

REVIEW ARTICLE

AYURVEDIC CONCEPT OF EXERCISE IN THE CONTEXT OF SPORTS PHYSIOLOGY: A SCOPING REVIEW

Pretty P^{1*}, Manjunatha B Sunagar²

¹Associate professor, ²Assistant professor, Department of Kriya Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan - 573201, Karnataka, India

*Corresponding author: Email address: prettyprabhakar@gmail.com

ABSTRACT

Background: Sports physiology examines the acute and chronic physiological responses to exercise, including adaptations in metabolism, cardiovascular function, respiratory efficiency and maintenance of homeostasis. Ayurveda, particularly through the principles of Kriya Shareera, offers a functional understanding of body dynamics and emphasizes the role of Vyayama (exercise) in preserving health and enhancing physical capacity. Although both systems advocate regular physical activity for maintaining health and enhancing functional capacity, the conceptual relationship between modern sports physiology and Ayurvedic principles has not been comprehensively mapped. **Objective:** To systematically map the available evidence describing the conceptual relationship between Ayurvedic principles of Vyayama and the physiological adaptations explained in modern sports physiology from a Kriya Shareera perspective. **Eligibility Criteria:** Classical Ayurvedic texts describing the concepts of *Vyayama*, *Bala*, *Agni*, and *Dosha* were included in the review. In addition, modern literature focusing on exercise physiology, sports physiology, and the cardiovascular, respiratory, metabolic, and thermoregulatory responses to exercise was considered. Studies that did not address exercise physiology or the Ayurvedic principles related to exercise were excluded. **Sources of Evidence:** Evidence was obtained from classical Ayurvedic texts including Charaka Samhita and Sushruta Samhita, authoritative commentaries, standard textbooks of physiology and sports physiology, and electronic databases including PubMed and Google Scholar. **Charting Methods:** The collected data were extracted, systematically organized and reviewed to understand how the Ayurvedic concept of *Vyayama* corresponds with the physiological adaptations to exercise described in modern medicine. **Results:** The reviewed literature indicates that exercise induces well-established physiological adaptations, including improved muscle metabolism, increased cardiac output, enhanced oxygen utilization and efficient thermoregulation. These adaptations demonstrate conceptual parallels with Ayurvedic descriptions of appropriate Vyayama, which is associated with Laghava (lightness of the body), Karma Samarthya (enhanced functional efficiency), Sthairya (stability) and Agni Vriddhi (improvement in digestive and metabolic functions). Furthermore, balanced exercise is considered conducive to Dosha equilibrium and overall well-being, whereas excessive or improper exercise may aggravate Vata and contribute to fatigue and tissue depletion. **Conclusion:** The present scoping review demonstrates considerable conceptual overlap between Ayurvedic principles of Vyayama and modern sports physiology. Both systems emphasize individualized exercise prescription, moderation, progressive adaptation and adequate recovery as essential determinants of health and physical performance. An integrative understanding of sports physiology and Ayurvedic Kriya Shareera may provide a holistic framework for understanding exercise responses and offers potential directions for interdisciplinary research in exercise science and health promotion.

KEYWORDS: Ayurveda; Exercise physiology; Sports physiology; Vyayama; Kriya Shareera; Dosha; Agni; Bala.

Submitted date – 24.01.2026

Revised Date – 26.02.2026

Accepted Date – 18.03.2026

INTRODUCTION

Sports physiology is the study of the short-term and long-term effects of physical activity on body systems. It focuses on understanding how exercise influences muscles, metabolism, cardiovascular and respiratory systems and overall performance. Sports physiology is the branch of exercise science that examines the acute and chronic adaptations of body systems to physical activity and exercise, with particular emphasis on metabolic, cardiovascular, respiratory, neuromuscular and performance-related responses¹.

Although modern sports physiology provides detailed explanations of exercise-induced physiological adaptations, Ayurveda offers a holistic framework for understanding physical activity through concepts such as Vyayama, Bala, Agni and Dosha equilibrium. Exploring the conceptual parallels between these perspectives may contribute

to a more comprehensive understanding of exercise and health promotion.

