्रतिस्पर्धा और अपेक्षाएँ मानसिक दबाव को बढ़ाती हैं।

वर्तमान समय में तनाव, चिंता और अवसाद जैसी मानसिक समस्याएँ विश्व स्तर पर तेजी से बढ़ रही हैं। विश्व स्वास्थ्य संगठन के अनुसार मानसिक स्वास्थ्य समस्याएँ वैश्विक स्तर पर विकलांगता और कार्य क्षमता में कमी के प्रमुख कारणों में से एक हैं (WHO, 2020)। लंबे समय तक तनाव बने रहने से व्यक्ति की शारीरिक क्षमता, सामाजिक संबंध और जीवन की संतुष्टि प्रभावित होती है।

तनाव का प्रभाव केवल मानसिक स्तर तक सीमित नहीं रहता, बल्कि यह शारीरिक स्वास्थ्य पर भी प्रभाव डालता है। लगातार तनाव में रहने से उच्च रक्तचाप, हृदय रोग, अनिद्रा, पाचन संबंधी समस्याएँ और प्रतिरक्षा प्रणाली की कमजोरी जैसी समस्याएँ उत्पन्न हो सकती हैं। इसलिए मानसिक संतुलन बनाए रखने के लिए प्रभावी और प्राकृतिक उपायों की आवश्यकता है।

योग भारतीय संस्कृति की प्राचीन परंपरा का महत्वपूर्ण अंग है। योग केवल शारीरिक व्यायाम नहीं बल्कि शरीर, मन और आत्मा के बीच संतुलन स्थापित करने की एक समग्र प्रणाली है। योग का मूल उद्देश्य मन की चंचलता को नियंत्रित करना और आंतरिक शांति प्राप्त करना है। महर्षि पतंजलि ने योग को "योगश्चित्तवृत्तिनिरोधः" के रूप में परिभाषित किया है, जिसका अर्थ है मन की चंचल वृत्तियों का नियंत्रण (Patanjali, 2001)।

आज विश्व के अनेक देशों में योग को मानसिक स्वास्थ्य सुधारने और तनाव कम करने के प्रभावी साधन के रूप में अपनाया जा रहा है। वैज्ञानिक शोधों ने भी यह सिद्ध किया है कि योग मानसिक तनाव को कम करने, भावनात्मक संतुलन बढ़ाने और जीवन की गुणवत्ता सुधारने में सहायक है (Ross & Thomas, 2010)।

इस शोध का उद्देश्य योगाभ्यासों के माध्यम से तनाव, मानसिक स्वास्थ्य और भावनात्मक कल्याण के बीच संबंध का अध्ययन करना है।

आज प्रायः योग की सही स्थिति को न समझ पाने के कारण अनेक भ्रम उत्पन्न हो रहे हैं। लोग योग के ऐतिहासिक और दार्शनिक विकास क्रम को जाने बिना अपने ढंग से इसकी व्याख्या कर रहे हैं। जो स्थिति को बहुत अधिक संवेदनशील कर रही है। योग को

समझने के लिए यह अति आवश्यक है। कि इसके ऐतिहासिक व दार्शनिक पक्षों को सही रूप में समझा जाए तब भी हम इस क्षेत्र में अपना महत्वपूर्ण योगदान दे सकेंगे । इस शोध के माध्यम से हम आशा करेंगे कि आप योग से सम्बन्धित प्रामाणिक जानकारी प्राप्त कर सकें साथ ही आप योग अभ्यास के लिए प्रेरित हो सकें

अध्ययन के उद्देश्य

इस शोध के मुख्य उद्देश्य निम्नलिखित हैं:

- योगाभ्यासों के माध्यम से तनाव को कम करने में योग की भूमिका का अध्ययन करना।
- योग के मानसिक स्वास्थ्य पर पड़ने वाले प्रभावों का विश्लेषण करना।
- योगाभ्यासों के माध्यम से भावनात्मक संतुलन और मानसिक शांति को समझना।
- आधुनिक जीवन में योग के महत्व को स्पष्ट करना।
- योग के अभ्यास से स्वस्थ जीवन शैली एवं समग्र विकास होना ।

साहित्य समीक्षा

पिछले कुछ दशकों में योग और मानसिक स्वास्थ्य के संबंध में कई महत्वपूर्ण शोध किए गए हैं।

Brown और Gerbarg (2005) ने अपने अध्ययन में पाया कि योगिक श्वसन तकनीकों से तनाव, चिंता और अवसाद के लक्षणों में उल्लेखनीय कमी आती है। उनके अध्ययन के अनुसार नियंत्रित श्वास तकनीकें तंत्रिका तंत्र को संतुलित करती हैं और शरीर को शांत अवस्था में लाती हैं।

Ross और Thomas (2010) के अध्ययन में यह पाया गया कि योग और शारीरिक व्यायाम दोनों ही स्वास्थ्य के लिए लाभकारी हैं, लेकिन योग मानसिक शांति और तनाव नियंत्रण में अधिक प्रभावी है क्योंकि इसमें ध्यान और श्वसन तकनीकें शामिल होती हैं।

Woodyard (2011) ने अपने शोध में बताया कि योग शरीर और मन दोनों के लिए लाभकारी है और इससे मानसिक संतुलन, आत्म-नियंत्रण तथा सकारात्मक सोच में वृद्धि होती है।

Streeter et al. (2012) के शोध में यह पाया गया कि योग मस्तिष्क में न्यूरोट्रांसमीटर गतिविधियों को प्रभावित करता है जिससे तनाव कम होता है और व्यक्ति मानसिक शांति का अनुभव करता है।

Cramer et al. (2013) ने अपने अध्ययन में निष्कर्ष निकाला कि योग अवसाद और चिंता के उपचार में सहायक हो सकता है।

Singh et al. (2024) के अध्ययन में पाया गया कि 8 सप्ताह के योग अभ्यास के बाद व्यक्ति के कोर्टिसोल स्तर में महत्वपूर्ण कमी आई, जिससे उनका तनाव भी घटा।

Castelot-Cablero et al. (2024) के यादृच्छिक नियंत्रित परीक्षण में पाया गया है, कि 12 सप्ताह के योग अभ्यास के बाद विश्वविद्यालय के छात्रों में चिंता और तनाव में उल्लेखनीय कमी आई और उनके भावनात्मक कल्याण में भी सुधार हुआ।

Chauhan et al. (2025) ने 220 मेडिकल छात्रों पर 10-सप्ताह के योग अभ्यास का अध्ययन किया, जिसमें अवसाद, चिंता, तनाव में कमी और नींद की गुणवत्ता एवं भावनात्मक नियमन में सुधार पाया गया।

इन सभी अध्ययनों से यह स्पष्ट होता है कि योग मानसिक और भावनात्मक स्वास्थ्य को बेहतर बनाने का एक प्रभावी साधन है।

शोध प्रविधि

इस शोध में मुख्य रूप से गुणात्मक और विश्लेषणात्मक शोध विधियों का उपयोग किया गया है।

शोध में योग से संबंधित विभिन्न पुस्तकों, शोध पत्रों, लेखों और इंटरनेट स्रोतों का अध्ययन किया गया है। इन स्रोतों के माध्यम से योग के मानसिक और भावनात्मक प्रभावों का विश्लेषण किया गया है। गुणात्मक विधि का उपयोग इसलिए किया गया क्योंकि इस शोध का उद्देश्य योग के अनुभवात्मक और मनोवैज्ञानिक प्रभावों को समझना है।

शोध के स्रोत

इस शोध में निम्नलिखित स्रोतों का उपयोग किया गया है:

- पुस्तकालय और संदर्भ पुस्तकें
- योग से संबंधित शोध पत्र एवं इंटरनेट स्रोत• योग विशेषज्ञों के विचार

इन सभी स्रोतों के माध्यम से योग और मानसिक स्वास्थ्य से संबंधित जानकारी एकत्रित की गई है।

योग की अवधारणा

योग एक प्राचीन भारतीय विज्ञान है जिसका अर्थ है **एकता या मिलन**। यह शरीर, मन और आत्मा के बीच संतुलन स्थापित करता है। महर्षि पतंजलि के अनुसार:

"योगश्चित्तवृत्तिनिरोधः"

अर्थात मन की चंचल वृत्तियों का नियंत्रण ही योग है।

योग के आठ अंग होते हैं जिन्हें अष्टांग योग कहा जाता है: यम, नियम, आसन, प्राणायाम, प्रत्याहार, धारणा, ध्यान एवं समाधि। इन आठ अंगों का नियमित अभ्यास व्यक्ति को शारीरिक, मानसिक और आध्यात्मिक संतुलन प्राप्त करने में सहायता करता है।

योग शब्द 'युज ' धातु से बना है। जिसका अर्थ समाधि से है, अर्थात योग का अर्थ समाधि हुआ । 'सात्वत संहिता ' नामक ग्रन्थ में शाण्डिल्य के अनुसार—आत्मा और परमात्मा के स्वरूप को जानना योग है। अच्छा स्वास्थ्य प्रत्येक मनुष्य का अधिकार है। लेकिन यह अधिकार व्यक्तिगत, सामाजिक और पर्यावरणीय कारकों पर निर्भर करता है। मुख्य रूप से पर्यावरणीय या सामाजिक कारकों के साथ-साथ हम एक बेहतर रोग प्रतिरक्षा तंत्र और अपनी बेहतर समझ विकसित कर सकते हैं जिससे कि अन्य परिस्थितियाँ हम पर बहुत अधिक प्रतिकूल प्रभाव न डाल पाएँ और हम अच्छा स्वास्थ्य प्राप्त कर सकें।

स्वास्थ्य एक सकारात्मक अवधारणा है। सकारात्मक स्वास्थ्य केवल बीमारियों से मुक्त होना ही नहीं है, बल्कि इसमें विशिष्ट कारकों के प्रति प्रतिरोधक क्षमता तथा रोगों के लिए सामान्य प्रतिरक्षा की समुचित मात्रा के विकास के साथ-साथ स्वस्थ होने की बहुत ही अधिक क्षमता एवं साथ ही ऊर्जावान अनुभूति भी शामिल है। इसके लिए योग एक महत्वपूर्ण भूमिका निभा सकता है

योग, उपचार के सर्वाधिक शक्तिशाली औषधरहित तंत्रों में से एक है। स्वस्थता की इसकी अपनी एक अवधारणा है जिसे बहुत-से लोगों ने वैज्ञानिक रूप से समझा है और प्रस्तुत किया है। योग को अपने शारीरिक और मानसिक स्वास्थ्य को बढ़ावा देने के लिए जीवनशैली के रूप में अपनाया जा सकता है।

शारीरिक स्तर पर योग बल, सहनशक्ति, क्षमता और उच्च ऊर्जा के विकास में मदद करता है। यह व्यक्ति को मानसिक स्तर पर उन्नत एकाग्रता, शांति और संतोष के साथ सशक्त भी बनाता है, जो आंतरिक और वाह्य सामंजस्य प्रदान करता है। इस प्रकार विद्यालय स्तर पर योग का लक्ष्य बच्चों के शारीरिक, मानसिक और भावात्मक स्वास्थ्य के लिए एक सकारात्मक और स्वस्थ जीवनशैली को प्रोत्साहित करना है।

महर्षि पतंजलि ने ये भी कहा कि सर्वत्र समान स्थिति में बने रहना योग है। इसका अर्थ यह हुआ कि चाहे लाभ हो , हानि हो, सुख या फिर दुःख सभी परिस्थितियों में समान रहना योग का लक्षण बताया गया है। योग एक व्यापक अवधारणा है। सामान्य शब्दों में योग का अर्थ दो वस्तुओं को जोड़ना है; योग को सामान्य शब्दों में कई विविध प्रकार के आसन, प्राणायाम तथा अन्य शारीरिक गतिविधियों तक ही सीमित मान लिया जाता हैं। कुछ व्यक्तियों के शारीरिक रोग निवारण की व्यवस्था मानते हैं लेकिन योग की परिभाषा एवं विद्वानों के विचार इसके वास्तविक स्वरूप को स्पष्ट करते हैं।

शिवजी ने योग सम्बन्धी ज्ञान को हिमालय पर्वत पर कांति सरोवर झील के निकट सप्तर्षियों को आत्मसात कराया था। ऐसा धर्मग्रन्थ एवं विद्वानों द्वारा स्वीकार किया गया है। सप्तर्षियों द्वारा विश्व भ्रमण के दौरान योग का व्यापक रूप से प्रचार - प्रसार किया गया । इसका प्रमाण सिन्धु घाटी सभ्यता की मूर्ति एवं सिक्कों पर योगासन में बैठे व्यक्तियों के द्वारा प्रमाणित होता हैं। जब मन का व्यवहार नियंत्रित हो जाता है तब योग की स्थिति उत्पन्न होती है। जैसे मन शराब पीने के लिए कर रहा है तो इसको चरणामृत पीने के लिए तैयार करना तथा शराब पीने से रोकना मन के व्यवहार पर नियंत्रण करता है। नियंत्रण के बाद व्यक्ति जब मन को आत्मतत्व से जोड़ता है तब उसका समग्र कल्याण एवं इश्वर प्राप्ति करता है।

