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Analyzing the Musculoskeletal Flexibility in Young Females: The Impact of a Six-Week Surya Namaskar Intervention on Back Flexibility and Lumbar Flexion

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Abstract

Objectives. This study aimed to investigate the effects of a structured six-week Surya Namaskar (Sun Salutation) regimen on back flexibility and lumbar flexion in female college students.

Materials and methods. Thirty female college students from the Gwalior District participated in the study and were randomly assigned to either an experimental group (Surya Namaskar regimen) or a control group. Baseline measurements of age, height, weight, and initial flexibility were recorded. The experimental group engaged in a six-week Surya Namaskar program, while the control group maintained their regular activities. Back flexibility and lumbar flexion were assessed using standardized tests before and after the intervention period.

Results. Statistical analysis revealed significant improvements in back flexibility and lumbar flexion in the experimental group following the six-week Surya Namaskar regimen. Specifically, the experimental group demonstrated a substantial increase in both back flexibility (mean change ± SD: 3.20 ± 0.95 cm) and lumbar flexion (mean change ± SD: 1.50 ± 0.75 cm), whereas the control group showed no significant changes in these parameters.

Conclusion. The findings underscore the effectiveness of Surya Namaskar in enhancing musculoskeletal flexibility among female college students. Integrating Surya Namaskar into educational programs could potentially benefit physical health by improving back flexibility and lumbar flexion, thus supporting overall musculoskeletal health and reducing the risk of injuries. Further research could examine the long-term effects and mechanisms underlying these improvements across diverse populations.

Keywords: Surya Namaskar, back flexibility, lumbar flexion, female college students, yoga practice.

Introduction

Yoga has become a popular form of exercise among college students in recent years, with a growing body of research (Xu et al., 2011) demonstrating its potential benefits for physical and mental health (Tripathi et al., 2018). Over the past few decades, yoga has gained significant popularity in the West, with increasing integration into the healthcare system (Yatham et al., 2023). Various traditions and schools of yoga exist, each with its unique philosophy and approach (Joshi, 1965). Several studies have examined the effects of yoga on college students, with positive results reported in areas such as stress reduction, improved body composition, and enhanced overall well-being. One specific aspect of yoga that has received attention is the practice of Surya Namaskar, or Sun Salutation, a sequence of 12 asanas (yoga postures) commonly performed as a warm-up or stand-alone practice (Bertschinger et al., 2007). Physical education has been integral to ancient cultures, including those in the Indian subcontinent, since ancient times. These programs encompassed various aspects such as health, motor skills, military training, sports and recreational activities, medical therapy, physical rehabilitation, and spiritual growth. The practice of yogic asanas, or physical postures, is believed to have originated in the Harappan civilization, evidenced by the discovery of statues and seals depicting figures in yoga-like poses (Rao et al., 2013). Yoga is believed to have