In Ayurveda, the concept of Kriya Shareera explains the functional aspects of the body, emphasizing balance among Dosha, Dhatu and Agni. Vyayama (exercise) is considered an essential component of daily regimen (Dinacharya) and is described as a means to enhance strength (Bala), endurance and metabolic efficiency. Ayurveda describes Bala (strength or vitality) as being of three types—Sahaja Bala (innate strength), Kalaja Bala (strength influenced by age and seasonal factors) and Yuktikrita Bala (acquired strength developed through appropriate diet, lifestyle and exercise). The concept of Vyayama primarily contributes to the enhancement of Yuktikrita Bala. This article attempts to bridge modern sports physiology with Ayurvedic principles. In Charaka Samhita, Vyayama is defined as controlled physical activity that

enhances strength and stability when performed in proper measure, producing benefits such as lightness of body, improved work capacity, endurance, increased stress tolerance, reduction of doshas and stimulation of digestive fire².

Previous reviews have primarily focused either ayurvedic concepts of exercise or physiological adaptations separately. But no comprehensive scoping review was carried out to know the conceptual relationships between the principles of Vyayama described in Kriya Shareera and contemporary sports physiology. Mapping these relationships helps to identify the existing evidence, conceptual similarity and to identify the knowledge gaps so that guides the future interdisciplinary research.

REVIEW OBJECTIVE

This scoping review aimed to systematically map the available evidence regarding the conceptual relationship between Ayurvedic principles of Vyayama and the physiological adaptations described in modern sports physiology, with particular emphasis on metabolism, cardiovascular function, respiratory physiology, thermoregulation, exercise adaptation, homeostasis and physical performance from a Kriya Shareera perspective.

MATERIALS AND METHODS

Study Design

This study was conducted as a scoping review to systematically map the available evidence on the conceptual relationship between the Ayurvedic principles of Vyayama and the physiological adaptations described in modern sports physiology. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) to ensure transparent and comprehensive reporting.

Table1. Eligibility Criteria (PCC Framework)

PCC Component	Description
Population	Healthy individuals, physically active individuals, athletes, and literature describing exercise physiology or Vyayama
Concept	Vyayama, Bala, Agni, Dosha, Kriya Shareera, exercise physiology, sports physiology, physiological adaptations to exercise
Context	Classical Ayurvedic literature and modern scientific literature describing exercise-induced physiological responses

Inclusion Criteria

- Classical Ayurvedic texts describing Vyayama and related concepts.
- Authoritative Ayurvedic commentaries.
- Standard physiology and sports physiology textbooks.
- Original research articles.
- Review articles.
- Clinical and experimental studies discussing exercise physiology.
- Publications describing metabolic, cardiovascular, respiratory, neuromuscular or thermoregulatory adaptations.
- English language publications.

Exclusion Criteria

- Literature not related to exercise physiology.
- Articles without relevance to Ayurvedic concepts of Vyayama.
- Duplicate publications.
- Non-English article

Sources of Ayurvedic Literature

Primary Ayurvedic references were obtained from classical texts, particularly the Charaka Samhita (Sutrasthana), along with authoritative commentaries explaining the concepts of Vyayama, Bala, Agni, Sthairya, Laghava and Ati-Vyayama. Relevant information from other Ayurvedic textbooks and scholarly articles was also consulted.

Sources of Modern Literature

Modern concepts related to exercise physiology were compiled from standard textbooks of physiology and sports physiology and from published scientific literature addressing exercise-induced adaptations in muscle metabolism, cardiovascular function, respiratory responses, thermoregulation, physical performance and exercise-related stress.

Literature Search and Selection

Literature was identified through manual review of classical texts and electronic searches of scientific databases such as PubMed and Google Scholar using keywords including “exercise physiology,” “sports physiology,” “exercise adaptations,” “physical activity,” “Vyayama,” “Bala,” “Agni,” and “Ayurveda.” Articles and textbook materials relevant to the objectives of the review were included, while publications unrelated to exercise physiology or the Ayurvedic concepts under study were excluded.

Data Charting and Synthesis of Results

The collected literature was critically reviewed and synthesized to identify conceptual parallels between

Ayurvedic descriptions of Vyayama and modern physiological responses to exercise. Correlations were interpreted from a Kriya Shareera perspective, with emphasis on functional adaptations in metabolism, cardiovascular efficiency, respiratory performance, homeostasis and physical endurance⁴.