योगाभ्यास और तनाव निवारण

तनाव आधुनिक जीवन की सबसे बड़ी समस्याओं में से एक है। जब व्यक्ति लंबे समय तक तनाव में रहता है तो उसका मानसिक और शारीरिक स्वास्थ्य प्रभावित होता है।

योगाभ्यास तनाव को कम करने में अत्यंत प्रभावी माना जाता है क्योंकि यह शरीर और मन दोनों को संतुलित करता है। योग के अभ्यास से श्वसन प्रणाली, तंत्रिका तंत्र और हार्मोन प्रणाली पर सकारात्मक प्रभाव पड़ता है (Streeter et al., 2012)।

योग के अभ्यास से शरीर में कॉर्टिसोल जैसे तनाव हार्मोन का स्तर कम होता है जिससे मानसिक शांति और भावनात्मक संतुलन बढ़ता है (Brown & Gerbarg, 2005)।

इसके अतिरिक्त योग ध्यान और श्वसन तकनीकों के माध्यम से मन को शांत करने और सकारात्मक सोच विकसित करने में मदद करता है।

यौगिक अभ्यास के लिए सामान्य दिशानिर्देश -

यौगिक अभ्यास का प्रारंभ शांत चित के साथ होना चाहिए, जो एक छोटी प्रार्थना बोलकर प्राप्त किया जा सकता है। यह आवश्यक है कि शरीर को सूक्ष्म यौगिक क्रियाओं; जैसे टखने मोड़ना, घुटने मोड़ना, अँगुलियों के संचलन, हाथ बाँधना, कलाई मोड़ना, कलाई घुमाना, कोहनी मोड़ना, कंधे घुमाना और आँखों का संचलन द्वारा तैयार किया जाना चाहिए। इसके बाद सूर्य नमस्कार का अभ्यास किया जा सकता है।

योग के शारीरिक और मानसिक, दोनों दृष्टिकोणों से अभ्यास में नियमितता आवश्यक है। योग के लिए धैर्य एक महत्वपूर्ण आवश्यकता है। निराश न हों यदि आप आज किसी आसन को करने या कार्य-संचालन के सही नियम के पालन में सफल नहीं होते हैं। आपको प्रयासों में दृढ़ रहने की आवश्यकता है। समय के साथ सफ़लता अवश्य मिलेगी।

प्रतिस्पर्धा न करें, बल्कि सहयोग करें। प्रतिस्पर्धा की भावना योग के मार्ग में निश्चित रूप से एक बाधा होती है। प्रतिस्पधाएँ हमारे अहम् को पोषित करती हैं जबकि योग हमें अपने अहम् से ऊपर उठने में मदद करता है।

अधिकांश आसन, प्राणायाम और क्रियाएँ खाली पेट या बहुत कम भरे पेट में की जानी चाहिए। इन अभ्यासों को शुरू करने से पूर्व मूत्राशय और आँतें खाली कर देने चाहिए। योगाभ्यास के लिए सुबह का समय सबसे अच्छा होता है परंतु इसे दोपहर के खाने के तीन घंटे बाद शाम को खाली पेट के साथ भी किया जा सकता है। योग को जल्दबाजी में या फिर जब आप थके हों, नहीं करना चाहिए। यौगिक अभ्यास के लिए एक अच्छा हवादार, साफ़, विघ्न रहित स्थान चुनें। योगाभ्यास कठोर सतह पर नहीं करना चाहिए। इस काम के लिए दरी, चटाई या कंबल का उपयोग किया जा सकता है। अभ्यास से पूर्व नहा लेना ठीक रहता है। व्यक्ति, मौसम की आवश्यकतानुसार ठंडा या गरम पानी, काम में ले सकता है। योगाभ्यास करते समय कपड़े ढीले और आरामदेह होने चाहिए ।

श्वसन यथासंभव सामान्य होना चाहिए। इसमें तब तक परिवर्तन नहीं किया जाता जब तक कि ऐसा करने के लिए विशेष रूप से न कहा जाए। योगाभ्यास की सीमाएँ होती हैं। यदि आप किसी समस्या या पुराने रोग से पीड़ित हैं तो इस बारे में योगाभ्यास शुरू करने से पूर्व अपने शिक्षक को अवश्य सूचित कर दें। योगाभ्यास को बढ़ते हुए क्रम के में बढ़ाना चाहिए । प्रारंभिक अवस्था में, आसान क्रियाओं को लिया जाना चाहिए। बाद में अधिक कठिन को किया जा सकता है। अतः सरल यौगिक क्रियाओं के साथ शुरू करें और फिर धीर-धीरे आगे बढ़े क्रियाओं की ओर बढ़ें। एक ही साथ यौगिक अभ्यास को अन्य शारीरिक गतिविधियों के साथ जोड़ कर न करें। ये दो अलग प्रकार की गतिविधियाँ हैं और इन्हें अलग-अलग किया जा सकता है।

(सेनापति एच. के ,योग - स्वस्थ जीवन जीने का तरीका, अध्यक्ष प्रकाशन प्रभाग, 2016)

तनाव निवारण एवं मानसिक शांति में सहायक योगासन -

तनाव **एवं मानसिक शांति** को कम करने के लिए कई योगासन उपयोगी माने जाते हैं। इनमें प्रमुख हैं:

• उत्तानपादासन • पवनमुक्तासन • भुजंगासन • सर्वांगासन • हलासन• मकरासन
• शशांकासन • गोमुखासन • शवासन• पश्चिमोत्तानासन

इन आसनों का नियमित अभ्यास शरीर को स्वस्थ रखने के साथ-साथ मानसिक तनाव को भी कम करता है। विशेष रूप से शवासन और शशांकासन मन को गहरी विश्राम अवस्था में ले जाते हैं जिससे तनाव कम होता है। तनाव, निराशा एवं अन्य मानसिक बीमारियों से छुटकारा पाने के लिए योगासन एक महत्वपूर्ण उपाय हैं। ऐसे अकाट्य वैज्ञानिक प्रमाण प्रमाणित हुए हैं जो इस बात का साक्ष्य हैं कि योग के माध्यम से तनाव जनित कई प्रकार के रोग जिनका रोकथाम एवं निवारण किया जा सकता हैं।

योग के मानसिक और भावनात्मक लाभ

योग का नियमित अभ्यास मानसिक और भावनात्मक स्वास्थ्य को बेहतर बनाने में सहायक होता है।योग के प्रमुख लाभ निम्नलिखित हैं:

- मानसिक तनाव में कमी
- चिंता और अवसाद के लक्षणों में कमी
- एकाग्रता में वृद्धि
- आत्म-नियंत्रण में सुधार
- सकारात्मक सोच का विकास
- भावनात्मक संतुलन में वृद्धि
- बेहतर नींद

भावनात्मक कल्याण केवल मानसिक रोगों की अनुपस्थित होना नहीं है, बल्कि यह सकारात्मक भावनाओं का अनुभव करने, जीवन में अपने उद्देश्य के प्रति जागरूकता की भावना रखने और चुनौतियों का सामना करने की क्षमता है। योग आत्म-जागरूकता, आत्म-स्वीकृति और करुणा को बढ़ावा देकर भावनात्मक कल्याण को सुदृढ़ करता है। जिससे व्यक्ति के भीतर हिंसा की भावना खत्म हो जाती हैं। और अहिंसा की ओर चलता है।

योग और शारीरिक स्वास्थ्य

योग न केवल मानसिक बल्कि शारीरिक स्वास्थ्य के लिए भी अत्यंत लाभकारी है। योग के नियमित अभ्यास से:
• रक्त संचार बेहतर होता है
• पाचन प्रणाली मजबूत होती है
• प्रतिरक्षा प्रणाली में सुधार होता है
• शरीर में लचीलापन बढ़ता है

कोविड-19 और योग का महत्व

कोविड-19 महामारी के दौरान लोगों को मानसिक तनाव, भय और चिंता का सामना करना पड़ा। इस दौरान योग और ध्यान ने मानसिक स्वास्थ्य को बनाए रखने में महत्वपूर्ण भूमिका निभाई। विश्व स्वास्थ्य संगठन ने भी मानसिक स्वास्थ्य को बनाए रखने के लिए योग और ध्यान जैसी गतिविधियों को उपयोगी बताया है।

शोध परिणाम

इस अध्ययन से यह स्पष्ट हुआ कि आधुनिक जीवन में बढ़ती तनावजनित समस्याओं के समाधान के लिए योग एक प्रभावी उपाय है।योग के नियमित अभ्यास से मानसिक तनाव कम होता है, भावनात्मक संतुलन बढ़ता है और व्यक्ति की जीवन गुणवत्ता में सुधार होता है।इसके अतिरिक्त योग शरीर और मन दोनों को स्वस्थ रखने में सहायक है।

योगाभ्यास से शरीर लचीला, मजबूत बनता हैं। मांसपेशिया सक्रिय और कई बिमारियों से बचाव में मदद मिलती है। योग से मन शांत , तनाव , चिंता और मानसिक थकान के साथ-साथ भावनाओं को नियंत्रित करने में मदद करता है। योग व्यक्ति को ध्यान केंद्रित करने में, अनुशासन , एवं संतुलित दिनचर्या एवं स्वस्थ जीवन के लिए प्रेरणा देता हैं।

निष्कर्ष

इस शोध से यह निष्कर्ष निकलता है कि योगाभ्यास मानसिक तनाव को कम करने और मानसिक स्वास्थ्य को बेहतर बनाने का एक प्रभावी साधन है।

योगिक अभ्यासों को यदि नियमितता एवं अनुशासन से अपनाया जाए तो यह न केवल तनाव नियंत्रण और मानसिक शांति प्रदान करता है, बल्कि व्यक्ति के समग्र विकाश , भावनात्मक और मानसिक कल्याण को भी सुनिश्चित करता है।

योग शरीर, मन और आत्मा के बीच संतुलन स्थापित करता है और व्यक्ति को आंतरिक शांति प्रदान करता है। आधुनिक जीवन की व्यस्तता और तनावपूर्ण परिस्थितियों में योग अत्यंत आवश्यक है। यदि व्यक्ति नियमित रूप से योगाभ्यास करे तो वह तनावमुक्त, स्वस्थ और संतुलित जीवन जी सकता है। इसलिए योग को दैनिक जीवन का हिस्सा बनाना चाहिए।

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CULTIVATING ETHICAL AWARENESS THROUGH YOGIC PRACTICE: A PATH TO MORAL DEVELOPMENT

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Abstract

Ethical awareness is a foundational component of moral development, influencing personal conduct, social harmony, and professional integrity. In contemporary society, increasing stress, competition, and value conflicts highlight the need for holistic approaches to character formation. Yogic philosophy, particularly as presented in the Yoga Sutras of Patanjali, emphasizes ethical disciplines such as Yama and Niyama as the basis of self-regulation and moral refinement. Scholars affirm that yoga is fundamentally an ethical and spiritual discipline aimed at character transformation. This thematic paper explores how regular yogic practice contributes to cultivating ethical awareness and fostering moral development among individuals. The study adopts a qualitative thematic analysis approach. Classical yogic texts and contemporary research on mindfulness and behavioral regulation were reviewed to identify recurring themes linking yogic practices such as Asana, Pranayama, Dhyana, and ethical observances to moral growth. Thematic coding was used to categorize insights into psychological, behavioural, and social dimensions of ethical development.

Key Themes Identified: Yama (Ahimsa, Satya, Asteya, Brahmacharya, Aparigraha) and Niyama (Shaucha, Santosha, Tapas, Svadhyaya, Ishvarpranidhana). The findings suggest that consistent engagement in yogic disciplines enhances moral sensitivity, strengthens value-based decision-making, and promotes prosocial behavior. Integrating yogic ethics into educational and community programs may support character education initiatives. Yogic practice provides a structured and experiential pathway to ethical awareness and moral development, bridging inner transformation with responsible social conduct.

Keywords: Yogic Practice, Ethical Awareness, Moral Development, Yama and Niyama, Self-Awareness.

Introduction:

Ethical awareness is a fundamental aspect of human development that shapes individual behavior, social relationships, and responsible decision-making. In a rapidly changing world marked by intense competition, stress, and moral dilemmas, the cultivation of ethical values has become increasingly important for sustaining social harmony and personal well-being (Shah & Dave, 2023). Traditional educational systems often emphasize intellectual growth but pay comparatively less attention to character formation and value-based living (Dylan & Muncaster, 2021). As a result, scholars and educators have begun to explore holistic approaches that integrate physical, psychological, and spiritual dimensions of human development to promote ethical awareness and moral responsibility (Ranganathan, 2021).

