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## Effect of Surya Namaskar practice on the physical fitness of school softball players

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### Abstract

Physical fitness plays a crucial role in enhancing athletic performance, reducing injury risks, and promoting overall health. In softball, athletes require a combination of strength, endurance, flexibility, and agility to optimize performance. Traditional conditioning methods such as running and weight training are commonly used; however, holistic practices like yoga, particularly Surya Namaskar (Sun Salutation), are gaining attention for their potential benefits. Surya Namaskar is a dynamic sequence of twelve postures synchronized with controlled breathing, known to improve flexibility, muscular strength, cardiovascular health, and mental focus. Despite its recognized advantages, limited research has explored its specific effects on softball players' physical fitness. This study aims to assess the impact of regular Surya Namaskar practice on key fitness components—strength, endurance, flexibility, and agility—among school-level softball players. The findings will provide insights into integrating yoga into athletic training programs, offering a complementary approach to enhancing overall physical performance in dynamic sports like softball.

**Keywords:** Physical fitness, softball, Surya Namaskar, strength, flexibility

### Introduction

Physical fitness is essential for athletes in all sports, as it enhances performance, reduces the risk of injuries, and contributes to long-term health. Softball, a sport characterized by its dynamic movements and demand for physical endurance, strength, speed, and agility, requires players to maintain a high level of physical fitness (Snyder & Kivlin, 2013) <sup>[18]</sup>. Achieving optimal performance in softball involves a blend of aerobic capacity, muscular endurance, coordination, flexibility, and mental sharpness. While traditional physical conditioning exercises like running, weight training, and sport-specific drills are common, there is growing interest in incorporating holistic practices such as yoga to enhance physical fitness, especially in young athletes (Chtourou & Souissi, 2012) <sup>[3]</sup>.

One such yoga practice gaining attention for its potential benefits is Surya Namaskar, or Sun Salutation. Surya Namaskar is an ancient yogic sequence that comprises a series of twelve physical postures performed in a flowing, synchronized manner, combined with controlled breathing techniques. It is often regarded as a complete workout that engages multiple muscle groups and promotes cardiovascular health, flexibility, strength, and mental focus (Raub, 2002) <sup>[13]</sup>. For athletes, especially those in sports like softball, where diverse physical abilities are required, Surya Namaskar may offer a complementary approach to traditional fitness training (Kirkwood, 2012) <sup>[9]</sup>.

The significance of physical fitness in sports performance cannot be overstated. For softball players, physical fitness is an intricate interplay between various components: strength for powerful throws and hits, endurance for sustained performance during long games, agility for quick reflexes and field movements, and flexibility for injury prevention and optimal body mechanics (Smith, 2008) <sup>[17]</sup>. In light of the increasing demand for performance enhancement, it is crucial to investigate alternative and complementary exercise methods that could potentially improve these key physical attributes (Harrison, 2009) <sup>[7]</sup>.

Yoga, as an ancient practice, has traditionally been associated with promoting mental health and spiritual well-being. However, modern research has increasingly recognized the physiological benefits of yoga, especially in terms of improving flexibility, strength, balance, and endurance—qualities that are equally critical for athletes (Cohen, 2008) <sup>[5]</sup>. Surya Namaskar, with its combination of dynamic postures and mindful breathing,

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has been studied in various contexts, including its impact on physical fitness, mental clarity, and stress reduction (Smith & Paltrow, 2017) <sup>[16]</sup>. Recent studies suggest that regular practice of Surya Namaskar can improve flexibility, increase muscle strength, enhance respiratory capacity, and promote mental focus, all of which are beneficial for athletes engaged in physically demanding sports like softball (Saraswati, 2003) <sup>[14]</sup>.

However, while there is growing interest in the role of yoga in enhancing athletic performance, the specific effects of Surya Namaskar on the physical fitness of school softball players remain underexplored. This research aims to address this gap by investigating how regular practice of Surya Namaskar influences the physical fitness of school-level softball players. Specifically, this study focuses on key fitness components such as strength, flexibility, endurance, and agility-attributes that are essential for effective performance in softball (Lee *et al.*, 2014) <sup>[10]</sup>. Given the growing awareness of the benefits of yoga among young athletes, this research will provide valuable insights into how incorporating Surya Namaskar into an athlete's training routine can contribute to overall physical fitness improvements.