RESULTS

The literature search identified relevant information from classical Ayurvedic texts, standard textbooks of physiology and sports physiology, and peer-reviewed articles retrieved from electronic databases such as PubMed and Google Scholar. After screening the retrieved literature for relevance, studies discussing the concepts of *Vyayama*, *Bala*, *Agni*, *Dosha*, and the physiological adaptations to exercise were included in the review. The selected evidence was then organized under relevant categories and examined to explore the relationship between the Ayurvedic principles of *Vyayama* and the physiological responses to exercise described in modern sports physiology.

Classical Ayurvedic texts describe Vyayama as purposeful physical activity that produces appropriate bodily exertion. Sushruta Samhita defines Vyayama as Shareerayasa-janana Karma (activity that generates bodily exertion) and recommends Vimardana (gentle body massage) following exercise to facilitate recovery and restore comfort. Regular practice of Vyayama is described to promote Shariropacaya (healthy body development), Kanti (radiance), Gatranam Suvibhaktata (well-proportioned musculature), Diptagnitva (enhanced digestive and metabolic activity), Analasyam (freedom from lethargy), Sthiratva (stability), Laghava (lightness of the body) and Mrjatā (cleanliness and purity). It also improves Sahishnuta (tolerance) towards Shrama (fatigue), Klama (exhaustion), Pipasa (thirst), Uṣṇa (heat), Shita (cold) and other environmental stressors, ultimately contributing to Parama arogya (excellent health).

Sushruta further states that no intervention is superior to Vyayama in reducing Sthaulya (obesity), delaying Jara (ageing) and promoting Mamsa Sthairya (muscular firmness). Regular exercise is also considered protective against Vyadhi (disease) and beneficial for maintaining physical appearance and vitality. Vyayama is described to strengthen Agni, thereby facilitating proper digestion and metabolic efficiency. It is considered particularly beneficial for Balinam (physically strong individuals) consuming Snigdha Bhojana (nourishing diets), especially during Shishira and

Vasanta Rtu⁵.

Ayurveda emphasizes that exercise should be performed only up to Ardha Bala (half of one's capacity), with consideration of Vaya (age), Bala (strength), Shareera (body constitution), Desha (habitat), Kala (season) and Asana (dietary habits). Excessive exercise (Ati-Vyayama) is described to produce adverse effects such as Kshaya (tissue depletion), Trishṇa (excessive thirst), Aruchi (loss of appetite), Chardi (vomiting), Raktapitta (bleeding disorders), Bhrama (giddiness), Klama (fatigue), Kasa (cough), Svasa (dyspnoea), Jvara (fever) and Shoṣha (wasting). Furthermore, Vyayama is contraindicated immediately after meals, after excessive sexual activity and in individuals who are Kṛsha (emaciated), Kṣhiṇa (debilitated), or suffering from Trishṇa, Bhrama, Svasa, Kasa, or Kṣhata. These classical descriptions demonstrate conceptual parallels with contemporary principles of individualized exercise prescription, recovery strategies, obesity management, healthy ageing and the prevention of exercise-induced overtraining and physiological stress.

Sports physiology is the scientific discipline that examines the acute and chronic effects of physical activity on the structure and function of the human body. It investigates physiological responses and adaptations of the musculoskeletal, cardiovascular, respiratory, metabolic, endocrine and neuromuscular systems to exercise and training. An evidence-based understanding of these responses provides the basis for optimizing athletic performance, improving physical fitness, preventing injuries and promoting safe and effective exercise practices.

The principles of sports physiology have broad applications in athletic performance and health promotion. Assessment of physiological parameters such as cardiovascular endurance, muscular strength, aerobic capacity and metabolic efficiency facilitates the development of individualized training programmes according to an individual's sport, fitness level and physiological characteristics. Knowledge of biomechanics, training load and physiological limits contributes to injury prevention by identifying movement deficiencies and reducing the risk of overtraining and musculoskeletal injuries. Furthermore, evidence-based approaches to nutrition, hydration, active recovery and rehabilitation support tissue repair, restoration of functional capacity and safe return to physical activity. Collectively, these principles contribute to improved performance, long-term health and overall well-being.