Yoga, an ancient Indian system of self-development, offers such a holistic framework for cultivating ethical and moral values. Rooted in the philosophical teachings of the Yoga Sutras of Patanjali, yoga is not merely a physical practice but a comprehensive discipline aimed at transforming the individual's body, mind, and consciousness (Bryant, 2009). The classical eight-limbed path (Ashtanga Yoga) begins with ethical foundations known as Yama (moral restraints) and Niyama (personal observances), which guide individuals toward responsible conduct and inner purification (Feuerstein, 2001). These principles including non-violence, truthfulness, non-possessiveness, self-discipline, and self-reflection form the ethical groundwork necessary for personal and social harmony (Whicher, 1998). As Srinivasan (2021) notes, the philosophy of yoga focuses on developing ethics through mental training and self-control in all aspects of life, with the Yamas and Niyama serving as key components by which to live yoga authentically. (Shah at al 2024) further emphasizes that these foundational principles establish the ethical groundwork required for both personal integrity and harmonious social interaction.

Beyond its ethical philosophy, modern research suggests that yogic practices including Asana (postures), Pranayama (breathing techniques), and Dhyana (meditation) enhance psychological self-regulation and emotional balance, which are essential for ethical behavior and value-based decision-making (Gard et al., 2014). A recent cluster

randomized controlled trial examining the mechanisms through which yoga produces salutary effects found that a single yoga session conferred psychological benefits related to emotion regulation, self-control, and distress tolerance (Sullivan et al., 2019). The study specifically identified cognitive reappraisal and discomfort tolerance as potential mediators through which yoga supports self-regulatory capacities. By improving awareness of internal states and strengthening cognitive control, yoga supports the development of disciplined behavior, empathy, and moral sensitivity (Tang et al., 2015). Another line of investigation has explored how yoga-based practices may enhance socially responsible decision-making through the cultivation of equanimity and emotional awareness, with findings suggesting that yoga serves as an effective training tool for building responsible decision-making abilities (Pandya, 2021).

Studies have also shown that participation in yoga programs can enhance psychosocial qualities such as empathy, altruism, and social competence, all of which contribute to moral development and prosocial behavior (Choukse et al., 2019). A residential yoga intervention study conducted with adolescents demonstrated significant improvements in social competence, empathy, and altruism following a seven-day integrated yoga program (Sethi et al., 2020). The intervention incorporated not only physical practices but also Jnana yoga sessions that taught Yama and Niyama concepts through storytelling, role playing, and other engaging methods, illustrating how the philosophical and practical aspects of yoga can be integrated to foster psychosocial development. Furthermore, emerging research examining the relationship between body awareness and social awareness suggests that yogic practices may strengthen the connections between bodily processes and social-cognitive functions such as compassion and empathy (Farb et al., 2015).

Furthermore, the ethical principles embedded in yogic philosophy extend beyond personal growth to influence social and environmental responsibility. Yoga encourages attitudes of compassion, non-violence, and respect for all living beings, thereby fostering ethical awareness that supports sustainable and harmonious living (Zafeiroudi et al., 2021). A recent doctoral thesis examining the metaethical frameworks of various yogic traditions explored how these philosophical systems may either support or undermine ethical codes of conduct and universal human rights principles (Dylan, 2020). The research suggests that contemporary yoga practitioners and teachers would benefit from greater awareness of the diversity of ethical perspectives within traditional teachings. Additionally, yoga's alignment with broader social responsibility goals is increasingly recognized, with the United Nations Sustainable Development Goals providing a framework for understanding how yoga contributes to good health and well-being, quality education, gender equality, and climate action through its emphasis on sustainable living and eco-friendly habits (Khanna & Greeson, 2013).

In this context, examining the relationship between yogic practice and ethical awareness becomes particularly relevant. Understanding how the philosophical and practical aspects of yoga contribute to moral development may provide valuable insights for character education and personal growth (Shah & Dave, 2023). The convergence of philosophical tradition and empirical research supports the understanding that yogic practices offer a comprehensive approach to ethical awareness and moral development, integrating ancient wisdom with contemporary psychological insight to address the fundamental question of how human beings can cultivate the internal capacities necessary for responsible and value-based living (Ranganathan, 2021; Gard et al., 2014).

Yogic Practice: Yogic practice refers to the regular practice of yoga techniques such as asana (physical postures), pranayama (breathing exercises), and meditation, along with ethical disciplines, to promote physical health, mental balance, self-awareness, and overall well-being.

Ethical Awareness: It is considered the first step in ethical decision-making, as individuals must first recognize the ethical dimension of a situation before making moral judgments or actions (Rottig et al., 2011).

Moral Development: Moral development occurs in progressive stages, where individuals move from self-focused reasoning to higher levels of ethical thinking based on fairness, justice, and universal principles.

Self-Awareness: Self-awareness is the ability of an individual to recognize and understand their own thoughts, emotions, values, and behaviours, and how these influence their actions and relationships with others. It contributes to self-regulation, responsible decision-making, and personal growth, thereby supporting overall psychological well-being.

Yama: Yama is the first limb of Ashtanga Yoga described in the Yoga Sutras of Patanjali. It represents a set of ethical restraints that guide an individual’s behavior toward others and society. Yama forms the moral foundation of yoga and helps develop self-discipline, social responsibility, and ethical conduct.

Ahimsa (Non-violence): Ahimsa means avoiding harm to any living being through thoughts, words, or actions. It promotes compassion, kindness, and respect for life.
Satya (Truthfulness): Satya refers to honesty and sincerity in speech and behavior, encouraging individuals to act with integrity and truth.

Asteya (Non-Stealing): Asteya means refraining from taking anything that does not belong to oneself and respecting the rights and property of others.

Brahmacharya (Self-Control): Brahmacharya emphasizes moderation and control over desires, helping individuals maintain discipline and balanced living.

Aparigraha (Non-possessiveness): Aparigraha refers to freedom from greed and excessive attachment to material possessions, encouraging simplicity and contentment.

Niyama: Niyama refers to personal observances or positive duties that guide an individual toward self-discipline, inner purification, and spiritual growth. Niyama focuses on regulating one's internal behavior and cultivating positive habits that support personal development and ethical living.

Saucha (Purity): Saucha refers to cleanliness and purity of the body and mind. It encourages maintaining physical hygiene and cultivating positive thoughts.

Santosha (Contentment): Santosha means being satisfied with what one has and developing a sense of gratitude and inner peace.

Tapas (Self-discipline): Tapas refers to dedicated effort, discipline, and perseverance in personal practices that strengthen willpower and character.

Svadhyaya (Self-study): Svadhyaya involves self-reflection and the study of spiritual or philosophical texts to gain deeper understanding of oneself.

Ishvara Pranidhana (Surrender to the Divine): Ishvara Pranidhana refers to devotion and surrender to a higher power, encouraging humility and spiritual awareness.

Mind Map

Discussion:

The present study examined the role of yogic practices in fostering ethical awareness and moral development, revealing that yoga functions not merely as a physical discipline but as a comprehensive system of ethical and psychological transformation. The findings indicate that yoga supports self-regulation, value-based behavior, and social responsibility through its multifaceted approach to human development, integrating philosophical principles with practical techniques for personal growth. These findings are consistent with the philosophical framework of the Yoga Sutras of Patanjali, which establishes ethical living as the essential foundation for personal transformation and higher consciousness. According to Bryant (2009), the Yoga Sutras present a systematic path toward self-realization that begins with ethical conduct, demonstrating that moral development is not incidental to yogic practice but constitutes its very groundwork. This ancient text, composed approximately 1,700 years ago, continues to inform contemporary understanding of how ethical principles shape psychological development and spiritual growth, providing a timeless framework for cultivating moral awareness (Whicher, 1998).

One of the major aspects highlighted in this study is the significance of Yama and Niyama as ethical principles that guide human conduct. These foundational concepts represent the first two limbs of Patanjali's eight-limbed path, underscoring their primacy in yogic philosophy. Yama encompasses moral restraints that regulate an individual's interactions with others and society, while Niyama consists of personal observances that support inner purification and spiritual development (Feuerstein, 2001). The five principles of Yama—Ahimsa (non-violence), Satya (truthfulness), Asteya (non-stealing), Brahmacharya (self-control), and Aparigraha (non-possessiveness)—encourage individuals to cultivate compassion, honesty, discipline, and respect in social relationships. These ethical restraints promote harmony and responsible behavior in social life. Recent scholarship has examined how these principles translate into practical moral guidance, with Shah and Dave (2023) demonstrating that systematic engagement with yogic ethics significantly influences moral reasoning and social behavior in educational contexts. Similarly, Dylan and Muncaster (2021) found that these principles provide a practical framework for navigating complex ethical dilemmas in contemporary professional settings, suggesting their relevance extends far beyond traditional spiritual practice.

Similarly, Niyama consists of Saucha (purity), Santosha (contentment), Tapas (self-discipline), Svadhyaya (self-study), and Ishvara Pranidhana (surrender to the divine). These personal observances focus on inner purification, self-reflection, and spiritual growth, creating the internal conditions necessary for ethical awareness to flourish. Together with the Yamas, these principles form a coherent moral framework that encourages individuals to develop ethical awareness and value-based living. Ranganathan (2021) argues that this integrated approach to ethics addresses both interpersonal conduct and intrapersonal development, creating a holistic system for moral cultivation that recognizes the interdependence of personal well-being and social responsibility. The complementary nature of these principles ensures that ethical development proceeds simultaneously on individual and collective levels, fostering both inner transformation and outer harmony.

In addition to the ethical foundations, the study emphasizes the importance of practical yogic techniques such as Asana (postures), Pranayama (breath control), and meditation. Regular engagement in these practices contributes to improved psychological self-regulation, emotional balance, and mental clarity, which are essential for ethical behavior and responsible decision-making. Research by Gard and colleagues (2014) suggests that yoga enhances awareness of internal experiences and strengthens cognitive control, thereby supporting disciplined behavior and ethical sensitivity. Their neuropsychological investigation revealed that regular practitioners demonstrate enhanced prefrontal cortex activation, which is associated with improved impulse control and decision-making capabilities. As individuals become more aware of their thoughts and emotions, they are better able to manage impulses and respond to situations with greater mindfulness and moral consideration. Furthermore, Tang and colleagues (2015) found that integrative mind-body training, including yogic practices, produces measurable changes in self-regulation capacities, with participants showing significant improvements in emotional regulation and attentional control following regular practice. These neurological and psychological changes provide the foundational capacities upon which ethical behavior depends, demonstrating how physical practice supports moral development.

Another important dimension identified in this study is the role of self-awareness in the process of moral development. Self-awareness enables individuals to recognize their internal states, including thoughts, emotions, and values, and to understand how these influence their behavior and interactions with others. This awareness is crucial for evaluating one's actions and aligning them with ethical principles. Previous studies indicate that individuals with higher levels of self-awareness demonstrate better self-regulation and are more capable of making responsible and ethical decisions. Morin (2011) conducted extensive research on the relationship between self-awareness and moral behavior, finding that increased self-focus promotes greater alignment between personal values

and actual conduct. Yogic practices, particularly meditation and self-reflection, play a significant role in enhancing this awareness by encouraging introspection and mindful observation. Hölzel and colleagues (2011) identified multiple mechanisms through which mindfulness practices, including those embedded in yogic traditions, enhance self-awareness, with their neuroimaging research demonstrating that regular meditation practice leads to structural changes in brain regions associated with self-referential processing and emotional regulation. This neurological evidence provides a biological basis for the observed improvements in ethical sensitivity and moral reasoning among regular practitioners.

Furthermore, the findings suggest that yogic practices contribute to the development of prosocial attitudes and socially responsible behavior. By emphasizing values such as compassion, non-violence, and respect for all living beings, yoga promotes empathy and moral sensitivity that extend beyond the individual to encompass broader social concerns. Participation in yoga programs has been associated with improvements in psychosocial qualities such as empathy, altruism, and social competence, which are essential components of moral development. Choukse and colleagues (2019) conducted a randomized controlled trial examining the effects of yoga on emotional intelligence and found significant improvements in empathy and social functioning among participants, suggesting that regular practice cultivates the interpersonal capacities necessary for ethical engagement with others. These outcomes highlight the potential of yoga as an effective approach for promoting character education and ethical consciousness in modern society. Additionally, Khanna and Greeson (2013) reviewed the empirical literature on yoga's effects on psychological functioning and concluded that regular practice fosters prosocial attitudes through multiple pathways, including stress reduction, enhanced emotional regulation, and increased self-compassion. These findings suggest that yoga's contribution to moral development extends beyond explicit ethical instruction to include implicit cultivation of qualities that support ethical behavior. The convergence of philosophical tradition and empirical research supports the understanding that yogic practices offer a comprehensive approach to ethical awareness and moral development, integrating ancient wisdom with contemporary psychological insight to address the fundamental question of how human beings can cultivate the internal capacities necessary for responsible and value-based living. As contemporary society grapples with complex ethical challenges, the ancient wisdom embedded in yogic traditions offers valuable resources for fostering moral development and social responsibility across diverse contexts and populations.

