

Research Article

Effect of Yogic Practices on Flexibility Using the Sit and Reach Test

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Abstract

This study examines the impact of a structured yoga training program on flexibility among students enrolled in the Post Graduate Diploma in Yoga Therapy Education (PGDYTE) at Rajiv Gandhi University, using the Sit and Reach Test as the primary assessment tool for lower back and hamstring extensibility. The intervention included a comprehensive sequence of asanas performed in standing, sitting, prone, and supine positions, complemented by relaxation practices such as the Deep Relaxation Technique, with the objective of determining whether regular yogic practice yields measurable improvements in physical flexibility. Data were collected from 20 participants through pre-test and post-test assessments, with results revealing a significant increase in flexibility, as reflected by the rise in mean scores from 34.45 to 42.05. A paired samples t-test confirmed the effectiveness of the intervention ($t = -9.547$, $p < .001$), demonstrating that consistent yoga practice produced meaningful gains in musculoskeletal function. These findings highlight the therapeutic potential of yoga as a holistic modality that supports physical well-being, enhances flexibility, and contributes to overall health promotion. The study underscores the relevance of integrating yoga into educational and wellness programs, while also suggesting the need for further research to explore the long-term sustainability of flexibility improvements and to better understand the physiological mechanisms underlying these positive outcomes.

Keyword

Yoga, Health, Flexibility, Sit and Reach Test, Rajiv Gandhi University

1. Introduction

Yoga has emerged as a globally recognized discipline that integrates physical, mental, and spiritual dimensions of human existence. In contemporary society, it is widely practiced both as an effective strategy for managing stress and as a holistic approach to physical fitness and well-being [1]. The

principal schools of yoga Karma Yoga, Bhakti Yoga, Raja Yoga, Jnana Yoga, and Hatha Yoga emphasize the attainment of spiritual perfection through mastery of the body and mind. These traditions employ various techniques such as prāṇāyāma, mudrās, and śaṭ karma to facilitate

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self-realization and internal harmony [2].

The historical roots of yoga trace back approximately 5,000 years to the Indus Valley Civilization, where early forms of yogic practices are believed to have originated [3]. According to yogic mythology, Lord Shiva is revered as the first Yogi (Adiyogi) and the primordial Guru (Adiguru), symbolizing the inception of yogic knowledge [4]. The systematization of these diverse practices and philosophies was later achieved by the sage Maharishi Patanjali, whose seminal work, the *Yoga Sūtras*, codified the essence of yoga into 196 aphorisms distributed across four chapters [2].

The Samādhi Pāda, comprising 51 sūtras, elucidates the foundational principles of yoga and explores the nature of the human mind (*citta*) and its fluctuations (*vṛttis*). The Sādhana Pāda, consisting of 55 sūtras, examines the causes of human afflictions (*kleśas*) and introduces the *Aṣṭāṅga Yoga* the eightfold path encompassing moral, physical, and meditative disciplines [6]. The Vibhūti Pāda, also containing 55 sūtras, delves into higher yogic practices and the development of extraordinary powers (*siddhis*). The Kaivalya Pāda, the concluding section with 34 sūtras, presents the philosophical and metaphysical dimensions of liberation (*kaivalya*), addressing the nature of consciousness, perception, desire, and ultimate freedom [5].

The eight limbs of yoga *yama*, *niyama*, *āsana*, *prāṇāyāma*, *pratyāhāra*, *dhāraṇā*, *dhyāna*, and *samādhi* constitute an integrated system aimed at achieving self-realization and discriminative enlightenment. While the spiritual objective of yoga remains paramount, its contemporary relevance also lies in its proven benefits for psychological balance, physical health, physiological regulation, and spiritual growth [9].