Table 2. Conceptual Correlation Between Ayurveda and Sports Physiology

Modern sports physiology	Ayurvedic concept	Functional correlation
Improved energy metabolism	Agni	Enhanced metabolic transformation and energy production
Increased muscular strength	Bala	Improved physical strength and functional capacity
Muscle hypertrophy	Mamsa Dhatu	Development and maintenance of muscle tissue
Cardiovascular adaptations	Vyana Vata	Circulation and distribution of nutrients and energy
Respiratory efficiency	Prana Vata	Regulation of respiration and vital functions
Thermoregulation	Pitta Dosha	Heat production and metabolic regulation
Fluid balance	Kapha Dosha	Maintenance of stability and hydration
Exercise tolerance	Laghava, Sthairya	Improved endurance and physical efficiency
Recovery following exercise	Dhatu Poshana	Tissue nourishment and restoration
Overtraining	Ati-Vyayama	Fatigue, tissue depletion and impaired physiological function

DISCUSSION

Muscle Physiology and Metabolism

Exercise performance depends largely on muscle strength, power and endurance, all of which require a continuous supply of energy in the form of adenosine triphosphate (ATP). During physical activity, ATP is generated through three principal energy systems: the phosphagen (ATP-phosphocreatine) system, the anaerobic glycolytic system and the aerobic oxidative system. The relative contribution of these pathways varies according to the intensity and duration of exercise. Acute and chronic exercise adaptations improve metabolic efficiency and enable sustained physical performance.

From an Ayurvedic perspective, muscle tissue can be conceptually related to Mamsa dhatu, while energy production and metabolic transformation may be interpreted through the functional role of Agni. Efficient metabolism and optimal physical performance are suggestive of appropriate Dhatvagni function and adequate Bala (strength and vitality). Regular Vyayama is described to promote metabolic efficiency and improve the functional capacity of bodily tissues.

Cardiovascular Adaptations

Exercise induces significant cardiovascular adaptations to meet the increased metabolic demands of active tissues. During moderate to vigorous exercise, cardiac output may increase several-fold, accompanied by increases in stroke volume, heart rate and blood flow to exercising muscles. Repeated training further enhances cardiovascular efficiency and contributes to improved endurance and physical performance.

These physiological adaptations demonstrate conceptual parallels with the functions attributed to Vyana Vata in Ayurveda. Vyana Vata governs circulation, movement and the distribution of nutrients and energy throughout the body. Efficient cardiovascular responses during exercise may therefore be interpreted as manifestations of the proper functioning of Vyana Vata.

Respiratory Adaptations

Exercise substantially increases oxygen demand, resulting in enhanced pulmonary ventilation, oxygen uptake and gas exchange. Endurance training further improves respiratory efficiency and oxygen diffusion capacity, enabling greater aerobic performance.

In Ayurveda, Prana Vata is responsible for the maintenance of vital functions, including respiration and the regulation of life-sustaining activities. The enhanced respiratory efficiency observed during exercise may be conceptually correlated with the optimal functioning of Prana Vata, which supports the intake and utilization of vital energy.

Thermoregulation and Fluid Balance

Increased metabolic activity during exercise generates considerable amounts of heat. Thermoregulatory mechanisms, particularly sweating and alterations in cutaneous blood flow, are activated to maintain body temperature within physiological limits. Prolonged exercise may also result in significant fluid and electrolyte losses.

From an Ayurvedic perspective, heat generation during exercise exhibits conceptual similarities to the functions of Pitta Dosha, which governs transformation and metabolic activity. Maintenance of fluid balance and bodily stability may be related

to the supportive functions of Kapha Dosha. Excessive sweating and dehydration have the potential to disturb Dosha equilibrium and impair physiological performance.

Adaptations to Training

Regular physical training induces numerous beneficial adaptations, including muscle hypertrophy, increased mitochondrial density, enhanced oxidative capacity and improvements in muscular strength and endurance. These adaptations collectively contribute to improved functional efficiency and exercise tolerance.

Ayurveda similarly describes that regular and appropriately performed Vyayama promotes Bala, enhances the stability of Dhatus and improves Agni, thereby facilitating proper nourishment and maintaining physiological equilibrium. These descriptions suggest a holistic understanding of exercise-induced adaptations and their role in preserving health and vitality⁶.