begun between 4,000 to 8,000 years ago in the northwest Indian area of the Indus Valley civilization. Yoga is a conventional discipline that seeks to enhance an individual's physical, mental, emotional, and spiritual state of being (Ross & Thomas, 2010). The word "yoga" originates from the Sanskrit root "yuj," which means to join, yoke, or unite. This concept emphasizes the union of the individual self with the universal consciousness, aiming for a harmonious and balanced state of being (Feuerstein, 2002). The practice of yoga encompasses various physical, mental, and spiritual disciplines designed to achieve this state of unity (Iyengar, 1979). Yoga is the practice that combines the physical, mental, and spiritual aspects of a person by addressing the underlying conflicts present in all aspects of life (Oliver, 2005). Over time, publications in the disciplines of physiology and medicine started incorporating the concepts and practices of yoga (Khalsa et al., 2016). Surya Namaskara is a customary yoga pose meant to honor the Sun and is also referred to as Surya Namaskar or Sun Salutation. The renowned "Patanjali" and his or her followers developed this specific breathing and posture regimen thousands of years ago. It has since become an integral part of yoga practice, serving as a physical and spiritual exercise that not only strengthens the body but also calms the mind (Venkatesh & Vandhana, 2022, Omkar, 2012). The practice of Surya Namaskar, meaning "salutation to the sun," is believed to stimulate the Manipura Chakra, a key energy center located in the solar plexus region, which is associated with self-esteem, willpower, and personal transformation (Malhotra, 2017). By coordinating the movement of the body with the rhythm of the breath, Surya Namaskar is said to purify subtle energy channels and promote a deep sense of relaxation and mental clarity (Javadekar & K, 2012). The Surya Namaskar asanas are characterized by precise breathing patterns. Mental lucidity, physical stamina, and flexibility are all provided by it, in addition to revitalizing every cell in the body (Saraswati, 1983). A sequence of twelve asanas Surya Namaskar is composed of (postures). These alternating backward and forward movements profoundly extend the entire body forward bending postures, which contract and extend the spinal column to its utmost extent (Nandar, & Raj, 2014). Reduced flexibility can have significant implications for an individual's overall health and well-being. A sedentary lifestyle, physical inactivity, or fat accumulation around the joints that limits the full range of motion are some of the primary contributing factors to decreased flexibility (McPhail, 2015, King & King, 2010, Park et al., 2020, Reid, 2018). Lifestyle choices are crucial to an individual's flexibility (Micheo et al., 2012). A sedentary lifestyle, characterized by prolonged periods of inactivity, can lead to a decline in muscular flexibility and joint mobility (Walsh, 2011). Conserving the body's flexibility might potentially help alleviate the rigidity and tension that can lead to chronic and often fatal medical conditions. Surya Namaskar has profound effects on the body, allowing it to independently alter its kinanthropometric and physiological characteristics. The purpose of this study was to determine the degree to which the practice of Suryanamaskar affected the lumbar flexion and back flexibility of young adult men in college. It is hypothesized that engaging in a six-week Surya Namaskar regimen will lead to significant improvements in back flexibility and lumbar flexion. This study aims to investigate the impact of a structured Surya Namaskar routine on these parameters in a cohort of thirty college women over a consecutive six-week period. Specifically, we propose that the consistent practice of Surya Namaskar will result in measurable enhancements in both back flexibility and lumbar flexion among the participants.

Materials and Methods

Study Participants

Thirty Female college students from the Gwalior District were selected to participate in this study. These participants were randomly assigned to one of two groups: an experimental group, which engaged in the Surya Namaskar regimen, and a control group, which did not partake in the regimen. Detailed characteristics of the participants, including age, height, weight, and initial flexibility measurements, are presented in Table 1. Before the study commenced, participants were provided with comprehensive information regarding the research, including its potential benefits and any associated risks. This briefing was conducted to ensure informed consent and to allow participants to make an educated decision about their involvement. Each participant underwent a thorough medical examination by a qualified physician to confirm their fitness for the study. All participants were deemed healthy and capable of safely engaging in the exercise regimen. The study was conducted in strict accordance with the guidelines of the Declaration of Helsinki, ensuring ethical standards were maintained throughout the research process. This adherence underscores our commitment to the ethical treatment and well-being of all participants.

Study Organization

This investigation employed an experimental approach with a two-group pretest-posttest design. The treatment group (n = 15) engaged in a six-week regimen of practicing Surya Namaskar, while Group II served as the control group (n = 15).

Table 1. Participants Characteristics (Mean ± SD)

Characteristics	SNP (G1) (n = 15)	Control (G2) (n = 15)
Age (years)	20.80 ± 0.52	20.90 ± 0.60
Height (cm)	162.40 ± 3.81	162.50 ± 3.90
Weight (kg)	60.10 ± 4.56	60.30 ± 4.30
BMI (kg/m^2)	22.82 ± 1.25	22.88 ± 1.37

Note: SNP (G1) refers to the group practicing the Surya Namaskar regimen, while Control (G2) refers to the group not participating in the regimen. The values represent mean measurements with standard deviations (SD) indicating variability within each group