Conclusion:

The present study examined the role of yogic practices in developing ethical awareness and promoting moral development. In contemporary society, where individuals often face stress, competition, and moral dilemmas, the cultivation of ethical values has become increasingly important. The findings of this study indicate that yoga provides a holistic framework that integrates ethical principles, physical practices, and psychological discipline to support character development and responsible behavior.

A significant aspect highlighted in this study is the role of Yama and Niyama as the ethical foundation of yogic philosophy. Yama, which includes Ahimsa (non-violence), Satya (truthfulness), Asteya (non-stealing), Brahmacharya (self-control), and Aparigraha (non-possessiveness), guides individuals in regulating their behavior toward others and society. These principles promote compassion, honesty, discipline, and respect, which are essential for maintaining harmonious social relationships. Similarly, Niyama, consisting of Saucha (purity), Santosha (contentment), Tapas (self-discipline), Svadhyaya (self-study), and Ishvara Pranidhana (surrender to the divine), focuses on personal observances that support inner purification, self-reflection, and spiritual growth.

In addition, the study highlights the importance of yogic practices such as Asana, Pranayama, and meditation in improving self-regulation, emotional stability, and self-awareness. These practices help individuals understand their thoughts, emotions, and behaviours more clearly, enabling them to make responsible and value-based decisions.

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AN EMPIRICAL ANALYSIS OF UNDERREPORTING OF BULLYING AND HARASSMENT AMONG INDIAN FEMALE ATHLETES: A COMPARATIVE GLOBAL PERSPECTIVE WITH PRACTICAL POLICY FRAMEWORK

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Abstract

The issue of bullying and harassment in sports had been recognized as pervasive and chronically underreported, particularly among female athletes in India. In this study, an empirical investigation was conducted involving 250 athletes across various disciplines. Statistical tools such as cross- tabulations and Chi-square tests through SPSS were applied to examine gender-based differences in the experience and reporting of bullying and psychological abuse. It was found that female athletes were more likely to witness and experience abuse, yet less likely to report it. Factors such as fear of retaliation, limited institutional support and retrenched socio-cultural norms were identified as significant contributors to this silence.

When the Indian context was examined alongside global data, the severity of underreporting appeared more pronounced. Hierarchical team dynamics, insufficient complaint mechanisms and cultural reluctance to challenge authority were seen to reinforce the issue. The case of Vinesh Phogat, a prominent Indian wrestler who had publicly addressed harassment within national training camps was cited as a rare yet powerful instance of resistance. However, such disclosures were shown to remain uncommon due to perceived personal and professional risks.

A comparison with international incidents such as the U.S. gymnastics abuse case, revealed that although underreporting was a global concern, Indian female athletes were rendered uniquely vulnerable by local institutional and cultural barriers. Based on the findings, a practical policy framework was proposed. This includes the establishment of independent grievance redressal bodies, mandatory sensitization training and anonymous digital reporting platforms. This research is intended to fill a critical gap in Indian sports sociology and to encourage policy reform.

Keywords- Harassment, underreported, bullying, framework.

Introduction

Violence, bullying, and harassment against women and girls remain among the most pervasive human rights challenges globally. While these issues are found across multiple domains, the world of sports presents a unique ecosystem where the risk is not only intensified but also inadequately addressed. Female athletes are frequently subjected to sexual abuse, psychological bullying, and gender-based violence, often from those in positions of power, including coaches, team staff, and fellow athletes. Despite growing awareness, the majority of these incidents go unreported, particularly in countries like India, where structural and cultural barriers further silence victims.

Gender-Based Violence in Sports: A Global Overview

Recent global studies have shed light on the alarming scale of abuse faced by female athletes. According to the World Players Association 2021 CARE Census, 22% of female respondents experienced at least one form of sexual abuse in childhood while participating in sport, compared to 11% of male respondents. Additionally, 25.7% of female athletes reported being subjected to uncomfortable stares, a form of sexualized harassment, compared to only 6.1% of males.

In terms of physical abuse, 20.6% of female respondents indicated they were punished with excessive training or were physically assaulted (10.6% beaten with objects, 7.6% knocked down). The numbers are disturbingly high and

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comparable to rates reported by male athletes, indicating a culture of normalized violence in training and competition settings.[4]

The Digital Threat: Online Harassment of Female Athletes

Online platforms have become another arena for gender-based abuse. A World Athletics study analysing Twitter abuse during the 2020 Tokyo Olympics revealed that 87% of abusive messages were targeted at female athletes. Shockingly, 63% of this abuse was aimed at just two Black female athletes, revealing an intersectional dimension of racism and sexism. Another study conducted during the World Athletics Championships Oregon22 found that 40% of abusive posts were explicitly sexual in nature, overwhelmingly directed at women.

Country-Specific Findings: Alarming Trends in India and Beyond

In India, a scoping review of interpersonal violence in sports indicated that approximately one-third of female athletes reported experiencing sexual harassment, abuse, or inappropriate behaviour—most commonly from male coaches. This mirrors findings from other countries:

- In Kenya, 64% of female university athletes reported experiencing sexual misconduct.[5]
- In Israel, over one-third of female athletes experienced sexual harassment by male coaches.

These patterns emphasize a global phenomenon, but with varied cultural, institutional, and legal responses.

The Indian Paradox: Silence, Stigma, and Underreporting

In the Indian context, social stigma, fear of retaliation, lack of trusted reporting mechanisms, and power hierarchies contribute to massive underreporting of bullying and harassment among female athletes. Cultural barriers often discourage women from speaking out, while institutional mechanisms remain reactive rather than preventive. This lack of formal acknowledgment and response creates an environment of impunity.

Purpose and Scope of the Research

This research aims to empirically analyse the phenomenon of underreporting of bullying and harassment among Indian female athletes, while placing it within a global comparative framework. Drawing from case studies, international data, survivor testimonies, and policy reviews, the study seeks to:

- Understand the prevalence and drivers of underreporting in India
- Compare India's situation with global counterparts
- Propose a practical policy framework for prevention, reporting, and redressal mechanisms in sports institutions

Research Methodology

This study adopted a **quantitative and empirical research design** to investigate the prevalence, perception, and reporting patterns of bullying and harassment in Indian sports, with a specific focus on female athletes. The research aimed to explore the psychological, institutional, and socio-cultural dimensions of abuse faced by athletes, and the barriers to reporting such experiences.

Population and Sample

A total of **250 athletes** were selected as respondents, representing a range of sporting disciplines and competitive levels across India. A **stratified random sampling technique** was employed to ensure equitable representation across gender and sport categories.

Instrument Design

[4] **World Players Association. (2021).** ***Census of Athlete Rights Experiences (CARE): Report 2021.*** Retrieved from https://files.cargocollective.com/c520687/World-Players_CARE-Report-2021-.pdf

[5] Teranishi Martinez, C., Scott Tappan, C., Martinez, J., & Baker, H. (2025, January 7). *Breaking the silence of sexual harassment and assault among trail and ultrarunners through cycles of inquiry*. **IntechOpen**. https://doi.org/10.5772/intechopen.1008548

Data were collected using a **structured questionnaire** consisting of **13 items**: 12 were based on a **five-point Likert scale** measuring agreement with statements related to experiences of bullying, psychological abuse, institutional response, and awareness of rights and grievance mechanisms. One item captured demographic information regarding the respondent's gender.

Validation of Instrument

The instrument was subjected to exploratory factor analysis (EFA) using SPSS to assess its construct validity. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy yielded a value of 0.738, which is considered acceptable. Bartlett's Test of Sphericity was significant at $p < 0.001$, confirming the adequacy of the data for factor analysis.

Reliability Testing

To ensure internal consistency of the identified constructs, Cronbach's Alpha was calculated for each factor:

- **Psychological and Institutional Impact** ($\alpha = 0.881$)
- **Institutional Safeguards and Legal Awareness** ($\alpha = 0.812$)
- **Personal Exposure to Abuse** ($\alpha = 0.799$)

These values confirm that the instrument demonstrates good to excellent reliability across dimensions.

Data Analysis

Factor Analysis

A **Principal Component Analysis** with **Varimax rotation** was conducted to uncover latent variables explaining patterns within the data. The analysis extracted **four components**, which cumulatively explained **79.7% of the total variance**—an excellent result in social science research.

Factor	Theme	Key Items	% of Variance
1	Psychological Pressure & Institutional Impact	Use of fear, retaliation, mental health issues, lack of trust in complaint mechanisms	32.16%
2	Institutional Safeguards & Legal Awareness	Awareness of laws and policies, enforcement, redressal mechanisms	18.81%
3	Personal Exposure to Abuse	Witnessing abuse, experiencing bullying, senior-junior dynamics	17.78%
4	Gender Differentiation (control variable)	Gender identification only (demographic purpose, not part of main analysis)	10.94%

Descriptive and Inferential Analysis

To compare whether females face more sexual harassment in sports than males, you need to use inferential statistics, a test for making broad predications based on small data**.** Descriptive statistics including frequency distributions and cross-tabulations were computed to understand demographic trends and response patterns. Further, Chi-square tests were applied to determine gender-based differences in both the experiences and reporting of abuse. Chi-square Test of Independence is used to know the significant association between Harassment Experience of Male and Female. The Questions are to be answered on Likert scale of 1 to 5, where 1 is highly agree and 5 is highly disagree and Male is 1 and Female is 2.

Female athletes were found to be significantly more likely to experience psychological abuse and less likely to report such incidents, a finding that resonates with the study's hypothesis and global literature.

Data Analysis and Interpretation

This chapter presents the empirical analysis of data collected through a structured questionnaire designed to explore the underreporting of bullying and harassment among Indian female athletes. The primary objective of this chapter is to interpret the responses in light of the study's aim—to understand the extent, nature, and reporting patterns of abuse in sports institutions, while comparing perspectives across genders and offering practical policy frameworks informed by global insights.

The data was analyzed using the Chi-Square Test of Independence, a statistical method appropriate for assessing relationships between categorical variables, particularly responses on Likert-scale items and gender. The results offer a detailed view of the perceptions, experiences, and institutional responses to bullying and harassment in sports environments. Each survey item is analyzed independently to determine whether gender significantly influences athlete perceptions and experiences.

The following sections present the question-wise analysis, including cross-tabulations and Chi-Square test results, accompanied by concise interpretations to highlight key patterns and statistical significance.

1. Bullying and harassment are effectively discouraged within my sports team.

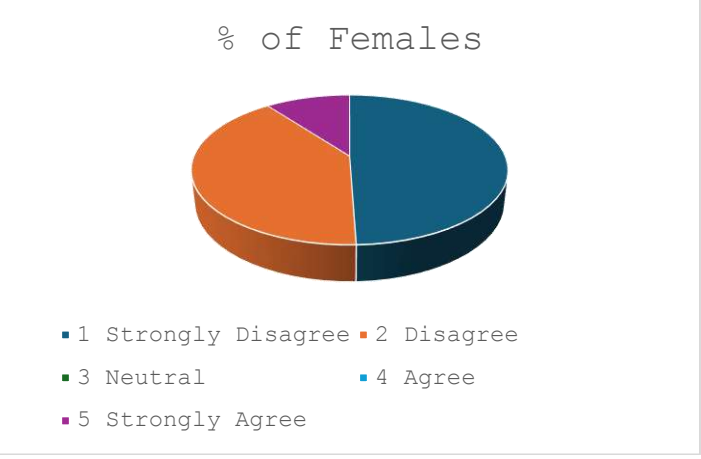
Crosstab								
			Bullying and harassment are effectively discouraged within my sports team.					
			1	2	3	4	5	Total
Gender	1	Count	63	38	26	24	12	163
		% within What is your gender?	38.7%	23.3%	16.0%	14.7%	7.4%	100.0%
		% within Bullying and harassment are effectively discouraged within my sports team.	59.4%	52.1%	100.0%	100.0%	57.1%	65.2%
		% of Total	**25.2%**	**15.2%**	**10.4%**	**9.6%**	**4.8%**	**65.2%**
	2	Count	43	35	0	0	9	87
		% within What is your gender?	49.4%	40.2%	0.0%	0.0%	10.3%	100.0%
		% within Bullying and harassment are effectively discouraged within my sports team.	40.6%	47.9%	0.0%	0.0%	42.9%	34.8%
		% of Total	**17.2%**	**14.0%**	**0.0%**	**0.0%**	**3.6%**	**34.8%**
Total		Count	106	73	26	24	21	250
		% within What is your gender?	42.4%	29.2%	10.4%	9.6%	8.4%	100.0%
		% within Bullying and harassment are effectively discouraged within my sports team.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**42.4%**	**29.2%**	**10.4%**	**9.6%**	**8.4%**	**100.0%**

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	34.401[a]	4	.000
Likelihood Ratio	50.191	4	.000
Linear-by-Linear Association	7.624	1	.006
N of Valid Cases	250		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.31.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	38.7%	49.4%
2	Disagree	23.3%	40.2%
3	Neutral	16.0%	0.0%
4	Agree	14.7%	0.0%
5	Strongly Agree	7.4%	10.3%



The responses to the question *"Bullying and harassment are effectively discouraged within my sports team"* were analysed to see if there is any difference between male and female athletes. It was found that most **female athletes disagreed** with the statement. About **49.4% strongly disagreed**, and **40.2% disagreed**, which shows that bullying and harassment are not seen as being properly handled by many women in sports. None of the female participants chose "Neutral" or "Agree," which shows that they may feel more negative or unsure about the support they receive.