Effects of Excessive Exercise

Although exercise is essential for maintaining health, excessive physical activity may lead to adverse physiological consequences. Modern exercise physiology recognizes that overtraining may result in fatigue, metabolic disturbances, impaired recovery, hormonal imbalance and reduced performance.

Ayurveda describes similar consequences under the concepts of Ati-Vyayama and Cheshtatiyoga. Excessive exercise is associated with manifestations such as Shrama (fatigue), Kshaya (tissue depletion), Trishna (excessive thirst), Kasa (cough) and Jwara (fever). These descriptions indicate that exercise beyond an individual's adaptive capacity can produce systemic disturbances and compromise health.

Overall, sports physiology explains exercise responses through the coordinated interaction of the musculoskeletal, cardiovascular, respiratory, metabolic and neuroendocrine systems to maintain homeostasis and optimize performance. Ayurveda provides a complementary functional perspective through the dynamic interplay of Doshas. Vata governs movement and neuromuscular activity, Pitta regulates metabolism and heat production and Kapha contributes to stability, endurance and structural integrity.

A fundamental principle shared by both systems is the importance of appropriate exercise dosage. The Ayurvedic concept of Vyayama Matra emphasizes that exercise should be performed according to an

individual's Bala, constitution, age and adaptive capacity. Similarly, modern exercise science advocates individualized exercise prescription, progressive adaptation and adequate recovery. Thus, both perspectives underscore the importance of moderation, individualized capacity, gradual adaptation and recovery in achieving optimal physical performance and maintaining health.

CONCLUSION

The concept of Vyayama described in Ayurveda represents a systematic and individualized approach to physical activity that emphasizes moderation, functional capacity and maintenance of physiological equilibrium. Classical Ayurvedic texts attribute regular and appropriately performed Vyayama to the promotion of Bala (strength), Laghava (lightness of the body), Sthairya (stability), enhancement of Agni (metabolic and transformative capacity) and preservation of overall health, while also cautioning against the adverse consequences of Ati-Vyayama (excessive exercise).

Contemporary sports physiology similarly recognizes exercise as an important determinant of musculoskeletal function, cardiovascular performance, respiratory efficiency, metabolic adaptation, thermoregulation and maintenance of homeostasis. The present review identifies conceptual parallels between these modern physiological adaptations and Ayurvedic principles interpreted from a Kriya Shareera perspective.

An integrative understanding of sports physiology and Ayurveda provides a broader framework for appreciating the effects of exercise on health and physical performance. The shared emphasis on individualized exercise prescription, moderation, gradual adaptation and adequate recovery highlights the relevance of Ayurvedic principles in contemporary exercise science. Further interdisciplinary and clinical research is required to explore these conceptual correlations and their potential applications in health promotion and exercise management.

REFERENCES

1. Guyton AC, Hall JE. Textbook of medical physiology. 12th ed. New Delhi: Elsevier; 2006. Chapter 84, Sports physiology; p. 1031.
2. Sharma PV, editor and translator. Caraka Samhita. Vol. 1. Reprint ed. Varanasi: Chaukhambha Orientalia; 2014. Sutrasthana, Chapter 7, Verse 31.
3. Han J, Lalario A, Merlo E, Sinagra G, Sharma S, Papadakis M, et al. Sudden cardiac death in athletes: facts and fallacies. J Cardiovasc Dev Dis. 2023;10(2):68. doi:10.3390/jcdd10020068.

4. Guyton AC, Hall JE. Textbook of medical physiology. 12th ed. New Delhi: Elsevier; 2006. Chapter 84, Sports physiology; p. 1066.
5. Sharma PV, editor and translator. Sushruta Samhita. Vol. 2. Varanasi: Chaukhambha Vishvabharati; 2018. Chikitsasthana, Chapter 24, Verse 31.
6. Sharma PV, editor and translator. Sushruta Samhita. Vol. 2. Varanasi: Chaukhambha Vishvabharati; 2018. Chikitsasthana, Chapter 24, Verse 31.

Financial Support: Self-financed. **Conflict of Interest:** None

How to cite: Pretty P, Sunagar MB. Ayurvedic concept of Exercise in the context of Sports Physiology: A Scoping Review. TAIJA – Tatwachintanam – International Journal of Ayurveda. 2026;2(1):20-25.