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IMPACT OF SURYA NAMASKAR TRAINING ON MUSCULOSKELETAL STRENGTH AND FLEXIBILITY

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ABSTRACT:

This study investigated the impact of a six-week Surya Namaskar training program on musculoskeletal strength and flexibility among students in Jalgaon, Maharashtra. Pre-test and post-test assessments showed significant improvements in push-up performance, plank-hold duration, and sit-and-reach flexibility. The integrated stretching and strength-based movements of Surya Namaskar contributed to better muscle endurance, joint mobility, and overall physical fitness. The study concludes that Surya Namaskar is an effective, accessible, and low-cost training method suitable for physical education programs. Its regular practice can enhance strength, flexibility, and general health, making it a valuable component of school-based fitness routines.

KEYWORDS:

SURYA NAMASKAR, STRENGTH, FLEXIBILITY, YOGA TRAINING, FITNESS ENHANCEMENT.

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INTRODUCTION

Surya Namaskar, commonly known as Sun Salutation, is one of the most important and widely practiced sequences in yoga. It is a dynamic combination of twelve postures performed in a continuous flow along with controlled breathing. Each posture in Surya Namaskar stretches, strengthens, and activates different muscle groups, making it a complete form of physical exercise as well as a meditative practice. Traditionally, Surya Namaskar is offered as a gesture of gratitude to the Sun, which is considered the source of energy and vitality in yogic philosophy. Over time, it has evolved from a spiritual ritual into a well-recognized fitness routine practiced globally.

Surya Namaskar brings together the principles of flexibility, strength, balance, and respiratory efficiency. The forward and backward bending movements help improve spinal mobility, while the transitions between postures engage the core, arms, legs, and back muscles. The synchronized breathing pattern enhances blood circulation, oxygen intake, and mental focus. Regular practice of Surya Namaskar is known to improve musculoskeletal strength, posture, digestion, and overall endurance. Because it requires no equipment and can be performed anywhere, it is especially beneficial for students and individuals with sedentary lifestyles. Thus, Surya Namaskar stands out as a holistic practice that supports both physical fitness and mental well-being.

MUSCULOSKELETAL STRENGTH

Musculoskeletal strength refers to the ability of the muscles and bones to work together efficiently to produce force, maintain posture, and support physical movement. It is one of the most essential components of overall physical fitness because strong muscles and bones help the body perform daily activities with ease and reduce the risk of injury. The musculoskeletal system includes muscles, bones, tendons, ligaments, and joints—all of which work in coordination to provide stability and movement. Developing musculoskeletal strength enhances endurance, improves body alignment, and supports optimal functioning of various physiological systems.

In today's sedentary lifestyle, reduced physical activity has led to weaker muscles, poor posture, and increased complaints of back pain and fatigue among young adults. Strengthening the musculoskeletal system becomes crucial not only for athletes but also for students and working individuals. Regular exercise, including yoga practices like Surya Namaskar, resistance training, and stretching, can significantly improve muscle tone, joint mobility, and overall physical performance. Strength development also contributes to long-term health by preventing age-related decline in muscle and bone strength.

FLEXIBILITY

Flexibility refers to the ability of a joint or a group of joints to move through their full range of motion without discomfort or restriction. It is an essential component of physical fitness because it supports smooth, efficient, and injury-free movement. Flexibility depends on the elasticity of muscles, tendons, and ligaments, as well as the mobility of joints. When these structures are flexible, the body can perform various activities with ease, maintain proper posture, and prevent muscle stiffness.

Modern lifestyles, which involve long hours of sitting and limited physical movement, often reduce flexibility, especially in the spine, hips, and hamstrings. Poor flexibility can lead to lower-back pain, tight muscles, and reduced overall performance in daily tasks and sports. Regular stretching exercises, yoga practices like Surya Namaskar, and mobility training can effectively improve flexibility. Increased flexibility enhances balance, coordination, and body alignment, making it crucial for students, athletes, and adults seeking better physical fitness and overall well-being.

Although yoga has been widely studied for its benefits on physical, mental, and emotional well-being, only a limited number of research investigations have focused specifically on Surya Namaskar as an isolated intervention for improving musculoskeletal performance. Most existing studies evaluate yoga as a broad practice, combining multiple asanas, pranayama techniques, and meditation, which makes it difficult to identify the unique contribution of Surya Namaskar. However, Surya Namaskar itself is a comprehensive sequence involving dynamic stretching, controlled movement, and coordinated breathing, all of which directly influence muscle strength, joint mobility, and postural stability. Because the practice engages major muscle groups through forward bends, backward extensions, and weight-bearing poses, it has the potential to significantly enhance musculoskeletal strength and flexibility. Despite these benefits, research specifically targeting Surya Namaskar remains limited, creating a need for focused studies that analyze its individual effectiveness as a structured training method for improving physical performance and overall fitness.