On the other hand, **male athletes gave a wider variety of answers**. Some disagreed, but others selected "Neutral," "Agree," or even "Strongly Agree." This shows that males may have mixed or more balanced views about how well bullying is prevented in their teams.

The Chi-Square test showed that this difference between male and female responses is **statistically significant** ($p < .001$), which means it is **very unlikely to be due to chance**. The trend across the responses was also shown to be significant through another test ($p = .006$).

From this, it can be understood that female athletes are more likely to feel that bullying and harassment are not being discouraged effectively, and their trust in the system appears to be lower than that of male athletes. This finding shows that sports institutions need to improve how they support and protect female athletes from such experiences.

2. Conflict resolution mechanisms are in place and properly implemented.

Crosstab								
			Conflict resolution mechanisms are in place and properly implemented.					
			1	2	3	4	5	Total
Gender	1	Count	16	36	77	21	13	163
		% within What is your gender?	9.8%	22.1%	47.2%	12.9%	8.0%	100.0%
		% within Conflict resolution mechanisms are in place and properly implemented.	57.1%	47.4%	72.0%	95.5%	76.5%	65.2%
		% of Total	6.4%	14.4%	30.8%	8.4%	5.2%	65.2%
	2	Count	12	40	30	1	4	87

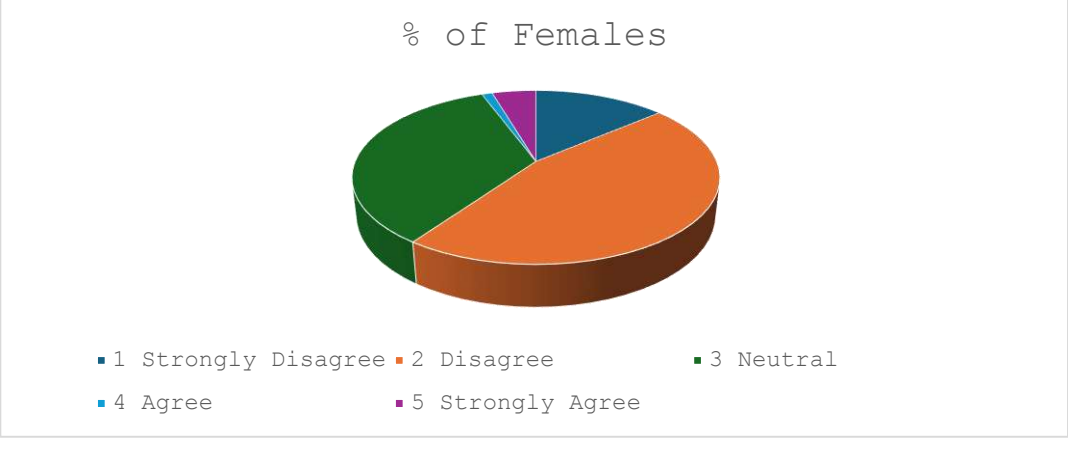
		% within What is your gender?	13.8%	46.0%	34.5%	1.1%	4.6%	100.0%
		% within Conflict resolution mechanisms are in place and properly implemented.	42.9%	52.6%	28.0%	4.5%	23.5%	34.8%
		% of Total	**4.8%**	**16.0%**	**12.0%**	**0.4%**	**1.6%**	**34.8%**
Total		**Count**	28	76	107	22	17	250
		% within What is your gender?	11.2%	30.4%	42.8%	8.8%	6.8%	100.0%
		% within Conflict resolution mechanisms are in place and properly implemented.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**11.2%**	**30.4%**	**42.8%**	**8.8%**	**6.8%**	**100.0%**

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	23.435[a]	4	.000
Likelihood Ratio	26.056	4	.000
Linear-by-Linear Association	14.039	1	.000
N of Valid Cases	250		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.92.

Analysis of the Cross-Table-

Response	**Meaning**	**% of Males**	**% of Females**
1	Strongly Disagree	9.8%	13.8%
2	Disagree	22.1%	46.0%
3	Neutral	47.2%	34.5%
4	Agree	12.9%	1.1%
5	Strongly Agree	8.0%	4.6%



The question regarding whether conflict resolution mechanisms are properly implemented in sports teams was analysed based on gender using the Chi-Square test. The responses from 250 participants were compared.

Among female athletes, 46% disagreed and 13.8% strongly disagreed that such mechanisms are in place and effectively used. Only a very small percentage agreed or strongly agreed (1.1% and 4.6% respectively), which suggests that conflict resolution is largely not trusted or not observed by female athletes.

In comparison, male athletes showed a higher level of neutrality and agreement. About 47.2% of males chose 'Neutral', and 20.9% agreed or strongly agreed with the statement. This indicates that males are either more satisfied with or less affected by conflict resolution practices in their teams.

The Chi-Square test result ($\chi^2 = 23.435$, $p < .001$) shows that the relationship between gender and perception of conflict resolution is statistically significant. The linear-by-linear association ($p = .000$) also confirms a strong pattern in responses across the gender groups.

From these results, it can be concluded that female athletes are less likely to feel supported by effective conflict resolution mechanisms in sports institutions. These findings highlight a critical gap in how conflict and team issues are addressed, particularly from the viewpoint of women in sports, and call for more inclusive and accessible conflict management policies.

3. I have personally witnessed bullying, harassment, or psychological abuse in a sport.

Crosstab							
			I have personally witnessed bullying, harassment, or psychological abuse in a sports.				
			1	2	3	4	5	Total
Gender	1	Count	4	48	49	22	40	163
		% within What is your gender?	2.5%	29.4%	30.1%	13.5%	24.5%	100.0%
		% within I have personally witnessed bullying, harassment, or psychological abuse in a sport.	33.3%	70.6%	77.8%	38.6%	80.0%	65.2%
		% of Total	**1.6%**	**19.2%**	**19.6%**	**8.8%**	**16.0%**	**65.2%**
	2	Count	8	20	14	35	10	87
		% within What is your gender?	9.2%	23.0%	16.1%	40.2%	11.5%	100.0%
		% within I have personally witnessed bullying, harassment, or psychological abuse in a sport.	66.7%	29.4%	22.2%	61.4%	20.0%	34.8%
		% of Total	**3.2%**	**8.0%**	**5.6%**	**14.0%**	**4.0%**	**34.8%**
Total		Count	12	68	63	57	50	250
		% within What is your gender?	4.8%	27.2%	25.2%	22.8%	20.0%	100.0%
		% within I have personally witnessed bullying, harassment, or psychological abuse in a sports.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**4.8%**	**27.2%**	**25.2%**	**22.8%**	**20.0%**	**100.0%**

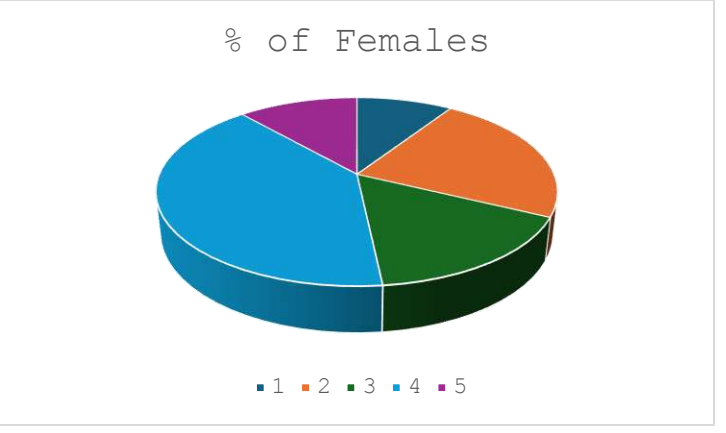
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	33.240[a]	4	.000
Likelihood Ratio	32.624	4	.000
Linear-by-Linear Association	.162	1	.688
N of Valid Cases	250		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.18.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	2.5%	9.2%
2	Disagree	29.4%	23.0%

3	Neutral	30.1%	16.1%
4	Agree	13.5%	40.2%
5	Strongly Agree	24.5%	11.5%



It was observed that 40.2% of female athletes agreed, and 11.5% strongly agreed that they had witnessed such behaviour. This means that more than half of the women confirmed seeing abuse happen in their sporting environments. This shows that bullying and harassment are frequently noticed by female athletes.

On the other hand, male athletes gave more varied responses. While 24.5% strongly agreed, and 13.5% agreed, a larger number (30.1%) selected **Neutral**, and nearly one-third either disagreed or strongly disagreed. This suggests that male athletes either witness fewer such incidents, are less likely to report them, or interpret them differently.

The Chi-Square test result was significant ($\chi^2(4) = 33.240$, $p < .001$), which confirms that the difference in responses between males and females is statistically meaningful and not due to chance. However, the linear-by-linear association test ($p = .688$) was not significant, suggesting that there is no clear increasing or decreasing trend across response levels.

From these results, it can be concluded that female athletes are more likely to witness or recognize bullying and harassment within sports settings, compared to their male counterparts. These findings further support the idea that women in sports are either more exposed to such behaviour or more sensitive to recognizing it, which calls for gender-specific awareness and prevention programs in sports institutions.

4. I have personally experienced bullying, harassment, or psychological abuse in my team.

Crosstab								
			I have personally experienced bullying, harassment, or psychological abuse in my team.					
			1	2	3	4	5	Total
Gender	**1**	**Count**	1	20	45	43	54	163
		% within What is your gender?	0.6%	12.3%	27.6%	26.4%	33.1%	100.0%
		% within I have personally experienced bullying, harassment, or psychological abuse in my team.	33.3%	87.0%	93.8%	43.9%	69.2%	65.2%
		% of Total	**0.4%**	**8.0%**	**18.0%**	**17.2%**	**21.6%**	**65.2%**
	2	**Count**	2	3	3	55	24	87
		% within What is your gender?	2.3%	3.4%	3.4%	63.2%	27.6%	100.0%

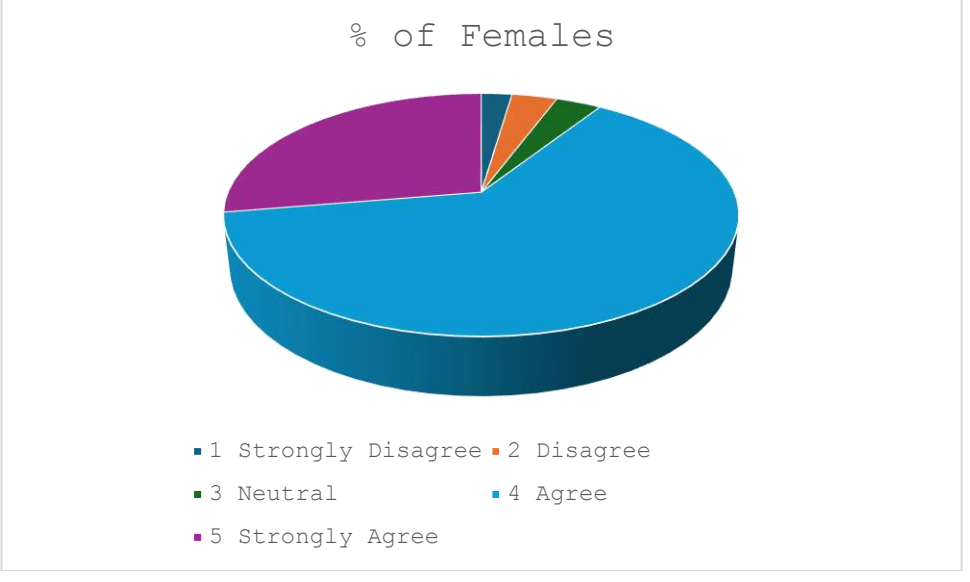
		% within I have personally experienced bullying, harassment, or psychological abuse in my team.	66.7%	13.0%	6.3%	56.1%	30.8%	34.8%
		% of Total	**0.8%**	**1.2%**	**1.2%**	**22.0%**	**9.6%**	**34.8%**
Total		**Count**	3	23	48	98	78	250
		% within What is your gender?	1.2%	9.2%	19.2%	39.2%	31.2%	100.0%
		% within I have personally experienced bullying, harassment, or psychological abuse in my team.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**1.2%**	**9.2%**	**19.2%**	**39.2%**	**31.2%**	**100.0%**

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	43.580[a]	4	.000
Likelihood Ratio	48.352	4	.000
Linear-by-Linear Association	5.671	1	.017
N of Valid Cases	250		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.04.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	0.6%	2.3%
2	Disagree	12.3%	3.4%
3	Neutral	27.6%	3.4%
4	Agree	26.4%	63.2%
5	Strongly Agree	33.1%	27.6%



It was found that female athletes were much more likely to agree or strongly agree that they had personally experienced bullying or abuse within their teams. In fact, over 90% of the females agreed with this in some form – 63.2% agreed and 27.6% strongly agreed. Very few females reported disagreement or neutrality, which shows that such experiences are widely recognized among women in sports teams.
In contrast, male athletes showed more balanced responses. While 33.1% of males strongly agreed, a sizable portion either remained neutral (27.6%) or disagreed (12.3%). A very small number of males strongly disagreed with the statement.

