



Original Research Article

## The Effect of Suryanamaskar Yoga Practice on the Heart Rate, Blood Pressure, Flexibility and Upper Body Muscle Endurance in Healthy Adult

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### ABSTRACT

**Aim:** To determine the effects of Suryanamaskar yoga practice on resting heart rate (HR), blood pressure (BP), flexibility and upper body muscle endurance in low to moderately active adult males and females.

**Methods:** A total of 80 normal healthy subjects (40 males and 40 females) between age group 18-40 years from Sumandeep Vidyapeeth University were randomly assigned a yoga or control group. After a 1.5 hour introduction to proper Suryanamaskar techniques, the subjects were directed to perform two Suryanamaskar routines daily for 10 minutes each followed by a 5 minute rest period, for duration of two weeks.

**Results:** The post-hoc t test showed a significant ( $p=0.000$ ) increase in flexibility and push-ups and decreased blood pressure in yoga group, with little or no change in control group.

**Conclusion:** Suryanamaskar is effective in increasing hamstring flexibility and improving upper body muscle endurance and helps to reduce blood pressure.

**Key Words:** Suryanamaskar, Heart Rate, Blood Pressure, Flexibility, Muscle Endurance.

### INTRODUCTION

Yoga is believed to be 4000 to 8000 years old with its origins in the Indus Valley civilization in the northwestern part of India.<sup>1</sup> The word yoga, meaning “unity or oneness,” was derived from the Sanskrit word yuj which means “to join.” Yoga was first mentioned in *Rig Veda*, the oldest sacred text of Brahmanism, which formed the basis of modern day Hinduism in approximately 1500 B.C.E. Before this time, it is believed that yoga techniques were kept secret by the sages

and never written down.<sup>2</sup> In the Upanishads (800-500 B.C.E.), yoga was thought of as a way of life that would allow an individual to achieve liberation from suffering. Through subsequent time periods, texts, and teachers, the definition of yoga has expanded to incorporate a wide range of disciplines, philosophies, and practices. The most prominent and recognizable form of yoga, especially in the Western world is hatha yoga.<sup>2</sup>

Suryanamaskar is a branch of yoga that concentrates physical health and mental well-being. Through practicing various body postures (asana), breathing techniques (pranayama), and meditation, it is believed that one can obtain a sound physical body as well as a calm and peaceful mind.<sup>2</sup>

Regular practice of a variety of yoga techniques have been shown to lower heart rate and blood pressure in various populations.<sup>3,4,5</sup> In recent years, it has become more apparent that people need techniques to help them cope with the everyday stressors of modern life. With stress related hypertension and cardiovascular disease on the rise, these hatha yoga techniques may provide a platform for health and well-being. This form of yoga may provide much needed physical and mental therapy.<sup>2</sup> Regardless of the testimony of celebrities or the documented physiological benefits of regular yoga or mind-body practices, even the most motivated individuals find it challenging to find time to implement any of the worthwhile yoga techniques available to them. With various organized classes ranging from 45 to 90 minutes in length, it is often difficult to incorporate a daily or weekly yoga practice given the time already appropriated to regular cardiovascular or resistance training routines. Carving time for yoga or flexibility training with a schedule that is already full morning to night is nearly impossible for most people.

In most cases facilitating mind and body flexibility is easily put aside when it is probably needed the most. However, keeping the body flexible may help decrease tightness and tensions that can lead to chronic and often debilitating physical problems.<sup>2,4</sup> Once sidelined from regular activities due to orthopedic or other problems, it becomes increasingly difficult to be motivated to start exercising again.<sup>5</sup> Regardless of the potential physical risks of inflexibility, even the most dedicated runner or recreational athlete often does not make time for adequate flexibility

training.<sup>6</sup> Since time is often seen as a limiting factor when exercising, a daily practice of Suryanamaskar (salute to the sun) can be the perfect solution for time-challenged individuals.<sup>7</sup>

Suryanamaskar is a series of 12 physical postures made up of a variety of forward and backward bends.<sup>7</sup> The series of movements stretch the spinal column and upper and lower body through their full range of motion, massaging, toning and stimulating vital organs by alternately flexing the body forwards and backwards.<sup>2</sup> It builds upper body strength through the inherent weight bearing positions, especially in the arms and shoulders, throughout the series.<sup>7</sup> The simulated push-up movement and upper body weight bearing positions in the series may help to develop muscular strength and endurance in the pectoral, triceps, as well as the muscles of the trunk.<sup>7</sup> The series gives such a profound stretch to the body that it is considered to be a complete yoga practice by itself.<sup>4</sup> The purpose of the study is to determine the effects of a two weeks, twice daily Suryanamaskar yoga practice (routine) on resting heart rate and blood pressure, upper body muscular endurance, flexibility in low to moderately active adult males and females.