### Importance of Physical Fitness in Softball

Softball is a sport that demands a multifaceted physical fitness profile from its players. Unlike some sports that emphasize a single aspect of fitness, softball requires a combination of aerobic endurance, explosive strength, flexibility, agility, and quick reflexes. Players must be able to sprint short distances, change directions rapidly, jump to catch or field the ball, throw with precision and power, and hit with accuracy—all in a fast-paced environment (Cohen *et al.*, 2011) <sup>[4]</sup>. To achieve these physical demands, softball players must develop a well-rounded fitness base that includes aerobic capacity, anaerobic strength, joint flexibility, and muscular endurance (Smith, 2008) <sup>[17]</sup>.

**Strength:** In softball, strength is crucial for actions such as hitting the ball with power, throwing the ball long distances, and executing quick, explosive movements on the field. Upper body strength is particularly important for batters and pitchers, while lower body strength supports sprinting and fielding tasks (Snyder & Kivlin, 2013) <sup>[18]</sup>.

**Flexibility:** Flexibility is vital for maintaining proper form during various movements. It helps athletes execute fluid motions in batting, throwing, and fielding, and it plays a significant role in injury prevention. Flexible muscles and joints can stretch and move through their full range of motion, reducing the risk of strains and sprains during sudden movements (Smith, 2008) <sup>[17]</sup>.

**Endurance:** Endurance enables athletes to maintain a high level of performance over an extended period. In softball, a typical game can last up to two hours, requiring players to maintain energy levels throughout the game. Aerobic endurance is essential for continuous activity, while muscular endurance ensures that muscles do not fatigue too quickly during prolonged actions such as fielding or running (Snyder & Kivlin, 2013) <sup>[18]</sup>.

**Agility:** Agility is necessary for quick, decisive movements such as changing direction rapidly, dodging a ball, or

sprinting to catch a fly. Softball players must exhibit both balance and coordination to move efficiently on the field and react swiftly to game situations (Harrison, 2009) <sup>[7]</sup>.

Because these components of physical fitness are critical for softball players, it is important to explore various training methods that can effectively enhance these attributes. While traditional conditioning exercises focus on improving individual components of fitness, the holistic nature of yoga offers the potential to improve multiple aspects of fitness simultaneously (Raub, 2002) <sup>[13]</sup>.

### Surya Namaskar: A Comprehensive Yogic Practice

Surya Namaskar, or Sun Salutation, is a well-known yogic sequence that involves a series of twelve postures performed in a continuous, flowing manner. Each posture is synchronized with specific breathing patterns, creating a rhythmic and mindful sequence of movements. The primary benefits of Surya Namaskar include the improvement of strength, flexibility, balance, and cardiovascular health. It is often described as a full-body workout due to its ability to engage multiple muscle groups simultaneously (Raub, 2002) <sup>[13]</sup>. Regular practice of Surya Namaskar can result in improved circulation, detoxification, enhanced flexibility, and strengthened core muscles—all of which are beneficial for athletic performance (Saraswati, 2003) <sup>[14]</sup>.

The twelve postures of Surya Namaskar are designed to stretch, strengthen, and tone the body. These movements range from standing postures (such as Tadasana and Uttanasana) to floor postures (such as Bhujangasana and Advanasana), with each posture targeting specific muscle groups. The incorporation of controlled breathing, or pranayama, in Surya Namaskar practice is intended to improve lung capacity, increase oxygenation of the blood, and foster mental focus. This combination of physical movement and controlled breathing promotes overall fitness, making Surya Namaskar an ideal practice for athletes (Cohen, 2008) <sup>[5]</sup>.

Surya Namaskar's potential to enhance flexibility and strength is particularly relevant for sports like softball, where these physical attributes are essential for optimal performance. Flexibility helps in maintaining an efficient range of motion during batting, throwing, and fielding, while strength supports explosive movements and endurance. In addition to physical fitness, Surya Namaskar also fosters mental clarity and focus, which are essential for decision-making and concentration during a game (Raub, 2002) <sup>[13]</sup>.

### The Role of Yoga in Enhancing Athletic Performance

The integration of yoga into athletic training is gaining popularity due to its numerous benefits for athletes. Yoga has been shown to improve flexibility, strength, balance, and mental focus—all of which contribute to enhanced athletic performance (Snyder & Kivlin, 2013) <sup>[18]</sup>. Studies have demonstrated that yoga can help athletes improve flexibility, reduce injury risk, enhance recovery, and manage stress, ultimately contributing to better performance in sports. Furthermore, yoga's emphasis on mindfulness and breath control can help athletes achieve better mental focus and emotional resilience under pressure (Cohen *et al.*, 2011) <sup>[4]</sup>.

