

# Measuring Immediate Effects of Surya Namaskar on Trunk and Hip Flexibility among Young College Going Students

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## ABSTRACT

**Aim:** The study was designed to evaluate the immediate effects of Surya Namaskar on flexibility in young females.

**Method:** The study consisted of 50 female students of age 18 to 25 years, their hip and trunk flexibility was measured using the sit and reach test, popliteal angle and lumbar flexion. After recording the pre measurements the subjects were made to do 10 slow Surya Namaskar with 10 sec hold at each asana and then immediately the post measurements were taken.

**Results:** Paired t-test was applied to see the immediate effect of Surya Namaskar. The t values shows significant difference for sit and reach test, lumbar flexion, popliteal angle Rt and Lt at p value <0.05; in trunk and hip flexibility before and after performance of Surya Namaskar.

**Conclusion:** In this study it is found that Surya Namaskar shows immediate effect on improving flexibility of the hip and trunk muscles.

**Key Words:** Surya Namaskar, Sit and reach test, Popliteal angle, Flexibility.

## INTRODUCTION

Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. [1] With increasing scientific research in yoga, its therapeutic aspects are also being explored. Surya Namaskar - the salutation to the god sun is also a part of Indian traditional yogic practices. [2] Surya Namaskar is a series of asanas with strict breathing pattern. Its revitalizes each and every cell of the body, gives physical strength, flexibility, and mental calmness. [3] These postures (asanas) encompass periodic forward and backward bending along with deep exhalation and inhalation respectively to the maximum

possible extent. The 12 different asanas of Surya Namaskar are:

Pranamasana, Hasta Uttanasana, Hastapaadasana, Ashwa Sanchalana Adho Mukha Svanasana / Parvatasan Ashtanga Namaskara, Bhujangasana, Adho Mukha Svanasana/ Parvatasan, Ashwa Sanchalanasana, Hastapaadasana Swadhisthana, Hasta Uttanasana, Pranamasana Anahata

By these movements, the whole musculoskeletal system is stretched and contracted in a systematic manner which provides more strength and flexibility to them. [4] Its training improves the flexibility of body muscles especially leg, back, chest and buttock muscles. [5]

There are many other benefits of Surya Namaskar as it is ideally done facing the early morning sun, helps our body to soak in its benefits - sun rays are a rich source of vitamin D and helps to strengthen our bones and also helps to clear our vision. Regular practice of this asanas can also help you lose the excess body fat. It loosens up the joints in the body and tones the muscles and the internal organs. It balances the respiratory, circulatory, reproductive and the endocrine system. The moves and postures of the asana help all our internal organs function better. It helps combat insomnia as it relaxes the body, calms the mind, removes lethargy and makes our mind alert. It helps regulate menstrual cycles and makes childbirth easier. Surya Namaskara activates the Pingala nadi (Surya nadi) which enhances the energy level in the body. [4]

Ashwini Deshmukh et al [6] in her study, A comparative study between Pilates and Surya Namaskar on flexibility in women having sedentary lifestyle using sit and reach test and shoulder and wrist test concluded that Surya Namaskar is beneficial in increasing flexibility in sedentary women as compared to pilates and can be incorporated in daily fitness routine.

Anagha Mangaonkar et al [7] studied the Effect of Surya Namaskar vs dynamic stretching on hamstring flexibility among physiotherapy students, concluded that Surya Namaskar is more effective in improving hamstring flexibility as compared to dynamic stretching.

Prof. (Dr.) Kanwaljeet Singh et al [2] in their study the effect of Surya Namaskar yogasana on muscular endurance and flexibility in intercollege yoginis, concluded that a 6-week training programme of Surya Namaskar asanas had significant effect on muscular endurance and flexibility.

Ananda Balayogi Bhavnani et al [8] studied the Immediate effects of Surya Namaskar on reaction time and heart rate in female volunteers and concluded that three rounds of Surya Namaskar produce significant shortening of Reaction Time in female subjects as part of a generalised

sympathetic arousal as evidenced by significant rise in Heart Rate and Surya Namaskar may be used as an effective training means to improve neuromuscular abilities.

Reduced flexibility maybe because of various reasons like deskbound lifestyle, physical inactivity or deposition of fat in around the joints restricting complete Range of motion. Alterations in flexibility can lead to various biomechanical changes in joints and altered postures. Hence flexibility is needed to perform daily activities with ease. Keeping the body flexible may help decrease tightness and tensions that can lead to chronic and often debilitating physical problems. [6] There are various studies which proved that short and long term practice of Surya Namaskar improves flexibility up to a great extent but to best of our knowledge there is not much evidence about the immediate effects of Surya Namaskar on flexibility. Therefore, the present study was needed to evaluate the immediate effects.