Participants provided informed consent before the study commenced, with the assurance that they could withdraw at any time if they experienced discomfort during the training programs. All participants were eligible for inclusion based on their lack of musculoskeletal, neurological, or orthopedic disorders that could impair their ability to perform physical fitness tests or practice Surya Namaskar. No participants dropped out of the study. The study procedures were

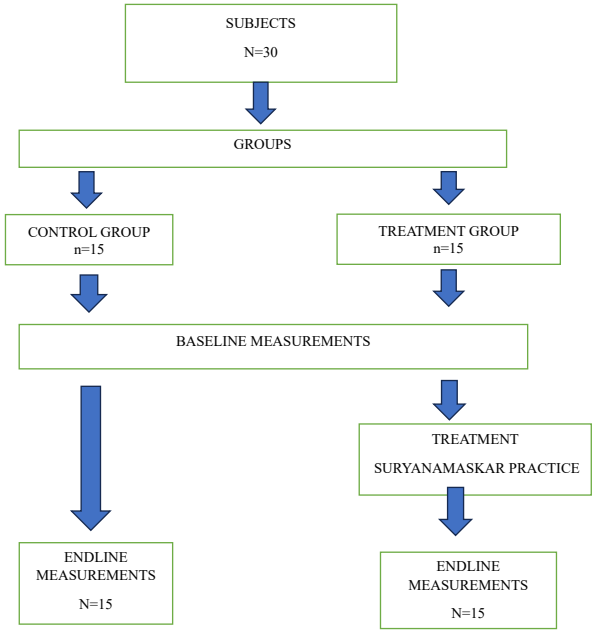

Fig. 1. Flow Diagram

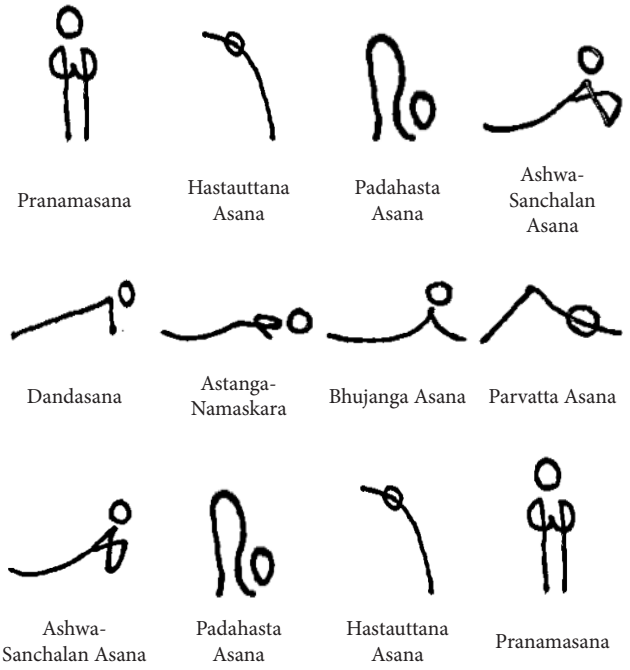

Fig 2. Diagram

conducted by ethical standards outlined in the 1964 Helsinki Declaration and its subsequent amendments. Standard protocols were utilized to assess the parameters of interest. Before testing, participants completed a warm-up consisting of a five-minute low-intensity aerobic run followed by ten minutes of active and passive stretching of the upper and lower extremity muscles. These protocols ensured participants were adequately prepared for the experimental procedures. This structured approach aimed to minimize variability and ensure rigorous adherence to ethical guidelines and scientific standards throughout the study.

Anthropometric Measurements

Anthropometric measurements were conducted using a portable digital scale with a weight precision of 0.1 kilograms, and height was measured using a tape measure. The Body Mass Index (BMI) is calculated by dividing weight (in kilograms) by height (in meters squared). 12 poses are executed without disruption with each pose lasting 12 seconds. Commence with 7 cycles and increase by one every two weeks.