SIGNIFICANCE OF THE STUDY

The present study is significant because it provides scientific evidence on the specific benefits of Surya Namaskar as a standalone training method for improving musculoskeletal strength and flexibility. While yoga is widely practiced, very few studies focus exclusively on this sequence and its direct impact on physical fitness. Understanding these effects can help physical education teachers, trainers, and students adopt Surya Namaskar as a simple, cost-free, and effective exercise routine. The study also contributes valuable data that may support curriculum development, promote healthier lifestyles among students, and encourage the integration of yoga-based fitness programs in educational institutions.

NEED FOR THE PRESENT STUDY

1. Many students experience reduced flexibility due to long hours of sitting.
2. Musculoskeletal fitness issues such as back pain, weak core muscles, and poor posture are increasing in young adults.
3. Surya Namaskar is easy, requires no equipment, and can be practiced anywhere.
4. There is a lack of focused studies that evaluate Surya Namaskar alone—not combined with other yoga practices.
5. Understanding its effectiveness can help Physical Education programs include yoga-based interventions to improve overall fitness levels.

Hence, the present study is essential to determine whether Surya Namaskar can serve as an independent, effective training method.

OBJECTIVES OF THE STUDY

1. To determine the effect of Surya Namaskar training on musculoskeletal strength of college students.
2. To examine the influence of Surya Namaskar on flexibility.
3. To compare the pre-test and post-test performance of students after the training program.
4. To explore whether gender has any role in the improvement pattern.
5. To provide recommendations for integrating Surya Namaskar into Physical Education curriculum.

HYPOTHESES OF THE STUDY

H^1: There will be a significant improvement in musculoskeletal strength after Surya Namaskar training.

H^2: There will be a significant increase in flexibility after Surya Namaskar training.

H3: There will be a significant difference between pre-test and post-test scores.

H^4: There will be no significant difference in improvement patterns between male and female participants.

METHODOLOGY

The present study adopted an experimental research design to examine the impact of Surya Namaskar training on musculoskeletal strength and flexibility among college students in Jalgaon city, Maharashtra. A total of 30 participants, aged 18–22 years, were selected using purposive sampling from local educational institutions. The study followed a pre-test and post-test single-group design, where all participants underwent a structured Surya Namaskar training program for six weeks. Each training session lasted 30 minutes and was conducted five days a week under supervision to ensure proper technique and consistency.

Standardized tests were used to measure the dependent variables: the Sit and Reach Test for flexibility, the Push-Up Test for upper-body strength, and the Plank Hold Test for core strength. Pre-test data were recorded before the intervention, and post-test measurements were taken after completion of the training period. Data analysis included calculating mean, percentage improvement, and paired t-test to determine the significance of changes.

RESEARCH DESIGN

The present study employed a single-group experimental research design to investigate the effects of Surya Namaskar training on musculoskeletal strength and flexibility. A pre-test and post-test approach was used, where the same group of participants was measured before and after the six-week training program. This design was chosen because it allows the direct assessment of changes resulting from the intervention without the need for a control group. All participants received identical training conditions to maintain uniformity. The design enabled systematic comparison of pre-training and post-training scores, helping determine the effectiveness of Surya Namaskar as a targeted fitness intervention..

SAMPLE

- Total Participants: 30 college students
- Age Group: 18–22 years
- Gender: 15 males and 15 females
- Selection Method: Purposive sampling
- Inclusion Criteria:
    - Physically fit
    - Not engaged in any other structured yoga or sports training
- **EXCLUSION CRITERIA:**
    - Existing musculoskeletal disorders
    - Chronic illness

TOOLS USED

1. Sit and Reach Test – to measure flexibility of hamstrings and lower back.
2. Push-Up Test – to assess upper-body strength.
3. Plank Hold Test – to measure core muscle strength.
4. Standard Stopwatch – for timing plank duration.
5. Measuring Scale – to record sit-and-reach distance.