The Chi-Square test result was statistically significant ($\chi^2(4) = 43.580$, $p < .001$), indicating that gender has a significant impact on how personal experiences of bullying and abuse are reported. The linear-by-linear association ($p = .017$) also shows a significant pattern in how these responses increase or decrease across categories.

From these results, it can be concluded that female athletes are more likely to report having experienced bullying, harassment, or psychological abuse in their teams, which points to a gender-based disparity in how such behaviours are experienced or perceived. These findings highlight the need for sports institutions to improve protection mechanisms and provide targeted support systems, particularly for women.

5. Senior players are more likely to engage in bullying or intimidation of junior members.

Crosstab								
			Senior players are more likely to engage in bullying or intimidation of junior members.					
			1	2	3	4	5	Total
Gender	1	Count	1	42	51	29	40	163
		% within What is your gender?	0.6%	25.8%	31.3%	17.8%	24.5%	100.0%
		% within Senior players are more likely to engage in bullying or intimidation of junior members.	6.3%	66.7%	71.8%	58.0%	80.0%	65.2%
		% of Total	**0.4%**	**16.8%**	**20.4%**	**11.6%**	**16.0%**	**65.2%**
	2	Count	15	21	20	21	10	87
		% within What is your gender?	17.2%	24.1%	23.0%	24.1%	11.5%	100.0%
		% within Senior players are more likely to engage in bullying or intimidation of junior members.	93.8%	33.3%	28.2%	42.0%	20.0%	34.8%
		% of Total	**6.0%**	**8.4%**	**8.0%**	**8.4%**	**4.0%**	**34.8%**
Total		Count	16	63	71	50	50	250
		% within What is your gender?	6.4%	25.2%	28.4%	20.0%	20.0%	100.0%
		% within Senior players are more likely to engage in bullying or intimidation of junior members.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**6.4%**	**25.2%**	**28.4%**	**20.0%**	**20.0%**	**100.0%**

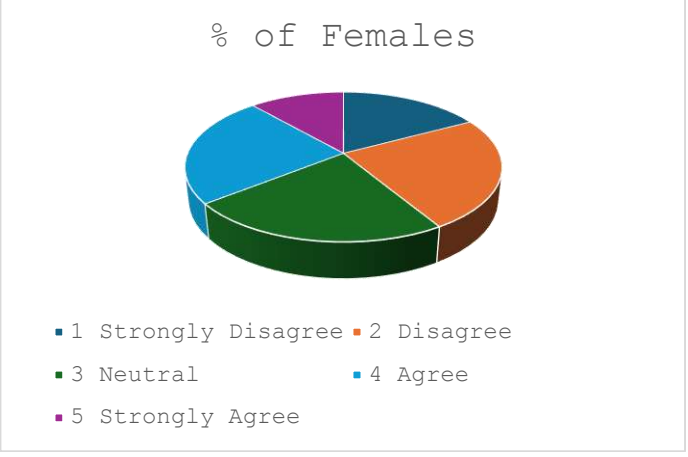
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.910[a]	4	.000
Likelihood Ratio	32.923	4	.000
Linear-by-Linear Association	10.215	1	.001

N of Valid Cases	250		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.57.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	0.6%	17.2%
2	Disagree	25.8%	24.1%
3	Neutral	31.3%	23.0%
4	Agree	17.8%	24.1%
5	Strongly Agree	24.5%	11.5%



It was observed that female athletes were more likely to strongly disagree (17.2%) with the idea that senior players bully juniors, whereas only 0.6% of male athletes strongly disagreed. This suggests that more females do not perceive senior players as aggressors, or they may be less likely to report such behaviour.

However, a notable number of male respondents strongly agreed (24.5%) with the statement, indicating that male athletes were more likely to acknowledge such behaviour among senior players. On the other hand, only 11.5% of female athletes strongly agreed. Interestingly, neutral responses were higher among males (31.3%) than females (23.0%), showing possible uncertainty or varied experiences among male participants.

The Chi-Square test result was statistically significant (**$\chi^2(4) = 31.910$, $p < .001$**), confirming that the **difference in perceptions between male and female athletes is meaningful and unlikely due to chance**. The **linear-by-linear association (p = .001)** further supports a consistent pattern across the response scale.

From this analysis, it can be concluded that **gender significantly influences how bullying by senior athletes is perceived**. This suggests a **need for team-level mentorship training and awareness programs**, especially to ensure that power hierarchies in sports teams do not lead to psychological harm.

6. Coaches sometimes use excessive verbal pressure or humiliation to push athletes.

Crosstab								
			Coaches sometimes use excessive verbal pressure or humiliation to push athletes.					
			1	2	3	4	5	Total
Gender	1	Count	18	57	59	12	17	163
		% within What is your gender?	11.0%	35.0%	36.2%	7.4%	10.4%	100.0%
		% within Coaches sometimes use	52.9%	66.3%	84.3%	36.4%	63.0%	65.2%

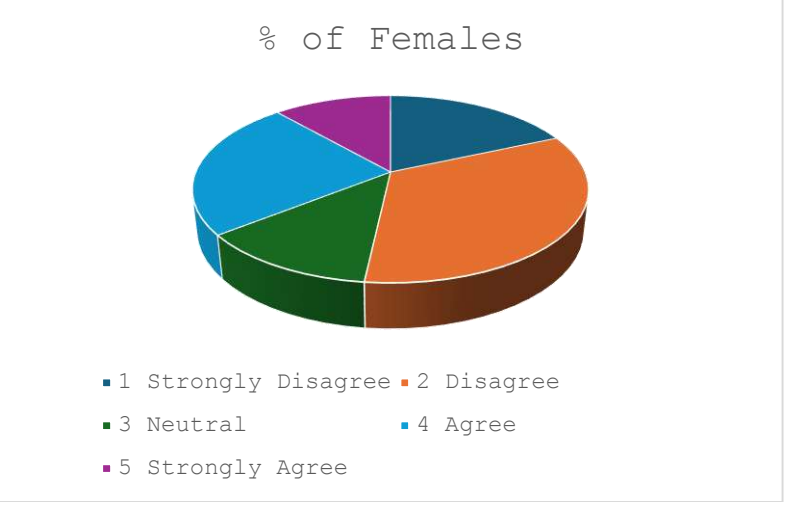
		excessive verbal pressure or humiliation to push athletes.						
		% of Total	**7.2%**	**22.8%**	**23.6%**	**4.8%**	**6.8%**	**65.2%**
	2	**Count**	16	29	11	21	10	87
		% within What is your gender?	18.4%	33.3%	12.6%	24.1%	11.5%	100.0%
		% within Coaches sometimes use excessive verbal pressure or humiliation to push athletes.	47.1%	33.7%	15.7%	63.6%	37.0%	34.8%
		% of Total	**6.4%**	**11.6%**	**4.4%**	**8.4%**	**4.0%**	**34.8%**
Total		**Count**	34	86	70	33	27	250
		% within What is your gender?	13.6%	34.4%	28.0%	13.2%	10.8%	100.0%
		% within Coaches sometimes use excessive verbal pressure or humiliation to push athletes.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**13.6%**	**34.4%**	**28.0%**	**13.2%**	**10.8%**	**100.0%**

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	25.688[a]	4	.000
Likelihood Ratio	26.405	4	.000
Linear-by-Linear Association	.140	1	.708
N of Valid Cases	250		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.40.

Analysis of the Cross-Table-

Response	**Meaning**	**% of Males**	**% of Females**
1	Strongly Disagree	11.0%	18.4%
2	Disagree	35.0%	33.3%
3	Neutral	36.2%	12.6%
4	Agree	7.4%	24.1%
5	Strongly Agree	10.4%	11.5%



It was observed that **35.0% of male athletes disagreed** with the statement, while **33.3% of females also disagreed**, suggesting that a sizable proportion from both genders does not see this behavior as prevalent. Interestingly, **neutral responses were much higher among males (36.2%)** than females (12.6%), indicating that males may be less certain or less vocal about this issue.

However, a higher percentage of **female athletes agreed (24.1%)** or **strongly agreed (11.5%)** compared to males (7.4% agreed and 10.4% strongly agreed). This suggests that female athletes may be more likely to report or feel affected by verbal pressure or humiliation from coaches.

The Chi-Square value of **25.688** with a **p-value of .000** indicates that this difference in perception between males and females is **statistically significant**, meaning it is highly unlikely to have occurred by chance.

Thus, it can be concluded that **gender plays a significant role in shaping how athletes perceive coaching behaviour**, particularly in terms of verbal pressure and humiliation. These findings highlight the **need for gender-sensitive coach training** and awareness programs that promote respectful and constructive communication styles in sports settings.

7. Bullying and harassment negatively impact athletes' mental health and performance.

Crosstab								
			Bullying and harassment negatively impact athletes' mental health and performance.					
			1	2	3	4	5	Total
Gender	1	Count	58	63	25	5	12	163
		% within What is your gender?	35.6%	38.7%	15.3%	3.1%	7.4%	100.0%
		% within Bullying and harassment negatively impact athletes' mental health and performance.	50.0%	71.6%	86.2%	100.0%	100.0%	65.2%
		% of Total	23.2%	25.2%	10.0%	2.0%	4.8%	65.2%
	2	Count	58	25	4	0	0	87
		% within What is your gender?	66.7%	28.7%	4.6%	0.0%	0.0%	100.0%
		% within Bullying and harassment negatively impact athletes' mental health and performance.	50.0%	28.4%	13.8%	0.0%	0.0%	34.8%
		% of Total	23.2%	10.0%	1.6%	0.0%	0.0%	34.8%
Total		Count	116	88	29	5	12	250

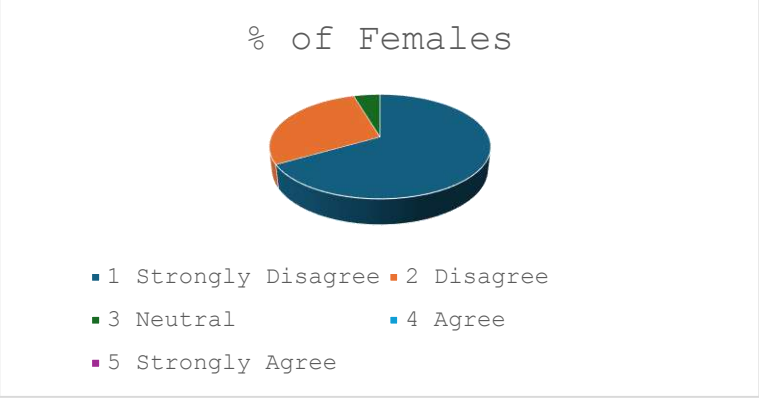
	% within What is your gender?	46.4%	35.2%	11.6%	2.0%	4.8%	100.0%
	% within Bullying and harassment negatively impact athletes' mental health and performance.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	46.4%	35.2%	11.6%	2.0%	4.8%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	28.110[a]	4	.000
Likelihood Ratio	33.988	4	.000
Linear-by-Linear Association	26.024	1	.000
N of Valid Cases	250		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.74.

Analysis of the Cross-Table-

Response	**Meaning**	**% of Males**	**% of Females**
1	Strongly Disagree	35.6%	66.7%
2	Disagree	38.7%	28.7%
3	Neutral	15.3%	4.6%
4	Agree	3.1%	0.0%
5	Strongly Agree	7.4%	0.0%



It was found that **a larger proportion of female athletes (66.7%) strongly disagreed** with the idea that bullying negatively affects performance, while only **35.6% of male athletes** held the same view. On the other hand, **a greater number of males selected "Disagree" (38.7%)** compared to **females (28.7%)**. Very few females agreed or strongly agreed with the statement, while **some males (7.4%) strongly agreed**, and **3.1% agreed**.

Interestingly, more **males expressed neutral opinions (15.3%)** than females (4.6%), suggesting a level of uncertainty or hesitation in fully acknowledging the negative mental health effects. The responses from males were more widely distributed across the scale, whereas female responses were concentrated at the higher end of disagreement.

The **Chi-Square test result ($\chi^2 = 28.110$, $p = .000$)** indicated a statistically significant difference in perceptions between males and females. Since the p-value is below 0.05, it can be confirmed that **gender plays a significant role** in shaping views on how bullying and harassment affect mental well-being and performance in sports.