2. Astanga or Eight Limbs of Yoga

- 1) Yama: (social codes- Consists of ahimsa, satya, asatya, brahmachari, aparigraha) Codes of restraint, abstinences, self regulations
- 2) Niyama: (personal code consists of sauca, santosa, tapa, swadhyaya, ishwarapranidhana) Observances, practices, self-training
- 3) Asana: Posture
- 4) Pranayama: (control of sense) Expansion of breath and prana, regulation, control
- 5) Pratyahara: Withdrawal of the senses, bringing inward
- 6) Dharana: Concentration
- 7) Dhyana: Meditation
- 8) Samadhi: Super consciousness- Deep absorption, meditation in its higher state, the state of perfected concentration

Engaging in regular physical activity is universally recognized as a cornerstone of a healthy lifestyle, fostering both physiological and psychological well-being while optimizing human performance across multiple domains. Insufficient physical activity contributes to the deterioration of natural muscular flexibility and strength, diminishing kinesthetic

awareness and leading to biomechanical imbalances that may result in postural deviations and musculoskeletal pain. Furthermore, chronic exposure to psychosocial stress has become an increasingly prevalent health concern in modern society, adversely influencing physical health, emotional stability, and cognitive functioning [1]. Although external stressors may remain beyond individual control, the regulation of bodily functions, breath, and mental states lies within human capability. The practice of yoga provides an effective means for this regulation, integrating the body, breath, and mind to mitigate the physiological and psychological impacts of stress, thereby promoting holistic well-being [4].

Yoga facilitates a state of harmony wherein the practitioner attains heightened awareness of their physical and mental states through the synchronization of movement, respiration, and concentration. Within this framework, flexibility refers to the elasticity and functional capacity of soft tissues including muscles, tendons, fascia, joint capsules, ligaments, and neurovascular structures that enable pain-free motion across joints [12]. Flexibility is influenced not only by the structural characteristics of soft tissues but also by neuromuscular factors such as muscle tone, proprioceptive feedback, and the responsiveness of sensory receptors embedded within the musculature. The nervous system regulates the extent and rate of muscular stretch, ensuring biomechanical safety and functional efficiency [13].

A decline in range of motion is often attributed to muscle tightness resulting from sedentary behavior, repetitive strain, or mechanical compression of periarticular soft tissues [19]. Regular yogic practice, however, has been shown to elicit significant and progressive improvements in flexibility. These adaptations occur primarily through sustained stretching, static postural retention, and controlled joint articulation across the full range of motion [14]. Yogic postures enhance joint lubrication and compressive stimulation of articular cartilage, facilitating the distribution of synovial fluid that delivers essential oxygen and nutrients to cartilage regions typically underutilized in daily movements [9].

Accordingly, the present study aims to examine the quantitative effects of regular yogic practice on musculoskeletal flexibility among young, healthy male and female students. Using the Sit and Reach Test, this investigation evaluates measurable changes in flexibility, thereby contributing empirical evidence to the growing body of literature supporting yoga as a scientifically grounded modality for physical conditioning and stress reduction [9, 10].

3. Methodology

This study aimed to examine the effect of six weeks of yogic practice on the flexibility of the lower back and hamstring muscles among students of the Postgraduate Diploma in Yoga Therapy Education at Rajiv Gandhi University. Flexibility is a vital component of physical fitness that supports posture, spinal alignment, and movement efficiency [12].

Yogic postures involving controlled stretching and breathing techniques are known to enhance neuromuscular coordination and muscle elasticity [14, 9].

Twenty participants underwent a six-week yogic training program emphasizing flexibility-oriented *āsanas* such as *Paschimottanasana*, *Trikonasana*, and *Bhujangasana*. Flexibility was assessed using the Sit and Reach Test, a reliable measure of lower back and hamstring flexibility [15]. Each participant sat with legs extended and reached forward with both hands while maintaining straight knees; the farthest reach was recorded as the score. This test was chosen for its validity, simplicity, and effectiveness in detecting training-induced improvements in flexibility [11].

Measurement Procedure for the Variable:

The primary variable examined in this study was flexibility, focusing on the lower back and hamstring muscles. A structured six-week yogic training program was implemented to enhance this component of physical fitness. Participants received supervised training sessions twice daily—morning sessions from 6:00 to 7:00 a.m. and evening sessions from 3:00 to 4:00 p.m., excluding Sundays. Each session lasted 60 minutes and incorporated selected *āsanas* designed to promote flexibility and muscle elongation. Pre-test and post-test assessments were conducted using the Sit and Reach Test to evaluate changes in flexibility following the six-week intervention. This training schedule ensured consistent exposure and adequate practice duration to produce measurable physiological adaptations [14, 9].