## **METHODOLOGY**

A total of 80 healthy subjects (40 males and 40 females) from Sumandeep Vidyapeeth University, Baroda, within 18-40 years of age group were included in this study who met the inclusion and exclusion criteria.

### ***Inclusion criteria:***

- Age- 18 to 40 years
- Sex- Males and Females

### ***Exclusion criteria:***

- Orthopedic problems
- Neurological conditions
- Cardiovascular diseases
- Psychological disorders
- People doing daily exercise.

***Instrumentation:***

- Standard Sphygmomanometer
- Stethoscope
- Weighing Machine
- Measure tape
- Sit and Reach Box
- Mat

***Procedure:***

In this study, 80 subjects were included within age group 18-40 years who fulfilled inclusion criteria. At the pre session, the subjects were measured weight, height, blood pressure by standard sphygmomanometer and stethoscope. Upper body muscle endurance particularly that of the triceps, anterior deltoids, and pectoralis was measured by a standard push up test where the number of correctly performed push-ups was counted until exhaustion. Males performed traditional push-ups while females performed modified push-ups.

After the pre-test, the intervention group or experimental group was given one and half hour session of instructions to learn the basic postures of the Suryanamaskar. After the initial instruction period, the group was instructed to perform the routine two times daily for 10 minutes followed by a 5 minute rest period of lying on their backs in Shavasana position. Subjects were instructed to take their natural breath without any interruption. Following the natural breath subjects were instructed to pay attention to each inhalation and exhalation for the period of time indicated. When performing the routine, instruction was given to hold each posture for the duration of one inhalation or exhalation depending on the movement being performed. By end of one week subjects were called for follow up. All subjects were

provided with a Yoga Practice Journal or record book to record their practice time, to indicate compliance to study protocol, and to alert the researcher to any problems encountered during the study period. The subjects were directed to perform two Suryanamaskar routines daily, once upon waking in morning and once before dinner for two weeks duration. Each routine consisted of eight rounds of practice followed by a five minute rest period where they were to lie still in a supine position (Shavasana) and to follow their natural breath.

The entire self directed yoga practice took approximately 15 minutes to complete. Throughout the two weeks self-directed portion of the study, the researcher emailed the participants weekly to ensure that they will continue compliance with the daily yoga routines and to obtain an electronic copy of their weekly Yoga Practice Journal. Both the yoga and control groups were instructed to continue aerobic exercise at their current level. The yoga group was instructed to refrain from any additional flexibility and strength training above and beyond the Suryanamaskar routine, and the control group was discouraged from participating in any flexibility and strength training for the duration of the study.

**RESULT ANALYSIS**

The post-hoc t test and ANOVA showed a significant ( $p=0.000$ ) increase in flexibility and push-ups and decreased blood pressure in yoga group, with little or no change in control group as shown in figure mentioned below.