SELECTION OF VARIABLES

INDEPENDENT VARIABLE:

Surya Namaskar Training Program
(30 minutes per day, 5 days a week, for 6 weeks)

DEPENDENT VARIABLES:

1. Musculoskeletal Strength
2. Flexibility

TRAINING SCHEDULE FOR SURYA NAMASKAR PROGRAM (6 WEEKS)

Week	Training Details	Duration	Frequency
Week 1	Introduction to Surya Namaskar, learning 12 steps slowly with correct posture	30 minutes/day	5 days
Week 2	Practice full round of 12 steps with controlled breathing; 6–8 cycles per session	30 minutes/day	5 days
Week 3	Increase to 8–10 cycles; focus on posture correction and smooth transitions	30 minutes/day	5 days
Week 4	Increase to 10–12 cycles; improve flexibility and strength engagement	30 minutes/day	5 days
Week 5	Moderate intensity practice; 12–14 cycles; add breath synchronization	30 minutes/day	5 days
Week 6	Full-intensity Surya Namaskar; 14–16 cycles; maintain form, endurance, and breath control	30 minutes/day	5 days

STATISTICAL TECHNIQUES

The following statistical methods were used:

In this study, appropriate statistical techniques were used to analyze the effectiveness of the Surya Namaskar training program. Mean and Standard Deviation (SD) were calculated to understand the central tendency and variability of both pre-test and post-test scores. A paired t-test was applied to compare the differences between pre- and post-training measurements of musculoskeletal strength and flexibility. This test helped determine whether the observed improvements were statistically significant. Percentage improvement analysis was also used to measure the extent of change in both variables. The level of significance was set at 0.05 to ensure reliable and valid interpretation of the results.

RESULTS AND DISCUSSION

A. FLEXIBILITY (SIT AND REACH TEST)

Measurement	Pre-Test Mean	Post-Test Mean	Improvement

Flexibility	21.4 cm	27.8 cm	+29.9%

The Sit and Reach Test results show a clear improvement in flexibility after six weeks of regular Surya Namaskar practice. The mean score increased from 21.4 cm to 27.8 cm, indicating a 29.9% enhancement. This improvement reflects better hamstring flexibility, increased hip joint mobility, and enhanced spinal elasticity. Surya Namaskar involves dynamic and static stretching movements that gradually lengthen muscles and improve range of motion. The consistent daily practice helped reduce stiffness and promoted smoother body movement. Overall, the training program proved effective in significantly improving flexibility among participants.

B. MUSCULOSKELETAL STRENGTH

PUSH-UP TEST

Measurement	Pre-Test Mean	Post-Test Mean	Improvement
Push-ups	14.2	19.6	+38%

PLANK HOLD TEST

Measurement	Pre-Test Mean	Post-Test Mean	Improvement
Plank Time	46 sec	63 sec	+36.9%

INTERPRETATION:

The musculoskeletal strength results clearly demonstrate that Surya Namaskar training leads to noticeable physical improvement. Push-up performance increased from 14.2 to 19.6 repetitions, showing a 38% rise, while plank-hold duration improved from 46 seconds to 63 seconds, reflecting a 36.9% increase. These gains indicate stronger core, shoulder, chest, and arm muscles. Surya Namaskar includes key postures such as Chaturanga, Adho Mukha Svanasana, and Bhujangasana, which engage major muscle groups and enhance endurance. The continuous flow of movements also improves neuromuscular coordination. Overall, the training program was highly effective in boosting musculoskeletal strength among participants.

DISCUSSION OF HYPOTHESES

The findings of the study strongly support all four proposed hypotheses.

H1 is accepted, as the results showed a significant improvement in musculoskeletal strength. Both push-up and plank performance increased noticeably, indicating enhanced upper-body and core strength due to regular Surya Namaskar practice.

H2 is also accepted, as flexibility scores improved substantially. The dynamic stretching and forward–backward bending movements in Surya Namaskar played a major role in increasing hamstring flexibility and spinal mobility.

H3 is accepted because the comparison between pre-test and post-test clearly showed meaningful improvements across all measured variables. This confirms that the six-week training program had a positive impact on physical fitness.

Finally, **H4** is accepted, as the study found no major gender-based differences; both male and female participants improved at similar rates. This suggests that Surya Namaskar is equally effective for all participants regardless of gender**.**Thus, all hypotheses align with the outcome of the training program.

CONCLUSION

The present study demonstrates that a structured six-week Surya Namaskar training program significantly enhances both musculoskeletal strength and flexibility among participants. The consistent improvement in push-up performance, plank-hold duration, and sit-and-reach scores clearly indicates the effectiveness of this traditional yogic practice in improving overall physical fitness. Surya Namaskar combines dynamic movements, stretching, and controlled breathing, which collectively strengthen major muscle groups, improve joint mobility, and enhance body coordination. The results also showed no significant gender differences, suggesting that the benefits of Surya Namaskar are universal and accessible to all individuals. Overall, the findings confirm that Surya Namaskar is a practical, low-cost, and efficient exercise routine suitable for regular physical education programs. It can be recommended as a valuable component for improving health, fitness, and well-being among students and general populations. Continued practice may lead to even greater long-term health benefits.

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