8. Athletes often hesitate to report bullying due to fear of retaliation.

Crosstab

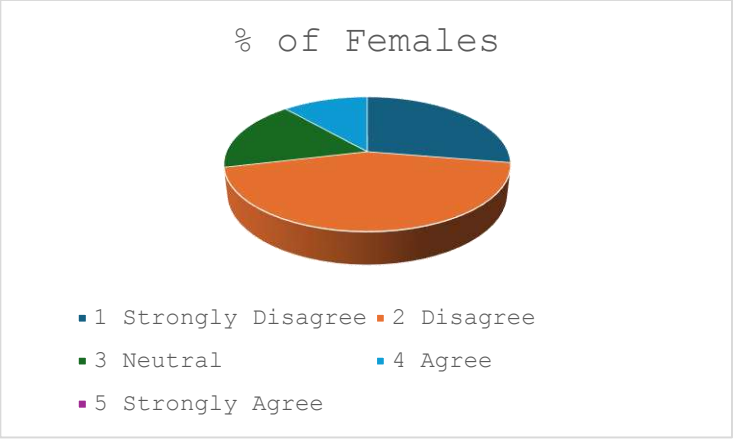
			Athletes often hesitate to report bullying due to fear of retaliation.					
			1	**2**	**3**	**4**	**5**	**Total**
Gender	**1**	**Count**	28	80	37	1	17	163
		% within What is your gender?	17.2%	49.1%	22.7%	0.6%	10.4%	100.0%
		% within Athletes often hesitate to report bullying due to fear of retaliation.	53.8%	67.8%	71.2%	9.1%	100.0%	65.2%
		% of Total	**11.2%**	**32.0%**	**14.8%**	**0.4%**	**6.8%**	**65.2%**
	2	**Count**	24	38	15	10	0	87
		% within What is your gender?	27.6%	43.7%	17.2%	11.5%	0.0%	100.0%
		% within Athletes often hesitate to report bullying due to fear of retaliation.	46.2%	32.2%	28.8%	90.9%	0.0%	34.8%
		% of Total	**9.6%**	**15.2%**	**6.0%**	**4.0%**	**0.0%**	**34.8%**
Total		**Count**	52	118	52	11	17	250
		% within What is your gender?	20.8%	47.2%	20.8%	4.4%	6.8%	100.0%
		% within Athletes often hesitate to report bullying due to fear of retaliation.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**20.8%**	**47.2%**	**20.8%**	**4.4%**	**6.8%**	**100.0%**

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	28.454[a]	4	.000
Likelihood Ratio	33.838	4	.000
Linear-by-Linear Association	3.256	1	.071
N of Valid Cases	250		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.83.

Analysis of the Cross-Table-

Response	**Meaning**	**% of Males**	**% of Females**
1	Strongly Disagree	17.2%	27.6%
2	Disagree	49.1%	43.7%
3	Neutral	22.7%	17.2%
4	Agree	0.6%	11.5%
5	Strongly Agree	10.4%	0.0%



It was observed that a **larger percentage of female athletes (27.6%) strongly disagreed** with the statement, indicating that they do not believe fear is a deterrent. In contrast, **17.2% of males** strongly disagreed. The majority of respondents from both genders selected "Disagree" — **49.1% of males** and **43.7% of females** — implying that hesitation is not strongly felt by most but still acknowledged.

Interestingly, **10.4% of male athletes strongly agreed** with the statement, whereas **none of the female athletes** did. A small portion of **females (11.5%) agreed**, which was slightly higher than the **0.6% of males** who did the same. These numbers suggest that while most athletes—regardless of gender—tend to disagree or remain neutral, **males show a slightly broader range of opinions**, including some strong agreement with the fear of retaliation.
The **Pearson Chi-Square value was 28.454 with a p-value of .000**, which is **statistically significant at the 0.05 level**. This confirms that the observed differences in responses between males and females were **unlikely to have occurred by chance**.

Hence, it can be concluded that gender does significantly influence how athletes perceive the fear of retaliation as a barrier to reporting bullying.

9. There is a lack of trust in how sports authorities handle complaints about abuse.

Crosstab								
			There is a lack of trust in how sports authorities handle complaints about abuse.					
			1	2	3	4	5	Total
Gender	1	Count	7	102	36	1	17	163
		% within What is your gender?	4.3%	62.6%	22.1%	0.6%	10.4%	100.0%
		% within There is a lack of trust in how sports authorities handle complaints about abuse.	43.8%	68.9%	63.2%	8.3%	100.0%	65.2%
		% of Total	2.8%	40.8%	14.4%	0.4%	6.8%	65.2%
	2	Count	9	46	21	11	0	87
		% within What is your gender?	10.3%	52.9%	24.1%	12.6%	0.0%	100.0%
		% within There is a lack of trust in how sports authorities handle complaints about abuse.	56.3%	31.1%	36.8%	91.7%	0.0%	34.8%
		% of Total	3.6%	18.4%	8.4%	4.4%	0.0%	34.8%
Total		Count	16	148	57	12	17	250
		% within What is your gender?	6.4%	59.2%	22.8%	4.8%	6.8%	100.0%

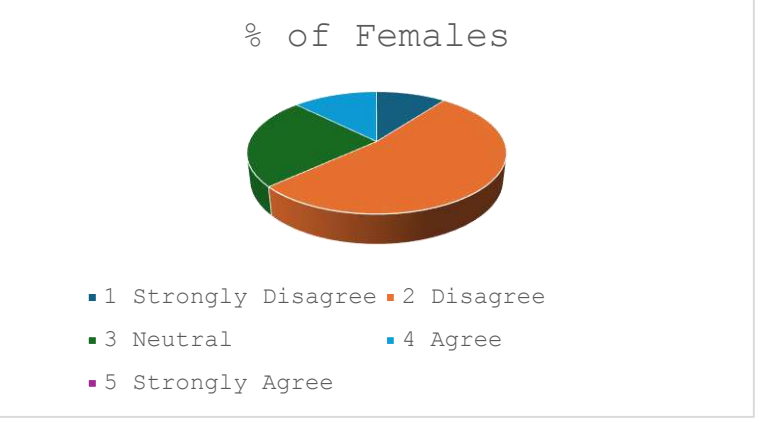
	% within There is a lack of trust in how sports authorities handle complaints about abuse.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	6.4%	59.2%	22.8%	4.8%	6.8%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	30.428[a]	4	.000
Likelihood Ratio	35.816	4	.000
Linear-by-Linear Association	.808	1	.369
N of Valid Cases	250		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.18.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	4.3%	10.3%
2	Disagree	62.6%	52.9%
3	Neutral	22.1%	24.1%
4	Agree	0.6%	12.6%
5	Strongly Agree	10.4%	0.0%



The majority of both male and female respondents selected **"Disagree"** with the statement — **62.6% of males** and **52.9% of females** — which indicated that **some level of trust was perceived** by both groups. However, **males showed higher disagreement**, suggesting a more optimistic view toward the authorities than females.
Interestingly, **12.6% of females agreed** that there is a lack of trust, while only **0.6% of males agreed**, showing that **female athletes were more likely to express distrust** in the system. Also, **10.4% of males strongly agreed**, and **no female respondents did so** — this shows an unexpected group of male respondents with very strong concerns about how complaints are handled.

The **Pearson Chi-Square value was 30.428 with a p-value of .000**, meaning the result is **statistically significant** at the 0.05 level. Therefore, it can be said that **gender has a significant impact on the level of trust athletes have in sports authorities when it comes to dealing with abuse complaints**.

10. I know athletes who have quit sports due to bullying, harassment or psychological abuse.

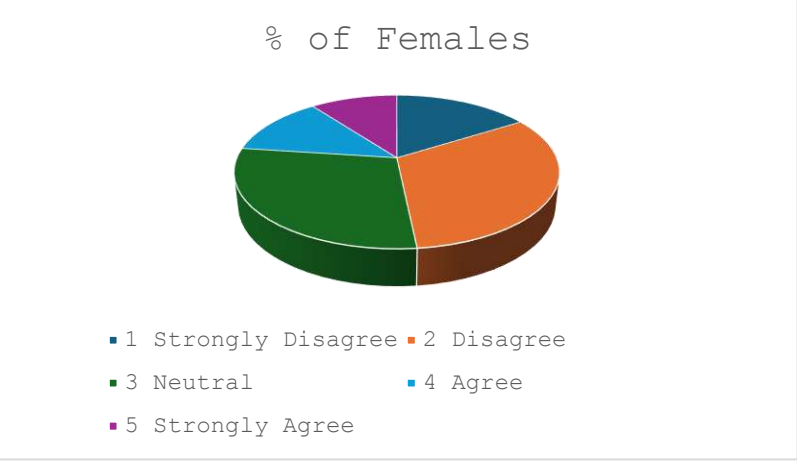
Crosstab								
			I know athletes who have quit sports due to bullying, harassment, or psychological abuse.					
			1	2	3	4	5	Total
Gender	1	Count	0	83	38	25	17	163
		% within What is your gender?	0.0%	50.9%	23.3%	15.3%	10.4%	100.0%
		% within I know athletes who have quit sports due to bullying, harassment, or psychological abuse.	0.0%	74.8%	60.3%	69.4%	65.4%	65.2%
		% of Total	**0.0%**	**33.2%**	**15.2%**	**10.0%**	**6.8%**	**65.2%**
	2	Count	14	28	25	11	9	87
		% within What is your gender?	16.1%	32.2%	28.7%	12.6%	10.3%	100.0%
		% within I know athletes who have quit sports due to bullying, harassment, or psychological abuse.	100.0%	25.2%	39.7%	30.6%	34.6%	34.8%
		% of Total	**5.6%**	**11.2%**	**10.0%**	**4.4%**	**3.6%**	**34.8%**
Total		Count	14	111	63	36	26	250
		% within What is your gender?	5.6%	44.4%	25.2%	14.4%	10.4%	100.0%
		% within I know athletes who have quit sports due to bullying, harassment, or psychological abuse.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	**5.6%**	**44.4%**	**25.2%**	**14.4%**	**10.4%**	**100.0%**

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.663[a]	4	.000
Likelihood Ratio	35.223	4	.000
Linear-by-Linear Association	1.267	1	.260
N of Valid Cases	250		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.87.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	0.0%	16.1%
2	Disagree	50.9%	32.2%
3	Neutral	23.3%	28.7%
4	Agree	15.3%	12.6%
5	Strongly Agree	10.4%	10.3%



This question was meant to find out whether **gender influences athletes' awareness of others who have quit sports due to bullying, harassment, or psychological abuse**.

It was observed that **none of the male athletes strongly disagreed**, while **16.1% of female athletes did**, indicating that **some female athletes clearly believed such cases were uncommon**. However, **half of the male respondents (50.9%) disagreed** with the statement — more than females (32.2%).

Interestingly, **neutral responses were reported by 23.3% of males and 28.7% of females**, suggesting uncertainty or limited awareness among some participants. Notably, **a similar proportion of males (10.4%) and females (10.3%) strongly agreed** that they knew athletes who had quit due to such abuse.

The **Pearson Chi-Square value was 31.663 with a p-value of .000**, indicating that the difference in responses by gender is **statistically significant**. In simple terms, it can be said that **gender plays a significant role in whether athletes know someone who has left sports due to experiences of abuse**.

11. I am aware of the legal protections available for athletes against bullying and harassment.

Crosstab								
			I am aware of the legal protections available for athletes against bullying and harassment.					
			1	2	3	4	5	6
Gender	1	Count	1	53	81	15	13	163
		% within What is your gender?	0.6%	32.5%	49.7%	9.2%	8.0%	100.0%
		% within I am aware of the legal protections available for athletes against bullying and harassment.	2.3%	72.6%	95.3%	41.7%	100.0%	65.2%
		% of Total	0.4%	21.2%	32.4%	6.0%	5.2%	65.2%
	2	Count	42	20	4	21	0	87
		% within What is your gender?	48.3%	23.0%	4.6%	24.1%	0.0%	100.0%
		% within I am aware of the legal protections available for athletes against bullying and harassment.	97.7%	27.4%	4.7%	58.3%	0.0%	34.8%
		% of Total	16.8%	8.0%	1.6%	8.4%	0.0%	34.8%
Total		Count	43	73	85	36	13	250

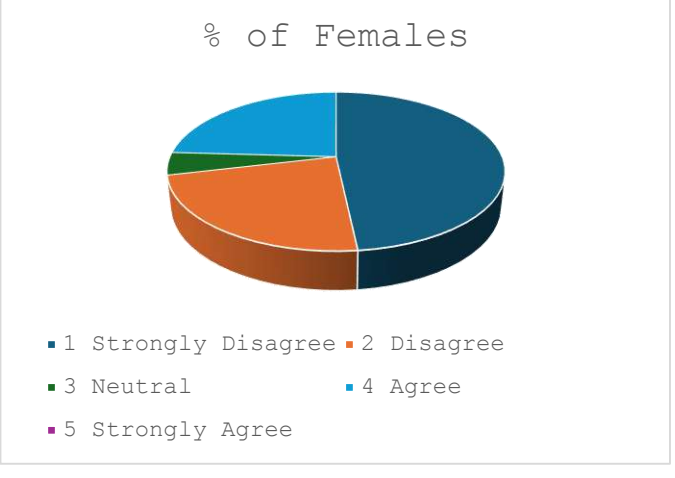
	% within What is your gender?	**17.2%**	**29.2%**	34.0%	14.4%	5.2%	100.0%
	% within I am aware of the legal protections available for athletes against bullying and harassment.	**100.0%**	**100.0%**	100.0%	100.0%	100.0%	100.0%
	% of Total	**17.2%**	**29.2%**	34.0%	14.4%	5.2%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	126.335[a]	4	.000
Likelihood Ratio	146.713	4	.000
Linear-by-Linear Association	36.040	1	.000
N of Valid Cases	250		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.52.