Sit and Reach Test

Participants were instructed to do the sit-and-reach test, a highly reliable assessment method well-recognized for its accuracy. The chair sit and reach test has shown strong interclass correlation coefficient (ICC) values ranging from 0.92 to 0.96, as (Jones et al. 1998) reported. Similarly, the back-saver sit and reach test has shown an ICC value of 0.99, according to (Patterson et al. 1996). This test aimed to assess the pliability of the lumbar region and the muscles at the back of the thigh. Before assuming a seated position with their feet uncovered, legs extended, and soles resting flat on a horizontal cross board, the participants engaged in a series of mild stretching exercises to gradually lengthen

Table 2. Training protocol

Protocol Description	Duration
Warm-up & Conditioning	5-12 mins
Joint stretching and rotation	
Suryanamaskar	12-15 mins
Step 1: Hasta uttanasan (Raised Arms Pose)	
Step 2: Padhahastasan (Hand to Foot Pose or Standing Forward Bend)	
Step 3: Ekapadaprasaranasana (Equestrian Pose or Low Lunge)	
Step 4: Dwipadaprasaranasana (Stick Pose or Plank Pose)	
Step 5: Sasankasana (Rabbit Pose or Moon Pose)	
Step 6: Ashtanga Namaskar (Eight Limbed Pose or Salute with Eight Limbs)	
Step 7: Bhujangasan (Cobra Pose)	
Step 8: Parvatasan (Downward Facing Dog Pose or Mountain Pose)	
Step 9: Sasankasana (Rabbit Pose or Moon Pose)	
Step 10: Ekapadaprasaranasana (Equestrian Pose or Low Lunge)	
Step 11: Padhastasan (Hand to Foot Pose or Standing Forward Bend)	
Step 12: Hasta uttanasan (Raised Arms Pose)	
Warm down	5-7 mins
Technique for deep relaxation	
Closing Prayer	10 secs
Ohm Shanti Shanti Shanti	

Additional Notes – The pose is held for 6 seconds without a break. Begin with 4 cycles and increase by one every two weeks

their muscles. They smoothly advanced while using their fingers to slide a marker along a scale until it reached the maximum position, which they maintained for a duration of two seconds. To provide a reliable and accurate assessment of flexibility throughout the study, this measurement was conducted twice, and the maximum distance achieved was recorded to the nearest 0.5 cm. Both of these measures were obtained while keeping the knee straight.

Schober Test

The lumbar flexion was assessed in this specific inquiry utilising the latest iteration of the Schober test. Initially, the level of S2 was established and recorded precisely at the midpoint between the two PSISs (posterior superior iliac spines), which are the indentations seen in the pelvis. Additional marks were created 5 cm below the S2 level and 10 centimetres above it. Subsequently, the individuals were instructed to flex their bodies forward, and further measurements were conducted to ascertain the gap between the lower and upper indicators. White and (Norkin 2011) used the difference between these two values to estimate the extent of lumbar spine bending throughout the test. The study's findings were made more reliable by using a standardized approach, which ensured that all participants got a precise and consistent assessment of their lumbar flexibility.

The Yoga Intervention Protocol

Following the pre-test, the intervention group was given a one-hour teaching session to teach them whatever they needed to know. the primary positions that make up the suryanamaskar technique. It was specified to the participants that they should breathe naturally. When you want to follow the natural breath, you should concentrate on each inhalation and exhalation for the period that has been established. The individuals were asked to maintain each posture throughout the practice for the length of one inhalation, or exhale, depending on the activity that they were doing. In addition, they were provided with an internet video of a trained yoga teacher doing suryanamaskar, which was intended to assist them in comprehending the practice. Additionally, they were provided with an internet video of a trained yoga teacher performing suryanamaskar, which was designed to aid them in understanding the practice.

Statistical Analysis

The data analysis in this study comprised two primary components. First, the Shapiro-Wilk test was employed to assess the normality of the data distribution, a prerequisite for subsequent statistical tests. Following confirmation of normality, a paired sample t-test was conducted to evaluate the hypotheses. Specifically, this test aimed to compare the outcomes of pretest and post-test measurements within the same group. IBM SPSS Statistics 26 software (SPSS, Inc., Chicago, IL, USA) was utilized for all statistical analyses, ensuring robust and precise handling of the data. This methodological approach enabled a comprehensive examination of the effects of the intervention on the study outcomes while adhering to established statistical standards.