## METHODOLOGY

Experimental study was conducted that consisted female students of age 18 to 25. Subjects who were willing to participate were included in the study. Females who were on their menstrual cycle and those who have any recent injuries or any musculoskeletal, cardiovascular or neurological conditions were excluded from the study. 55 participants were initially enrolled for the study out of those 50 students was recruited according to the criteria.

Materials and apparatus used:

- Sit and reach box (Baseline Sit and Reach Evaluation Instrument)
- Universal Goniometer
- Measure tape
- Paper
- Pen

Outcome measures:

1. **Sit and reach test:** This test needs a sit and reach test box. The subjects sat barefooted on the floor keeping their knees extended and feet against the box.

They placed the right hand over the left and reached forwards as far as they can by sliding their hands along the measuring board and measurement was recorded in centimeters. Best of three trials were taken. [9]

**2. Popliteal angle:** To measure the popliteal angle subject was laid in supine position and was asked to flex both hips to 90° while the knees are bent. The subject grasped behind the knees with both hands to stabilize the hips at 90° of flexion. Then the subject actively extended each knee in turn as much as possible. The angle formed between two lines i.e. one line along the shaft of femur and one line along the line of the tibia was the popliteal angle. [10]

**3. Lumbar flexion:** Lumbar flexion was measured using modified Schober test. A point was marked midway between the two PSISs (“dimples of the pelvis”), which is the level of S2; then, points 5 cm below and 10 cm above that level are marked. The distance between the three points is measured, the patient is asked to flex forward, and the distance is re-measured. The difference between the two measurements is an indication of the amount of flexion occurring in the lumbar spine. [11]

#### PROCEDURE:

All the subjects were measured for hip and trunk both flexibility using the sit and reach test. Popliteal angle was taken to measure the individual hamstring flexibility and lumbar flexion values were also taken. The subjects were demonstrated the techniques prior to measurement. After recording the pre measurements the subjects were made to do 10 slow Surya Namaskar with 10 sec hold at each asana.

#### Surya Namaskar postures:

It consists of a total of 12 postures/asanas:

- **Pranamasana (Prayer pose) – 1<sup>st</sup> and 12<sup>th</sup> Posture:**  
Stand erect with folded hands close to the chest and palms are held together in

the form of prayer pose. Look straight ahead, Exhale the breath normally.

- **Hasta Uttanasana (Raised arms pose)- 2<sup>nd</sup> and 11<sup>th</sup> Posture:**

Raise both the hands up above the crown from Pranamasana pose. Inhale the breath normally while raising your hands. Bend the trunk and neck slightly backward.

- **Padahasthasana (Hand to Foot pose)- 3<sup>rd</sup> and 10<sup>th</sup> Posture:**

Bend forward from Hasta Uttanasana pose and try to touch the floor with your both hands. Exhales breathe normally while bending forward.

- **Ashwa Sanchalanasana (The Equestrian Pose) 4<sup>th</sup> and 9<sup>th</sup> Posture:**

Stretch the left leg as far back as possible from Padahasthasana pose while inhaling the breath normally. At the same time, bend the right knee. While looking straight ahead the hands should be kept straight with fingers touching the floor. Arch the back a little with head tilted back. The same steps should be repeated with left knee in the 9<sup>th</sup> posture of Surya Namaskara.

- **Parvatasana (The Mountain Pose) – 5<sup>th</sup> and 8<sup>th</sup> Posture:**

While exhaling, take the right leg backward from Ashwa Sanchalanasana pose and place it parallel to the left leg, raise the buttocks at the same time. Place the hands straight supporting the weight of the body. The head should be placed between the hands.

- **Ashtanga Namaskara (Eight-Limbed salutation) – 6<sup>th</sup> Posture:**

Lower the body to the ground. Bend the legs and place your knees in contact with the floor. Bend the arms and lower trunk towards ground. Keep your chin on the floor. Keep the chest along the floor. Finally raise the abdomen and hips slightly off the ground. Body is in contact to ground at 8 points: 2 palms, 2 knees, 2heels, chest and chin.