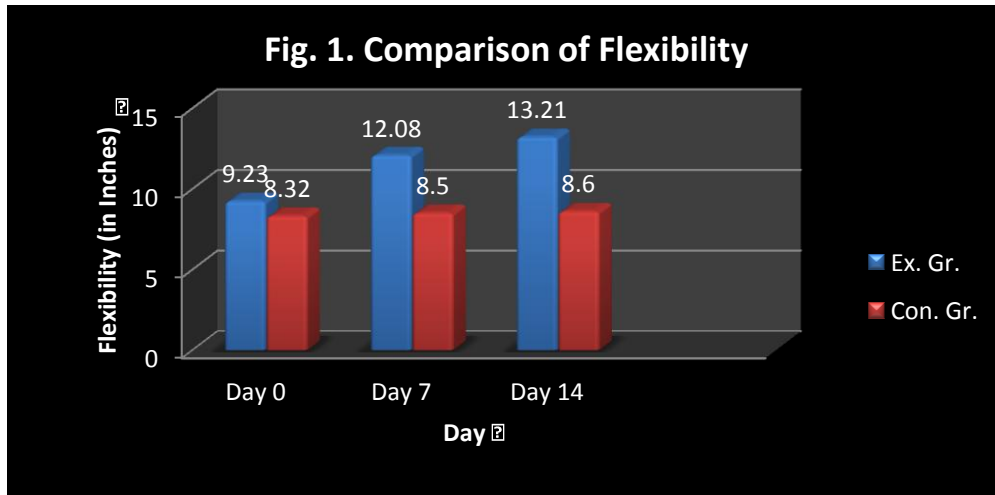


Figure 1. Comparison of Flexibility between Experimental Group (Ex. Gr.) & Control Group (Con. Gr.) at various duration.

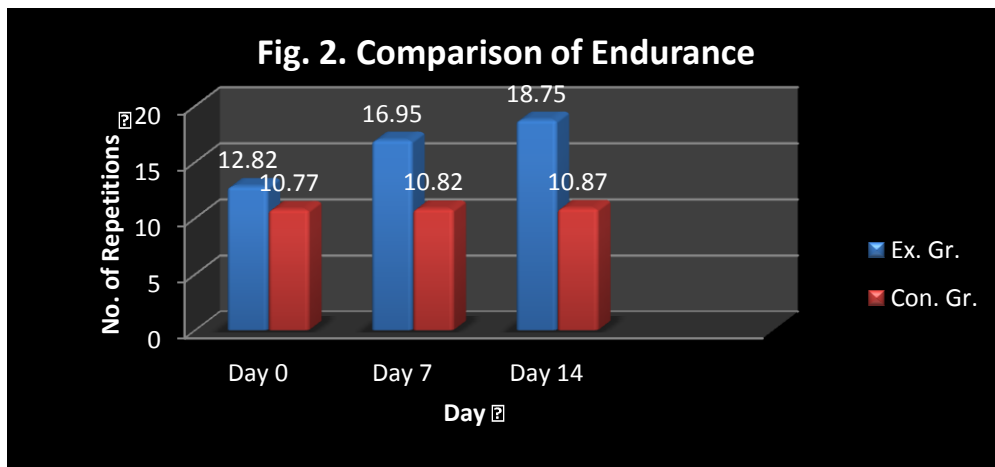


Figure 2. Comparison of Endurance between Experimental Group (Ex. Gr.) & Control Group (Con. Gr.) at various duration.

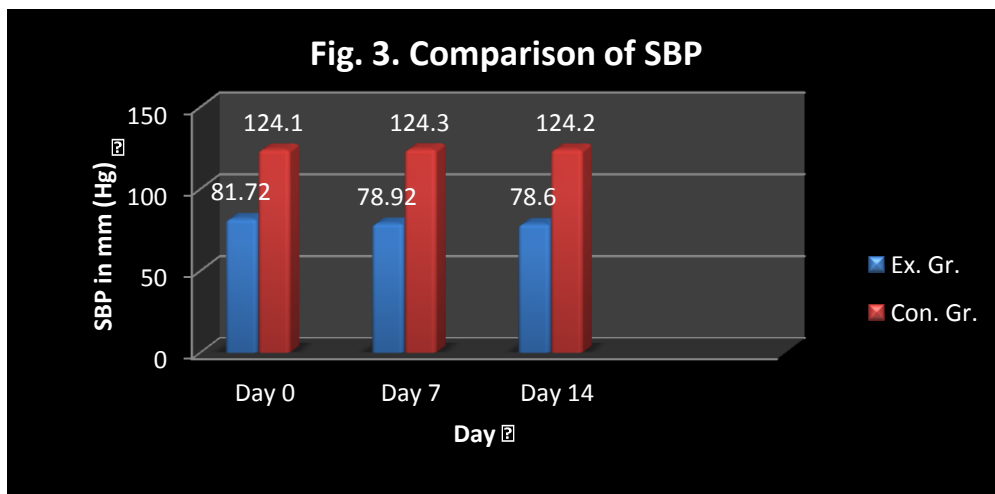


Figure 3. Comparison of Systolic Blood Pressure (SBP) between Experimental Group (Ex. Gr.) & Control Group (Con. Gr.) at various duration.