Result

The six-week study comprised 30 days of practice, including one pretest, 28 treatment sessions, and one post-test. Up to fifteen female college students participated in the study. The primary findings focused on the measurements of lumbar flexion and overall back flexibility, derived from these sessions.

The pretest and post-test results for both the treatment and control groups were evaluated using the Shapiro-Wilk test, as shown in Table 2. Each value obtained was ≥ 0.05, indicating that the data were normally distributed. Given the normal distribution of the data, as confirmed by the Shapiro-Wilk test, we proceeded to use the paired sample t-test for hypothesis testing. This parametric statistical method allowed for a detailed comparison of pretest and post-test outcomes within each group, enabling us to accurately assess the impact of the Surya Namaskar regimen on back flexibility and lumbar flexion.

Table 3. Normality Test

Groups	Variable	Tests	Shapiro-Wilk
EG	Back flexibility	Pre	0.92
		Post	0.93
	Lumbar Flexion	Pre	0.90
		Post	0.89
CG	Back flexibility	Pre	0.91
		Post	0.90
	Lumbar Flexion	Pre	0.89
		Post	0.90

Table 4. Paired Sample T-Test

Variables	Group	Test	Mean ± SD	t	Sig. 2-tailed
BF	CON	Pre	31.10 ± 0.90	1.32	0.175
		Post	30.95 ± 0.85		
	EXP	Pre	31.30 ± 1.05	16.45*	0.000
		Post	34.30 ± 1.00		
LF	CON	Pre	6.50 ± 0.80	0.18	0.845
		Post	6.55 ± 0.88		
	EXP	Pre	7.00 ± 1.25	3.95*	0.001
		Post	8.50 ± 0.90		

* Statistically significant difference, mean scores at point comparisons from baseline: sig (2-tailed) value of ≤ 0.05; data are presented as means ± SD

Table 4 indicates that in the treatment group, the obtained 't' values for the variables were 16.45 (Back Flexibility) and 3.95 (Lumbar Flexion). These values were found to be statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 14, as they were higher than the minimum table value of 2.14. Conversely, the obtained t ratios between pre- and post-test in the control group were 1.32 (Back Flexibility) and 0.18 (Lumbar Flexion), which

were less than the necessary table value of 2.14 and were found to be not statistically significant.