- **Bhujangasana (The Cobra Pose)- 7<sup>th</sup> Posture:**

While inhaling raise the body by using the hands from Ashtanga Namaskara pose. Arch your head backward. This position looks like the cobra which has raised its hood. [4]

After performing 10 rounds of Surya Namaskar the participants were given 10 minutes rest. The post measurements of sit and reach test, popliteal angle and lumbar flexion values were recorded.

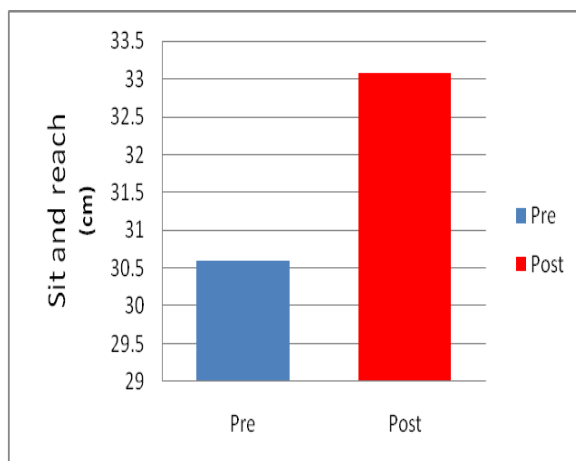
## RESULTS AND STATISTICAL ANALYSIS

All analysis was carried out in SPSS windows Version 20.0. An alpha-level of 0.05 was used to determine statistical significance. Paired t-test was applied in pre-post of Sit and Reach test, Lumbar flexion and popliteal angle to see the immediate effect of Surya Namaskar.

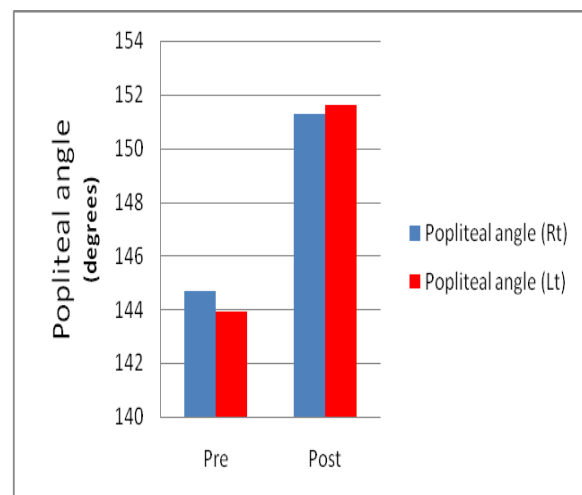
**Table 1: Comparison of all outcome measures following Surya Namaskar**

Outcome Measures	Pre Mean (SD)	Post Mean (SD)	t-value	P- value
Sit and reach (cm)	30.60 (6.11)	33.07 (5.94)	-12.30	0.00
Lumber flexion (cm)	5.13 (1.14)	6.04 (1.12)	-13.67	0.00
Popliteal angle (Rt)(degrees)	144.70 (7.45)	151.30(5.87)	-11.75	0.00
Popliteal angle (Lt)(degrees)	143.90 (6.16)	151.60 (5.67)	-13.16	0.00

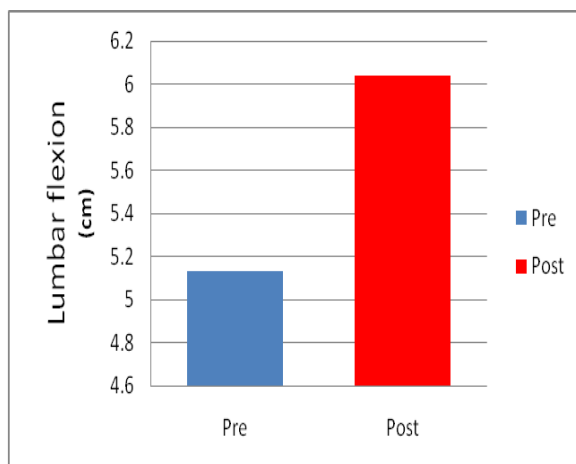
As shown in the above table there is significant difference in the values of sit and reach, lumbar flexion and popliteal angles readings at level of significance p=0.00.