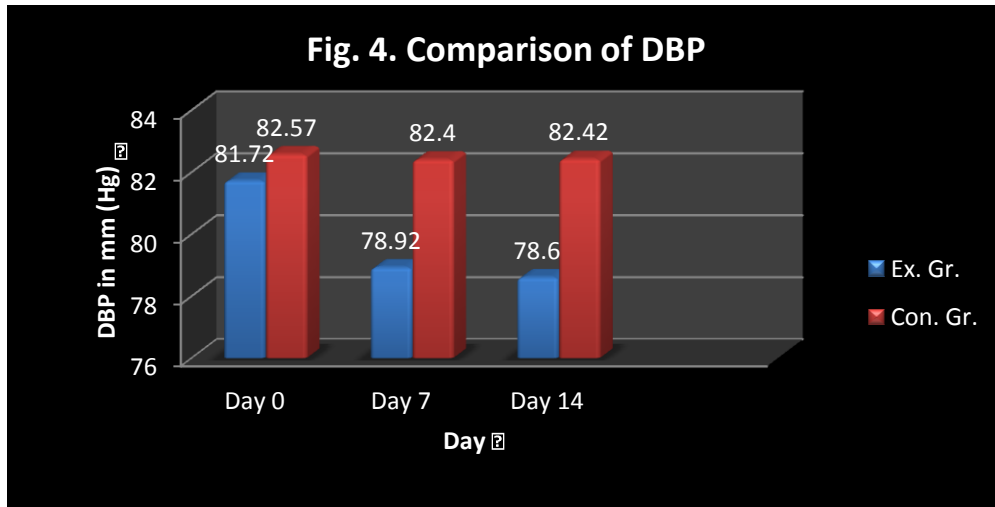


Figure 4. Comparison of Diastolic Blood Pressure (DBP) between Experimental Group (Ex. Gr.) & Control Group (Con. Gr.) at various duration.

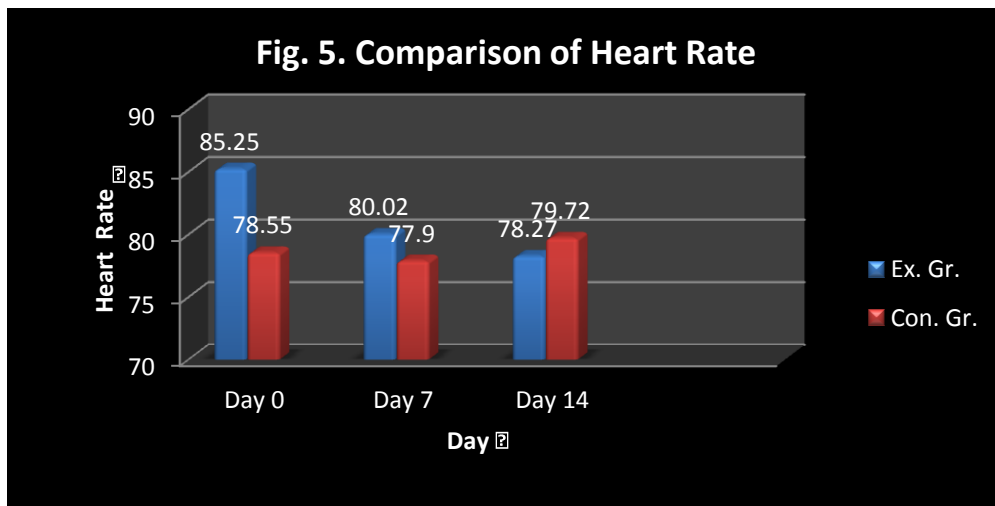


Figure 5. Comparison of Heart Rate between Experimental Group (Ex. Gr.) & Control Group (Con. Gr.) at various duration.