Analysis of the Cross-Table-

Response	**Meaning**	**% of Males**	**% of Females**
1	Strongly Disagree	0.6%	48.3%
2	Disagree	32.5%	23.0%
3	Neutral	49.7%	4.6%
4	Agree	9.2%	24.1%
5	Strongly Agree	8.0%	0.0%



This question was used to check how many athletes are aware of legal protections against bullying and harassment, and whether their awareness differs based on gender.

It was found that 48.3% of females strongly disagreed that they were aware of such protections, compared to only 0.6% of males, which shows a large gap in awareness levels. A high percentage of males (49.7%) remained neutral, while only **4**.6% of females did so, indicating that female athletes were more decisive in their responses — either agreeing or disagreeing.

Only **8.0% of males strongly agreed** that they were aware of legal protections, while **none of the females** strongly agreed. Overall, **males showed higher levels of awareness** than females regarding legal rights and protections in sports.

The **Pearson Chi-Square value of 126.335 with a p-value of .000** confirmed that the difference in awareness levels between males and females is **statistically significant**. In simple terms, it can be said that **awareness of legal protections varies significantly by gender**, with **females being less informed than males**.

12. Anti-bullying policies in sports should be enforced more strictly.

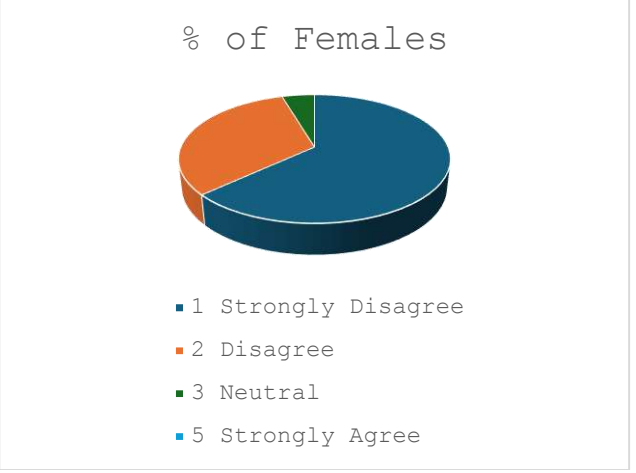
Crosstab							
			Anti-bullying policies in sports should be enforced more strictly.				
			1	2	3	5	Total
Gender	1	Count	33	77	36	17	163
		% within What is your gender?	20.2%	47.2%	22.1%	10.4%	100.0%
		% within Anti-bullying policies in sports should be enforced more strictly.	37.5%	73.3%	90.0%	100.0%	65.2%
		% of Total	13.2%	30.8%	14.4%	6.8%	65.2%
	2	Count	55	28	4	0	87
		% within What is your gender?	63.2%	32.2%	4.6%	0.0%	100.0%
		% within Anti-bullying policies in sports should be enforced more strictly.	62.5%	26.7%	10.0%	0.0%	34.8%
		% of Total	22.0%	11.2%	1.6%	0.0%	34.8%
Total		Count	88	105	40	17	250
		% within What is your gender?	35.2%	42.0%	16.0%	6.8%	100.0%
		% within Anti-bullying policies in sports should be enforced more strictly.	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	35.2%	42.0%	16.0%	6.8%	100.0%

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	52.736[a]	3	.000
Likelihood Ratio	58.876	3	.000
Linear-by-Linear Association	42.318	1	.000
N of Valid Cases	250		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.92.

Analysis of the Cross-Table-

Response	Meaning	% of Males	% of Females
1	Strongly Disagree	20.2%	63.2%
2	Disagree	47.2%	32.2%
3	Neutral	22.1%	4.6%
5	Strongly Agree	10.4%	0.0%



The statement asked whether anti-bullying policies in sports should be enforced more strictly. Responses were found to vary significantly by gender.

It was observed that 63.2% of females strongly disagreed, while only 20.2% of males strongly disagreed. On the other hand, 47.2% of males disagreed, and 32.2% of females also disagreed.
Very few respondents chose neutral (especially among females, only 4.6%), while 22.1% of males chose to remain neutral. Interestingly, 10.4% of males strongly agreed with the statement, while none of the females selected this option.

The Chi-Square test value (52.736) with a p-value of .000 shows that there is a statistically significant association between gender and the opinion on stricter anti-bullying policy enforcement. In simpler words, males and females clearly think differently about how strictly anti-bullying policies should be applied in sports settings.

Policy Framework

In order to address the pervasive issue of bullying, harassment, and abuse in Indian sports, particularly among female athletes, there is a pressing need to establish binding legal and institutional obligations. Policies must move beyond non-binding guidelines and develop enforceable mechanisms for compliance, investigation, and redressal. This includes setting up a structured, athlete- and survivor-centered reporting mechanism that prioritizes the safety and psychological well-being of the complainant, rather than merely safeguarding the image of sports organizations. Significant reforms are needed in how complaints are handled, especially in cases where power imbalances hinder reporting or where national and regional federations have historically failed to act. To close these gaps, a safety-net reporting structure must be instituted, allowing escalation of cases to independent bodies or ombudspersons if internal systems prove inadequate.

Moreover, the development of a publicly accessible registry of sanctioned offenders would enhance transparency and deter repeat offenses, much like the Safe Sport registry in the United States. Parallel to these measures, cooperation with law enforcement and judiciary is vital. Sports bodies must work in tandem with criminal justice systems while also offering victims a clear understanding of the distinction between internal governance and legal processes. It is critical to ensure that sports organizations retain the autonomy to act even when national crime agencies fall short, as evident from international examples where institutional failures compromised justice.

National laws must be amended or created to explicitly address abuse in sports, distinguishing such crimes from general violence against women statutes. These should mandate data collection on incidents, trends, and responses to violence against women and girls in sports, supporting evidence-based policymaking. Policy makers must also fund confidential and ethically managed databases for tracking incidents and outcomes, allowing regular trend analysis and informing both preventive and remedial strategies.

Conclusion

The findings of this research affirm that underreporting of bullying and harassment remains a significant issue among Indian female athletes. Statistical analysis revealed disparities across development levels of countries and across years, suggesting the systemic and persistent nature of the issue. Institutional silence, fear of retaliation, and lack of

accessible support systems contribute to the suppression of complaints. This silence is further exacerbated by the high power concentration in sports bodies, where perpetrators often hold influential positions that make it perilous for athletes to come forward. Furthermore, the absence of national-level sports-specific laws and the lack of inter-agency coordination between sports federations and legal systems has created a fragmented approach to justice and athlete protection.

The review of global practices highlights that India must urgently evolve from passive acknowledgement of abuse to active prevention and accountability. Without comprehensive frameworks that are survivor-centric, transparent, and legally enforceable, the sports ecosystem in India will continue to be an unsafe and inequitable space for women and girls.

Recommendations

A multi-stakeholder, cross-sectoral approach is necessary to dismantle the culture of silence and impunity in Indian sports. Sports administrators, policy makers, civil society organizations, and the media must work collaboratively to create a safe sporting environment. Firstly, sports federations must establish mandatory athlete protection units and conduct regular independent audits of abuse cases and reporting systems. These units should ensure protection for whistle-blowers and provide access to legal and psychological support.

Second, policy makers should legislate sport-specific laws that criminalize abuse and harassment within athletic contexts, including provisions for fast-tracked judicial processes. At the institutional level, sports organizations must implement ethics and gender-sensitivity training, introduce equitable hiring and leadership practices, and develop robust internal complaint committees aligned with the POSH (Prevention of Sexual Harassment) Act.

Media and civil society organizations also have a vital role to play in shifting public narratives. Responsible and survivor-sensitive journalism must be promoted to break societal taboos around abuse in sports. Further, media must actively highlight role models and equitable behaviour in sports, while also pushing for transparency in the handling of abuse cases. Increasing representation of women in sports governance, coaching, and journalism can significantly contribute to long-term structural change.

Lastly, education programs targeting both athletes and coaches must be implemented from the grassroots level to promote respect, consent, and accountability. International collaborations and benchmarking with best practices must be encouraged to constantly evaluate and improve India's response to violence against women and girls in sports. Only by placing the athlete's dignity, safety, and voice at the center of policy and practice can we truly reform the sporting landscape into one that is inclusive, just, and empowering.

युवा कार्यक्रम
एवं खेल मंत्रालय
भारत सरकार
YOUTH AFFAIRS
AND SPORTS

सत्यमेव जयते

SEMINAR OUTCOME

Facilitation of a national exchange leading to research collaborations, joint publications, and institutional partnerships; promotion of traditional and modernized health, Enhancement of global outlook and cross-cultural understanding among participants through presented international exposuree; Chicago, holding of yoga & sports science events; Resolve to adopt integrativeist approach combining behavioral (stress, biomechanics) and reconceptualized traditional knowledge (fatigue, ayurveda) concepts globally (challenge).

Strengthening the international academic standing and visibility of India's higher education. BHU, Haridwar, tranparency in youth programmes; NIS coaches' education and policy coherence; coacheskool.in, etc.

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- Master of Physical Education (M.P.Ed.) – 2 Years
- Master of Arts in Yoga Science (M.A.Yoga)
- Master of Sports Management (MSM) – 2 Years
- M.A. (Sports Journalism) – 2 Years
- M.A. (Yoga) – 2 Years
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- Post Graduate Diploma in Sports Coaching (PGDSC) – 1 Year
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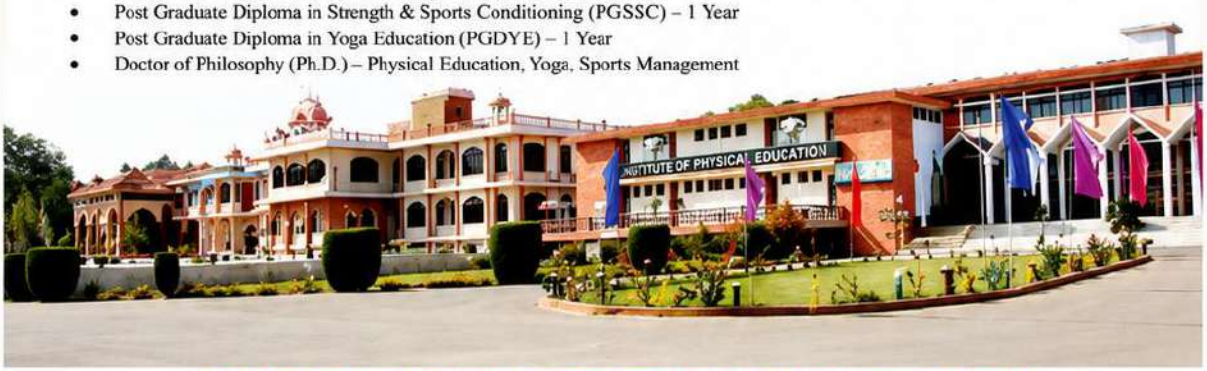

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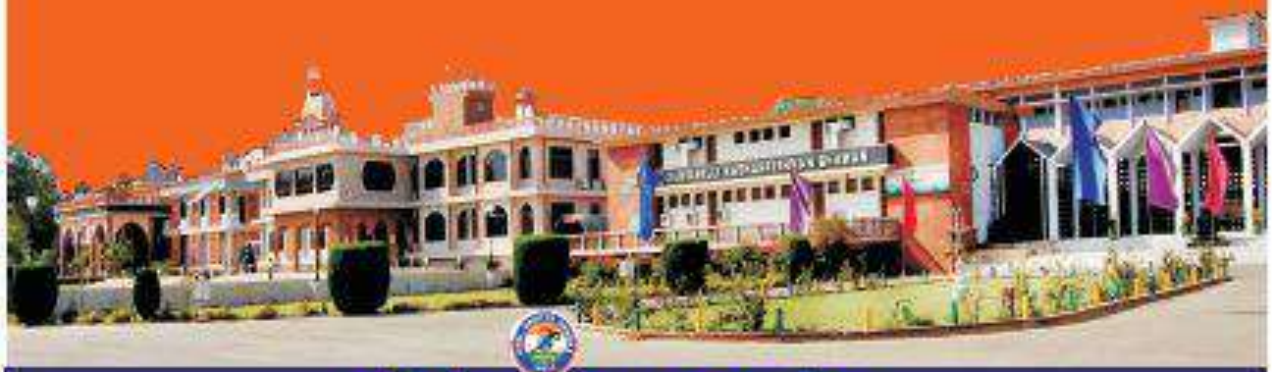

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