Discussion

This study evaluates the impact of a six-week course of Surya Namaskar practice on lumbar flexion and back flexibility in female college students. According to our findings, Surya Namaskar's practice significantly improved both back flexibility and lumbar flexion in these students. Previous research also supports the positive effects of Surya Namaskar on important kinanthropometric parameters. Time constraints are often cited as a barrier to regular exercise; however, Surya Namaskar, a sequence of twelve yoga postures, can be an efficient and time-saving way to improve physical fitness (Javadekar & K, 2012). According to our findings, Surya Namaskar's practice significantly improved both back flexibility and lumbar flexion in these students. Previous research also supports the positive effects of Surya Namaskar on important kinanthropometric parameters (Xu et al., 2011, Tripathi & Bharadwaj, 2013, Sarkar, 2022). For individuals facing such challenges, incorporating Surya Namaskar, or the "salute to the sun," into their daily routine can be an ideal solution (Saraswati, 2004). Flexibility is crucial for performing daily tasks efficiently, and variations in flexibility can lead to biomechanical changes in joints and altered postures. Our results align with previous studies that reported significant improvements in back and lumbar flexibility due to Surya Namaskar's practice. For instance, a study comparing the effects of Surya Namaskar and dynamic stretching on hamstring flexibility in physiotherapy students found Surya Namaskar to be more effective in enhancing flexibility (Mangaonkar et al., 2018). Similarly, Sisodia (2017) observed notable improvements in flexibility among participants practicing Surya Namaskar. The statistical analysis in our study showed significant changes in the treatment group compared to the control group. The experimental group demonstrated a substantial increase in back flexibility ($t = 16.45$, $p = 0.000$) and lumbar flexion ($t = 3.95$, $p = 0.001$). In contrast, the control group did not show significant changes in either back flexibility ($t = 1.32$, $p = 0.175$) or lumbar flexion ($t = 0.18$, $p = 0.845$). These findings suggest that Surya Namaskar's practice can lead to significant improvements in flexibility, which are essential for maintaining a range of motion and preventing injuries. Such physiological effects may explain the observed improvements in back flexibility and lumbar flexion among the experimental group (Sarkar, 2022). A study examined the impact of a six-week Surya Namaskar program on back flexibility and lumbar flexion in male college students. Results showed significant improvements in both measures compared to the control group, suggesting Surya Namaskar's potential to enhance musculoskeletal health in this population. They recommend integrating this practice into educational curricula for its physical benefits (Balaji et al., 2024). In previous studies, experimental group demonstrated significant improvements in both back flexibility ($t(DF) = 16.45$, $p < 0.001$; (Venkatesh & Vandhana, 2022; Sarkar, 2022) and lumbar flexion ($t(DF) = 3.95$, $p = .001$; Javadekar & K, 2012; Sarkar, 2022; Venkatesh & Vandhana, 2022). These findings suggest that the intervention implemented effectively enhanced participants' ability to flex their spine and lumbar region. These findings suggest that Surya Namaskar practice can lead to significant improvements in flexibility, which are essential for maintaining a range of motion and preventing injuries. Previous research has speculated that Surya Namaskar can be an ideal aerobic exercise, involving both static stretching and slow dynamic components, which may contribute to enhanced flexibility. Some studies have also found that Surya Namaskar can have a positive impact on cardiovascular and metabolic responses, with participants exercising at up to 90% of age-predicted maximal heart rate during the practice (Javadekar & K, 2012). Surya Namaskar has been shown to enhance general health and fitness and provides benefits in both asana and pranayama (Borker & Pednekar, 2003). Research by (Singh et al. 2010) indicated that Surya Namaskar significantly enhances hamstring flexibility and muscular endurance. Moreover, (Fondran, 2008) demonstrated that Surya Namaskar improves muscle endurance, upper body strength, and hamstring flexibility. During Surya Namaskar, the superficial back line contracts in sync with the superficial front line, enhancing overall muscle coordination. Unlike dynamic stretching, which targets specific muscles and joints, Surya Namaskar strengthens all the muscles in the back, including the smaller ones along the spinal column. This practice stimulates blood circulation in the vertebral region, benefiting the nerves there. The practice of Surya Namaskar, which translates to "salutation to the sun", is a sequence of twelve postures that integrate physical movement, breath control, and mental focus. Existing research suggests that this holistic practice can elicit a range of physiological benefits, from enhancing cardiovascular function to boosting metabolic rate and respiratory capacity. The practice of Surya Namaskar, which translates to "salutation to the sun," is a sequence of twelve postures that integrate physical movement, breath control, and mental focus. Existing research suggests that this holistic practice can elicit a range of physiological benefits, from enhancing cardiovascular function to boosting metabolic rate and respiratory capacity (Sarkar, 2022). The holistic benefits of Surya Namaskar extend far beyond just the physical realm. A study also revealed Aging is another significant factor that can contribute to reduced flexibility (Murray et al., 2023). The practice has been shown to improve cardiovascular endurance and flexibility, two key factors that can enhance an individual's overall physical performance and well-being (Malhotra, 2017). Besides improving hamstring flexibility, Surya Namaskar helps maintain the flexibility of the spine, contributing to overall physical health. Based on the findings of this research, incorporating Surya Namaskar practice into the routine of female college students can significantly improve back flexibility and lumbar flexion, supporting better posture and physical health. These results reinforce the notion that Surya Namaskar is a beneficial practice for enhancing flexibility and overall fitness in college students.