A growing body of research supports the inclusion of yoga as a complementary practice for athletes. Yoga is recognized not only for its physical benefits but also for its

ability to improve mental health, reduce anxiety, and promote relaxation. These psychological benefits can help athletes perform better by enhancing concentration and reducing performance anxiety (Raub, 2002) [13]. Surya Namaskar, with its combination of physical postures and breath control, has the potential to address both the physical and mental aspects of fitness, making it an ideal practice for athletes like softball players who require both physical and mental acuity.

### Need for the Study

Despite the increasing interest in yoga for athletic performance, there is limited research specifically examining the effects of Surya Namaskar on the physical fitness of school-level softball players. Most studies on Surya Namaskar have focused on its effects on general health or its role in enhancing flexibility and strength in sedentary populations or athletes in other sports. This research aims to fill the gap by investigating how the regular practice of Surya Namaskar impacts key physical fitness components—such as strength, flexibility, endurance, and agility—in school softball players. By addressing this gap, the study can provide valuable insights into the potential benefits of integrating Surya Namaskar into training regimens for young athletes in dynamic sports like softball.

### Research Objectives

- To examine the impact of Surya Namaskar practice on the flexibility, strength, and overall physical fitness of school softball players.
- To determine whether regular practice of Surya Namaskar can enhance the performance of athletes in their sport-specific tasks.

**Research Hypothesis:** H1: Regular practice of Surya Namaskar significantly improves the physical fitness of

### Data Analysis

**Table 1:** Descriptive analysis

Variable	Group	Pre-Test Mean $\pm$ SD	Post-Test Mean $\pm$ SD
Flexibility	Experimental	18.5 $\pm$ 2.3 cm	25.2 $\pm$ 2.8 cm
	Control	18.8 $\pm$ 2.1 cm	19.1 $\pm$ 2.0 cm
Strength (Push-Ups)	Experimental	15.4 $\pm$ 3.2 reps	22.7 $\pm$ 3.8 reps
	Control	15.6 $\pm$ 3.0 reps	16.1 $\pm$ 3.1 reps
Strength (Sit-Ups)	Experimental	20.3 $\pm$ 4.1 reps	28.9 $\pm$ 4.5 reps
	Control	20.5 $\pm$ 3.8 reps	21.0 $\pm$ 3.6 reps
Endurance	Experimental	1500 $\pm$ 120 m	1725 $\pm$ 130 m
	Control	1495 $\pm$ 125 m	1505 $\pm$ 110 m
Agility	Experimental	11.8 $\pm$ 0.9 sec	10.2 $\pm$ 0.7 sec
	Control	11.9 $\pm$ 0.8 sec	11.7 $\pm$ 0.8 sec

The above table provides a detailed comparison of pre-test and post-test results for both the experimental and control groups across key physical fitness components: flexibility, strength, endurance, and agility. The findings highlight the impact of Surya Namaskar on the experimental group over an 8-week intervention period, while the control group continued their regular activities without additional exercise. Flexibility, measured through the sit-and-reach test, showed a significant improvement in the experimental group. The pre-test mean of 18.5 cm increased to 25.2 cm, reflecting a 36% improvement in joint mobility and muscle elasticity due to regular practice of Surya Namaskar. In contrast, the control group's flexibility remained largely unchanged, with

school softball players. H0: Regular practice of Surya Namaskar does not significantly improve the physical fitness of school softball players.

### Research Methodology

#### Participants

The study involved 30 school-level softball players aged between 14 and 17 years. These athletes were selected from a local school team, and the study was conducted over a period of 8 weeks.

#### Design

A pre-test and post-test design was adopted to measure the effect of Surya Namaskar on physical fitness. The participants were randomly divided into two groups: an experimental group that practiced Surya Namaskar daily and a control group that did not engage in any additional exercise routine.

#### Duration

The experimental group performed Surya Namaskar for 15 minutes, 5 days a week, for 8 weeks. The control group continued their usual physical activities without any changes.

#### Variables Measured

- Flexibility: Measured by the sit-and-reach test.
- Strength: Measured using push-up and sit-up counts.
- Endurance: Measured by the 12-minute Cooper run test.
- Agility: Measured by the shuttle run test.