**Graph 1: Mean of sit and reach**



**Graph 3: Mean of popliteal angle**



**Graph 2: Mean of lumbar flexion**

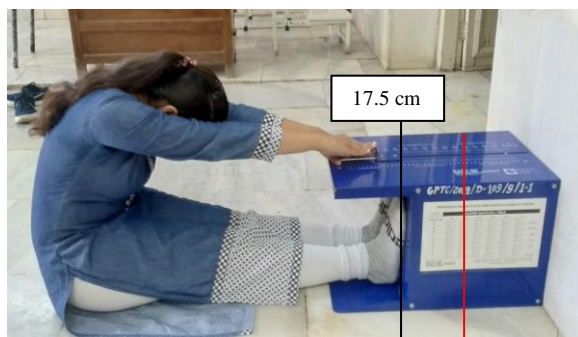
## DISCUSSION

In the present study subjects were asked to perform Surya Namaskar for 10 times with 10 sec hold at each asana. Then their flexibility was measured before and after doing Surya Namaskar by sit and reach test, modified Schober test and popliteal angle by goniometer.

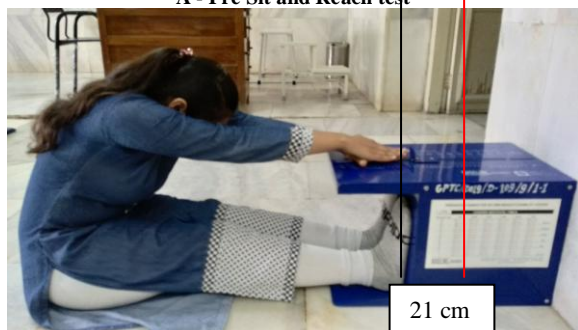
The results of the present study as shown in table are mean values for sit and reach test before and after doing Surya Namaskar are 30.60±6.11 cm and 33.07±5.94 cm respectively; mean for lumber flexion is 5.13±1.14 cm and

6.04±1.12 cm respectively and mean for popliteal angle in right lower limb are 144.70±7.45 degree and 151.30±5.87 degree and for left lower limb are 143.90±6.16 degree and 151.60±5.67 degree respectively. Thus, it is found that Surya Namaskar shows immediate effect on improving flexibility of the muscles.

The increase in flexibility can most likely be attributed to the static stretching nature of the asanas. The probable reason may be that Surya Namaskar is the combination of twelve exercises that include stretching, holding and relaxation. Stretching is most commonly advised as a method for increasing flexibility. The increased range of motion resulting from prolonged stretching is most likely due to an increase in length of both connective and muscle tissue. Increased connective tissue length can occur due to its property of elastic elongation. The findings of our study are consistent with the study of Safa A et al. (2017) who found mean difference of 4.56 at  $p < 0.0001$  for sit and reach test. [12]



A - Pre Sit and Reach test



B - Post Sit and Reach test

Moreover, Murphy has theorized that as the dynamic range of motion is performed, metabolic processes increase. A decrease in muscle viscosity is caused by

the increased temperature of the muscle allowing a smoother contraction. The flexibility of the muscle improves as it becomes more pliable and accommodating to the forces placed on it due to its elevated temperature. [7]

Results of our study are similar to the study of Prof. (Dr.) Kanwaljeet Singh et al. (2010) who found mean of flexibility pre test and post test as 4.6667± 1.4960 and 5.7333± 1.5337 respectively. This supports our study that Surya Namaskar yogasana leads to significant improvement in flexibility. [2]

Similar results were demonstrated by Dr. Anurodh Singh Sisodia who found that mean of flexibility of pace 2 group, pace 4 and control group as 24.95±2.60 cm, 26.70±2.03 cm and 21.20±3.15 cm respectively. This shows that in Surya Namaskar practice we perform flexion and extension or hyperextension of hip joint which improve flexibility of hip joint, lower back and posterior thigh muscles. [9]

Kristine M. Fondran did a study to find out the effect of Surya Namaskar on flexibility and found that mean of flexibility of yoga and control group as 10.5±4.0 inch and 9.3±3.9 inch respectively. This suggests that inclusion of Surya Namaskar in an exercise program may help to prevent orthopedic disorders associated with limited hamstring and low back flexibility. [13] Dr. Sethu S. in his study assessed the effect of Surya Namaskar on Joint Flexibility and concluded that Surya Namaskar is the best practice to improve flexibility at the joints. [14]

The present study was limited only to female college students aged from 18 to 25 years. Future studies can be performed on both the gender and on healthy and elderly populations. In addition, effect of Surya Namaskar needs to be further investigated as a tool to enhance physical fitness and quality of life dimensions in various diseased conditions. Longitudinal study can also be performed.

## CONCLUSION

In the present study it is found that Surya Namaskar shows immediate effect on improving flexibility of the muscles. Thus, Surya Namaskar can be recommended to improve flexibility component of physical fitness.

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