## DISCUSSION

The current study is an attempt to see the effect of Suryanamaskar on flexibility, endurance, blood pressure and heart rate. The results of the current study showed that there is a highly significant increase in the flexibility ( $t = 8.15$ ,  $p = 0.00$ ) as well as highly significant increase in upper limb endurance ( $t = 7.63$ ,  $p = 0.00$ ) as well as highly significant decrease in blood pressure ( $t = -5.51$ ,  $p = 0.00$ ) while there is no significant reduction in heart rate.

McCaffrey et al.<sup>3</sup> who examined the effectiveness of an 8 week yoga program in a group of hypertensive patients in Thailand, as well as Blank<sup>8</sup> who studied the physiological

responses to Iyengar Yoga, as performed by trained practitioners, and found a significant decrease in blood pressure which is in consistent with the present study.

In current study hamstring flexibility improved significantly for the Surya Namaskar intervention group which shows its ability to increase hamstring and lower back flexibility as measured by the sit and reach test.<sup>9</sup> Mastangelo et al. who also used the sit and reach test for measurement of hamstring flexibility, found a significant increase in hamstring flexibility with their yoga intervention group as well.<sup>10</sup> It was also noted that prior to the onset of the study, a majority of participants lamented their lack of

hamstring flexibility and many also reported associated lower back stiffness. Amongst the participants, there was recognition of the importance of flexibility training in maintaining lower back health, but all reported that they made little or no effort to improve flexibility prior to study. Since hamstring and low back flexibility, along with abdominal strength and endurance, have been shown to play an important role in maintaining a healthy back, the results of the Suryanamaskar intervention suggests that inclusion of Suryanamaskar in an exercise program may help prevent orthopedic disorders associated with limited hamstring and low back flexibility.<sup>9</sup>

The increased number of push-ups by the yoga group participants after the intervention of Suryanamaskar shows that it may promote increased upper-body muscular endurance. For those who have limited time for strength training or avoid it all together, the muscle endurance improvements found in this study would be a good argument for performing the routine on a regular basis. In addition, since the simulated push-up portion of the routine specifically works the triceps and serratus anterior muscles, prolonged practice of Suryanamaskar may improve muscle strength and endurance. Suryanamaskar may be especially beneficial for older adults as strength decreases with age.

Telles et al.<sup>11</sup> who found a reduction in resting heart rate when a yoga training program was implemented and participants were trained specifically on how to lower their resting heart rate, no differences was found in resting heart rate with the yoga intervention in the current study. Sivansankaran et al.<sup>12</sup> who studied the effects of a six week intervention of yoga on subjects with coronary artery disease also found significant reductions in heart rate from baseline measurements. While the

intervention of Suryanamaskar in this study does not significantly reduce resting heart rate.

In addition, after reviewing the yoga group journals or record book, it is observed that most participants found the 5 minute breath awareness activity after the Suryanamaskar routine to be difficult. There were many comments on how lying still for 5 minutes was “boring” and that many were “anxious” to get on with their daily activities. This finding of the study is similar to Telles et al.<sup>11</sup> as it stimulated the protocol for voluntarily lowering heart rate since multiple journal comments on the difficulty of lying still for 5 minutes, it might be inferred that the mind-set of true relaxation after the rigors of the Suryanamaskar routine was not there and thus does not influence the resting heart rate.

## CONCLUSION

The Suryanamaskar yoga series is a unique form of yoga as it integrates physical and mental aspects of body through a low impact of body movements. This study is the first of its kind to assess the effects of short duration yoga practices and showed significantly increasing flexibility and upper body muscle endurance and reduced blood pressure after a two weeks intervention. Individuals may greatly benefitted from a short duration of Suryanamaskar yoga as it may be helpful in relieving muscle stiffness in the back and legs which often contributes to low back pain. The additional benefit of improved upper body muscle endurance is very important especially with inevitable age-related reduced strength. It is further concluded that there is no significant change in resting heart rate.

## Further suggestions

Further studies may be carried out with inclusion of hypertensive patients as Suryanamaskar is helpful to reduce blood pressure as found in the current study. The present study was limited to two weeks of

yoga programme, so another study may be done by extending the duration of Suryanamaskar more than two weeks as longer duration study could result in different findings. The future study may include mental stress as one of the outcome variable as it is believed that yoga helps reduce mental stress.

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