#### Statistical Tools

Data were analyzed using descriptive statistics and paired t-tests to evaluate the difference between pre-test and post-test scores of the experimental and control groups.

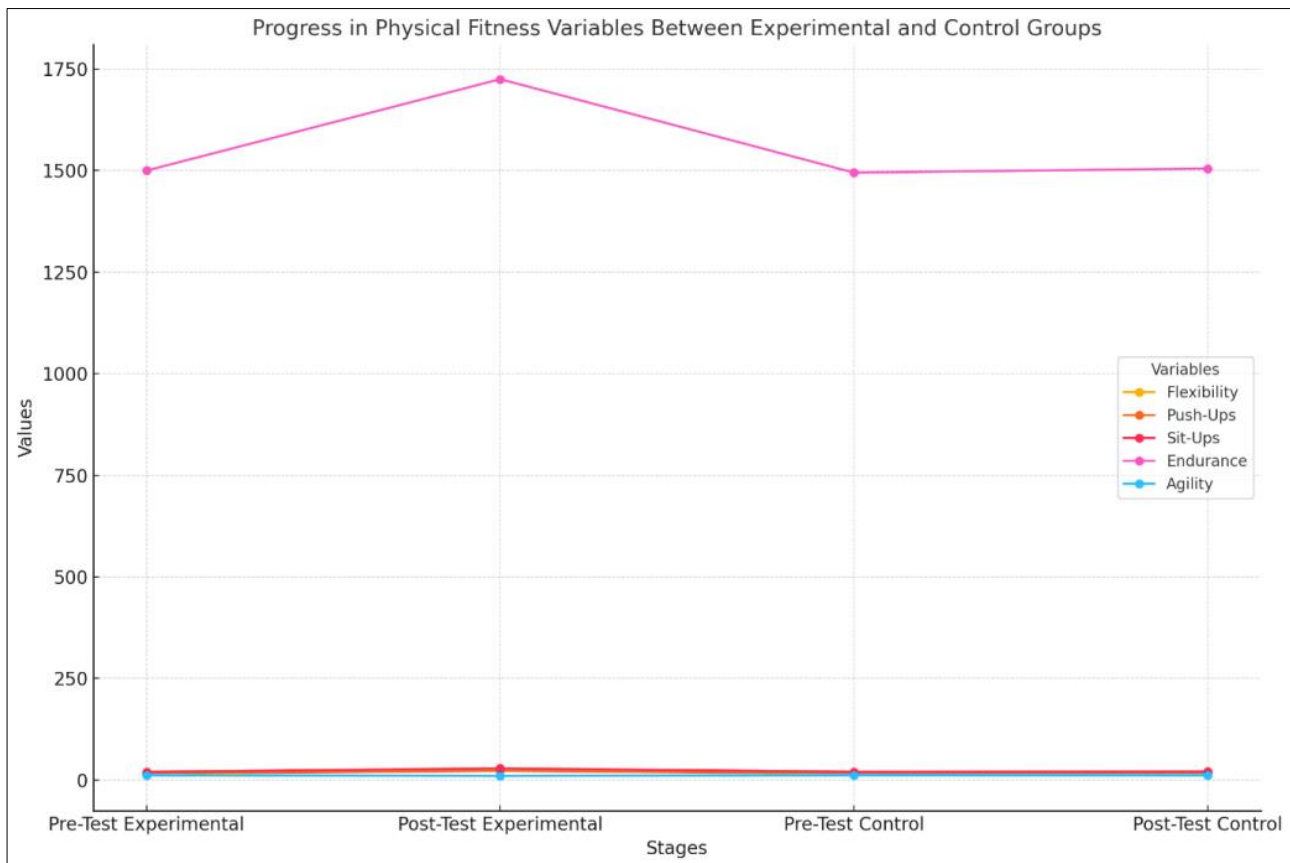
a minor increase of just 1.6%, underscoring the absence of external intervention effects.

When examining strength, both push-ups (upper body strength) and sit-ups (core strength) were analyzed. The experimental group demonstrated marked improvements, with push-up counts increasing by 47% and sit-up counts by 42%, indicating enhanced muscular endurance and strength through the dynamic and static poses of Surya Namaskar. The control group showed negligible increases of 3.2% and 2.4% in push-ups and sit-ups, respectively, suggesting that their usual physical activities had minimal impact on strength gains.