Table 1. Training Regime for 6 week Yogic Practices.

6 Week Yogic Practices For The Enhancement Of Flexibility			
Sl. No	Position	Yogic Postures	Time
1	Warm Up/Loosening Practices.	Joint Movements	10 minuts
2	Standing	Vrikshasana	12 minuts
		Tadasana	
		Virbhadrasana	
		Utatanekapada	
		Uttan Eka Pada Sirasana	
		Utannasana	
3	Sitting	Bhadrhakonasana	12 minuts
		Janusirasana	
		Paschiomootanasana	
		Bhumasana	
		Hanumanasana	
4	Prone	Eka Pada Sirasana	6 minuts
		Bhujangasana	
		Salabasana	
5	Supine	Dhanurasana	6 minuts
		Uttanpadasana	
		Naukasana	
6	Relaxation Practices	Pawn Mukta Asana	4 minuts
		Merudandasanas	
7	Deep Relaxation Technique	Yog Niodra	10 minuts
Duration Of Yogic Practices			60 minuts

4. Sit and Reach Test

4.1. Objective

Sit and Reach Test measures the flexibility of the lower back and hamstrings.

4.2. Required Resources

To undertake this test you will require:

- Sit and Reach Box about 50cm (12 inches) high.
- A meter rule.

4.3. Test Procedure

The participant should be seated on the floor without shoes. They should position the soles of their feet (10 to 12 inches apart) against the side of a box, which is approximately 12 inches or 30 cm high, with their knees fully extended. Upon hearing the start signal from the tester, the participant will place one hand over the other and push against a measuring plate positioned on top of the box, attempting to reach as far as possible without bending their knees. The best result out of three attempts will be recorded.



Source: Author 2024



Source: Author 2024

Figure 1. Sit-and-Reach Test Procedure for Data Collection.

5. Result

Table 2. Descriptive Result of Pre and Post Test of Yogic Students.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	34.4500	20	5.40	1.21

	Mean	N	Std. Deviation	Std. Error Mean
Post Test	42.0500	20	3.91	0.88

This section presents the analyzed data obtained from participants, including descriptive statistics and comparative outcomes. The findings highlight the key patterns, differences, and significant results derived from the study's measurements.

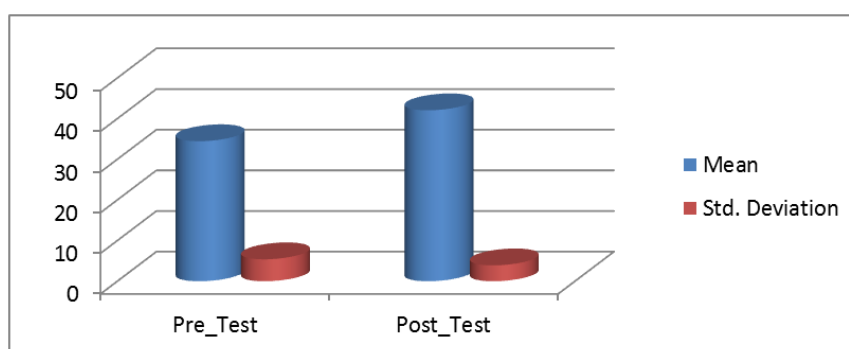


Figure 2. Graph Shows the Result of Pre and Post Test of Yogic Students.

The descriptive statistics presented in Table 1 indicate a notable improvement in flexibility following six weeks of yogic training. The mean pre-test score of participants was 34.45 (SD = 5.40), while the mean post-test score increased to 42.05 (SD = 3.91). This represents a mean gain of 7.60 points, suggesting a substantial enhancement in lower back and hamstring flexibility after the intervention.