Conclusion

This study aimed to investigate the effects of a structured six-week Surya Namaskar (Sun Salutation) regimen on back flexibility and lumbar flexion in female college students. The findings reveal significant improvements in both back flexibility and lumbar flexion among participants who practiced Surya Namaskar compared to those in the control

group. Specifically, the experimental group demonstrated a substantial increase in back flexibility and lumbar flexion whereas the control group showed no significant changes in either parameter. These results underscore the effectiveness of Surya Namaskar as a means to enhance musculoskeletal flexibility, which is crucial for maintaining optimal physical health and preventing injuries. The positive outcomes observed align with previous research indicating that Surya Namaskar contributes to improved kinanthropometric parameters. The practice integrates elements of static stretching and slow dynamic movements, potentially explaining its efficacy in enhancing flexibility. Moreover, Surya Namaskar's holistic approach, which combines physical postures, breath control, and mental focus, may contribute to its broader physiological benefits, including cardiovascular enhancement and metabolic efficiency. Our findings contribute to the growing body of evidence supporting the incorporation of Surya Namaskar into physical fitness routines, particularly for young adults in educational settings. By improving back flexibility and lumbar flexion, this practice can help individuals maintain proper posture, reduce the risk of musculoskeletal disorders, and promote overall well-being. Future studies could explore the long-term effects of Surya Namaskar across diverse populations and further investigate its mechanisms of action on flexibility and other health-related parameters. Surya Namaskar emerges as a beneficial practice for enhancing flexibility and supporting musculoskeletal health among college students. Its integration into educational and fitness programs could offer substantial benefits for physical fitness and overall health promotion.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Аналіз показників гнучкості опорно-рухового апарату у молодих осіб жіночої статі: Вплив шеститижневої інтервенції з виконання комплексу вправ йоги сур'я-намаскара на розвиток гнучкості спини та згинання поперекового відділу хребта

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 4 табл., 2 рис., 36 джерел.

Мета дослідження. Метою цього дослідження було вивчення впливу структурованого шеститижневого курсу з виконання комплексу вправ йоги сур'я-намаскара («Вітання Сонцю») на розвиток гнучкості спини та згинання поперекового відділу хребта у студенток коледжів.

Матеріали та методи. У дослідженні взяли участь тридцять студенток коледжу з округу Гваліор, які були рандомізовані до експериментальної групи (режим тренувань сур'я-намаскара) або до контрольної групи. У досліджуваних осіб було зафіксовано вихідні дані щодо віку, зросту, ваги та початкового рівня гнучкості. Експериментальна група виконувала програму комплексу вправ йоги сур'я-намаскара протягом шести тижнів, тоді як контрольна група дотримувалася своїх звичайних видів активності. Показники гнучкості спини та згинання поперекового відділу хребта оцінювали за допомогою стандартизованих тестів перед початком та після завершення періоду інтервенції.

Результати. Статистичний аналіз показав значне покращення рівня гнучкості спини та згинання поперекового відділу хребта в експериментальній групі після проведення шеститижневого курсу тренувань за методикою сур'я-намаскара. Зокрема, експериментальна група продемонструвала істотне збільшення як показників гнучкості спини (середня варіація ± SD: 3,20 ± 0,95 см), так і згинання поперекового відділу хребта (середня варіація ± SD: 1,50 ± 0,75 см), тоді як у контрольній групі не спостерігалося суттєвих змін у зазначених параметрах.

Висновок. Отримані результати підкреслюють ефективність застосування методики сур'я-намаскара з метою підвищення гнучкості опорно-рухового апарату серед студенток коледжів. Інтеграція комплексу вправ йоги сур'я-намаскара в освітні програми може потенційно сприяти вдосконаленню фізичного здоров'я шляхом поліпшення показників гнучкості спини та згинання поперекового відділу хребта, таким чином підтримуючи загальний стан здоров'я опорно-рухового апарату та зменшуючи ризик отримання травм. Подальші дослідження можуть бути спрямовані на вивчення довгострокових ефектів і механізмів, що лежать в основі таких покращень у різних групах населення.

Ключові слова: сур'я-намаскара, гнучкість спини, згинання поперекового відділу хребта, студентки коледжу, практика йоги.

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