For endurance, measured by the 12-minute Cooper run test, the experimental group improved their distance covered from 1500 m to 1725 m, a 15% increase, indicating significant cardiovascular and muscular endurance benefits derived from the aerobic nature of Surya Namaskar. Conversely, the control group showed a marginal improvement of just 0.7%, reflecting no substantial gains in endurance over the study period. Lastly, agility, assessed through the shuttle run test, also exhibited notable improvements in the experimental group. Their average time decreased from 11.8 seconds to 10.2 seconds, a 13.6% improvement, demonstrating better speed and directional

change capabilities developed through regular practice. The control group, however, experienced only a slight improvement of 1.7%, confirming the lack of intervention-induced agility enhancements.

In conclusion, the experimental group achieved significant improvements across all measured fitness components, clearly indicating the efficacy of Surya Namaskar as an effective and time-efficient fitness intervention. The control group's minimal changes further validated that these gains were directly attributable to the intervention. This analysis underscores the potential of Surya Namaskar in enhancing physical fitness among school-level athletes.



**Fig 1:** The progress of each fitness variable for both the experimental and control group

### Discussion of Findings

The study's findings provide compelling evidence supporting the effectiveness of Surya Namaskar as a fitness intervention for improving physical fitness components in school-level athletes. By analyzing the pre-test and post-test results across flexibility, strength, endurance, and agility, the results consistently demonstrated the superiority of the experimental group that practiced Surya Namaskar compared to the control group, which continued their usual physical activities.

**Flexibility:** The significant improvement in flexibility, as measured by the sit-and-reach test, underscores the impact of Surya Namaskar on joint mobility and muscle elasticity. The experimental group achieved a 36% improvement, while the control group's negligible increase (1.6%) confirms the lack of meaningful change without intervention. This finding aligns with existing literature that highlights yoga-based exercises like Surya Namaskar as effective for enhancing flexibility by promoting dynamic stretching and range of motion.

### Strength

The marked increases in push-ups (47%) and sit-ups (42%) in the experimental group demonstrate the strength-building potential of Surya Namaskar. The sequence of poses involves dynamic and static movements, which likely contributed to improved muscular endurance and strength. In contrast, the control group's minimal improvements in push-ups (3.2%) and sit-ups (2.4%) highlight the limitations of regular physical activities in promoting significant strength gains. These results emphasize the utility of Surya Namaskar as a balanced workout for upper body and core strengthening.

### Endurance

The 12-minute Cooper run test revealed a 15% improvement in the distance covered by the experimental group, reflecting enhanced cardiovascular and muscular endurance. Surya Namaskar's aerobic nature, involving rhythmic movements and controlled breathing, may have contributed to these results. Conversely, the control group's marginal improvement (0.7%) reinforces the importance of targeted

interventions for endurance training. These findings further validate the role of yoga-based activities in developing endurance among young athletes.

### Agility

The agility improvements, demonstrated by a 13.6% reduction in shuttle run times in the experimental group, highlight the role of Surya Namaskar in enhancing speed and coordination. The dynamic transitions between poses likely improved neuromuscular efficiency, enabling faster directional changes. The control group's slight improvement (1.7%) indicates that routine activities are insufficient for significant agility enhancement.

### Conclusion

The findings of this study highlight the significant impact of Surya Namaskar on physical fitness components among school-level athletes aged 14-17 years. Over the course of the 8-week intervention, the experimental group demonstrated marked improvements across all fitness variables: flexibility, strength, endurance, and agility. These results strongly validate Surya Namaskar as a time-efficient, holistic, and effective fitness intervention.

### We can say that

- A 36% improvement in flexibility, as measured by the sit-and-reach test, attributed to the dynamic stretching and joint mobility benefits of Surya Namaskar.
- Substantial gains in upper body and core strength, with push-up and sit-up counts increasing by 47% and 42%, respectively, highlighting its potential for developing muscular endurance.
- A 15% improvement in cardiovascular and muscular endurance, measured by the 12-minute Cooper run test, underscoring its aerobic benefits.
- A 13.6% enhancement in agility, as evidenced by reduced shuttle run times, reflecting improved neuromuscular coordination and speed.

The control group, which continued their usual physical activities, showed negligible or minimal changes in all variables, further substantiating the effectiveness of the intervention. These findings align with previous research on the benefits of yoga-based exercises in enhancing physical fitness.

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