The smaller standard deviation in the post-test (3.91) compared to the pre-test (5.40) also indicates a reduction in variability among participants' scores, implying that the training produced more consistent outcomes across the group. The lower standard error of the mean (0.88) in the post-test further supports the reliability of the post-intervention results.

Table 3. Result of Mean, Standard Deviation (SD) and 't' Value of Pre and Post Test of Yogic Players.

		Mean	Std. Deviation	Std. Error Mean	t	df	Sig.
Pair 1	Pre_Test - Post_Test	-7.60000	3.56001	.79604	-9.547	19	.000

The findings presented in Table 2 reveal a significant improvement in flexibility among the participants following six weeks of yogic training. The mean pre-test score (M = 34.45, SD = 5.40) increased to a mean post-test score (M = 42.05, SD = 3.91), yielding a mean difference of 7.60 points.

The results of the paired samples t-test indicate that this difference is statistically significant, $t(19) = -9.55$, $p < .001$. This suggests that the observed improvement in lower back and hamstring flexibility was not due to chance but rather the effect of the yogic intervention. The negative t -value reflects the direction of change (post-test scores being higher than pre-test scores) [7].

Additionally, the reduction in standard deviation from pre- to post-test indicates greater consistency among participants after the intervention. These results confirm that six weeks of structured yogic training produced a significant and reliable enhancement in flexibility, supporting previous findings that regular yoga practice improves muscular elasticity and joint mobility [14, 9].

6. Discussion

In previous investigations, the beneficial effects of yoga on physical flexibility and overall well-being have been consistently emphasized. For example, Telles, Hanumanthaiah, Nagarathna, and Nagendra (1993) conducted a study examining the impact of a comprehensive yoga program on flexibility among adults. Their findings demonstrated significant enhancements in flexibility measures after a six-month yoga intervention, aligning with the outcomes observed in the current study. Moreover, a meta-analysis conducted by [1] scrutinized the effects of yoga on various health outcomes, including flexibility, synthesizing data from numerous randomized controlled trials. The meta-analysis concluded that yoga interventions consistently contributed to improvements in flexibility across diverse populations. These seminal findings provide a robust theoretical framework for the present

study's exploration of yogic practices and their effects on flexibility [8, 14].

Moreover, the observed mean difference of -7.60 points in the Sit and Reach Test scores aligns with the expected outcomes based on the principles of yoga. Yoga incorporates a variety of stretching and flexibility-focused poses (asanas) aimed at increasing joint mobility and muscle elasticity [2]. By regularly engaging in these practices, individuals may experience gradual improvements in their flexibility over time. The substantial improvement in flexibility observed in this study underscores the efficacy of yoga as a therapeutic modality for enhancing physical flexibility. This aligns with the broader philosophy of yoga, which emphasizes holistic well-being encompassing physical, mental, and spiritual dimensions [3]. Thus, the current findings not only contribute to the growing body of evidence supporting the benefits of yoga for physical health but also underscore its potential role in promoting overall wellness and quality of life.

7. Conclusion

The findings of this study demonstrated a significant improvement in lower back and hamstring flexibility following six weeks of structured yogic training among postgraduate students. The post-test scores revealed that consistent yoga practice effectively enhanced musculoskeletal elasticity, joint mobility, and neuromotor coordination, confirming yoga's role as a scientifically supported method for improving physical fitness parameters. These outcomes align with earlier research indicating that regular yogic exercises foster improved flexibility, muscle efficiency, and physical performance through static and dynamic stretching mechanisms [16, 18].

Moreover, the results underscore yoga's broader implications as a preventive and rehabilitative strategy for maintaining postural integrity and reducing the risk of musculoskeletal injuries in active individuals [17]. The integration of

yoga into physical education curricula can thus be an effective approach for enhancing physical and psychological well-being, promoting holistic health, and encouraging sustainable fitness practices among students [19]. Future research should expand on these findings by incorporating larger sample sizes, diverse populations, and longer training durations to examine the longitudinal effects of yogic intervention on flexibility and performance outcomes.

Conflicts of Interest

The authors declare no conflicts of interest.

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