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EFFECT OF SURYANAMASKAR ON WAIST HIP RATIO, BALANCE AND PHYSICAL FITNESS INDEX AMONG OVERWEIGHT COLLEGE GOING STUDENTS.

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Abstract

Background: Surya Namaskar has effect in detoxifying the organs which is deep in nature through copious oxygenation and has a deeper relaxing effect. It is a series of twelve postures. **Aim:** To study the effect of Surya namaskar on waist hip ratio, balance and physical fitness index among overweight college going students. **Methods:** In this study, 30 overweight students based on inclusion and exclusion criteria were recruited from M.V. P's college. Their ages ranged from 18-35 years. The subjects underwent Suryanamaskar practice. Outcome measures were Waist hip ratio, Star Excursion Balance Test and Modified Harvard Step Test. The pre and post test data was collected. **Results:** As the P value regarding pre and post treatment for both Star Excursion Balance Test and Modified Harvard Step Test was <0.0001 . As the P value regarding pre and post treatment for waist hip ratio was 0.8896. The study proved to be statistically non-significant in reducing waist hip ratio among overweight college going students. **Conclusion:** The study concluded that Suryanamaskar has an effect on improving balance and physical fitness index among overweight college going students. Whereas, Suryanamaskar has no effect on reducing waist hip ratio among overweight college going students as the duration of study was less.

Key words Suryanamaskar, waist hip ratio, balance, physical fitness index, overweight.

INTRODUCTION

Obesity is an unusual building up of fatty tissues occurring by expansion of adipoceros cell size or by proliferation of these cells number or because of both.^[1] Obesity is a disease chronic in nature which has spread all over the world and threatens public global health.^[2] It is a medical condition in which excess body fat has accumulated to the extent that may adversely affect on health, leading to various health problems. In general, it is a condition chronic in nature defined by an excess amount of body fat.^[3]

According to WHO four categories were defined as follows: underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI 25-29.9), obese (BMI ≥ 30) BMI categories in Asian populations as follows: underweight (BMI < 18.5), normal (BMI 18.5- 23), overweight (BMI 23-27.5), and obese (BMI ≥ 27.5).^[4]

In modern era human beings are more prone to various lifestyle disorders, due to defect in food habits and sedentary lifestyle. Obesity is one such lifestyle disease.^[5] One of the causes of increased obesity is the broad shift over the last 20 years to more sedentary work pattern. In free time, people spend their time in various activities like watching television or using the computer which lack physical activities. The sedentary lifestyle in working place not only produces obesity but also influence the blood pressure.^[6]

As the BMI increases, the balance level decreases of the subjects in their age group 20s and 30s and overweight older adults are at a higher risk of fall.^[7] Obesity is considered as the most hazardous factor in modern sedentary society and is a complex disorder of the modern world. It is emerged as the most prevalent sedentary lifestyle disorder in urban society. A major cause of all these diseases was found to be improper lifestyle and stress. Excessive stress is known to cause hormonal imbalances and chemical imbalances in human body.^[8]

Obesity and overweight is defined by body mass index and further evaluated by both percent body fat and total body fat.^[9]

The term `Yoga` has been derived from Sanskrit root-`Ujir`, meaning yoke, to unite, to put together, to combine, to bind together in the union. Literally, it means the union of an individual soul with the universal spirit, which is the aim of the discipline of yoga.^[10] Yoga is a mind-body, or meditative movement, practice originating in ancient India that combines physical postures (asanas), breathing exercises (pranayamas), and meditation or relaxation.^[11] Yoga requires little space and virtually no equipment, has limited or no side effects and with its focus on relaxation of mind and body. It is integration and harmony among head, heart, and limb.^[12]

Surya Namaskar has effect in detoxifying the organs which is deep in nature through copious oxygenation and has a deeper relaxing effect. It is a series of twelve postures. The alternating bending postures flex and stretch the spinal column giving a profound stretch to the whole body.^[13] Surya Namaskar is an exercise that provides physical health benefits and mental or emotional as well as spiritual benefits. The advantage of Surya Namaskar is that the workout it provides for the muscles, and it also benefits joints, ligaments, and the skeletal system by improving posture, flexibility, and balance.^[14] To make a person fit and proportionate the Surya namaskar has great impact by making muscle and joints strong, provides vigour and vitality, improve blood circulation to all body, and significantly reduces body weight.^[15]

It helps to relieve stiffness, revitalizes the body, refreshes the mind, and purifies subtle energy channels. There are number of studies which are conducted on Surya namaskar and found significant improvement in flexibility.^[16] Aim was to determine the effect of Surya namaskar on waist hip ratio, balance and physical fitness index among overweight college going students.

METHODOLOGY: Quasi experimental study, Convenient sampling, 30 samples taken from MVP's college of physiotherapy and medical college the **Inclusion criteria:**^[1,18,4] Age between 18 to 35 years. Both male and female students, Body Mass Index 23 to 27.4 kg/m² {Asian classification}. **Exclusion criteria:**^[1,19,17] Patients who come under underweight and obese class I-III, any trauma in lumbar region; currently pregnant and receiving any other therapies, hypertension, who had injuries in past 6 months, History of cardiovascular and respiratory disorders, epilepsy, ligament injuries, uncontrolled diabetes, neuropathies.

OUTCOME MEASURES:

1. **WAIST HIP RATIO:**^[1,20,21] - Waist circumference: It was measured with shoulder relaxed using a tailor's tape at mid-way from the top of iliac crest and last costal margin in the back and at umbilicus in the front. Hip circumference: It was measured in centimetres, keeping the legs close together at the level of greater trochanters.
2. **STAR EXCURSION BALANCE TEST:**^[11,22,23]- It is a test used for dynamic balance. The goal is to maintain a single leg stance at the midpoint of intersection of all the 3 lines (anterior, posterolateral, posteromedial) while reaching as far as possible with the contralateral leg. The test was performed 3 times and the best out of the three results was taken.
3. **MODIFIED HARVARD STEP TEST:**^[24,25,26]- The subject was advised to step up on the modified Harvard steps of 33cms height once every two seconds (20 per minute) for 5 minutes, a total of 100 steps. At one, three and five minutes after the test, pulse rate was recorded as: PR1 (Pulse Rate 1) - 1 min after exercise, PR2 (Pulse Rate 2) - 3 min after exercise, PR3 (Pulse Rate 3) - 5 min after exercise.

$$PFI = \frac{\text{Duration of exercise in seconds}}{2(\text{pulse 1} + 2 + 3)} \times 100$$

The fitness of the subject will be graded on basis of score of PFI as: ≤50: Poor, 51-60: Average, 61-70: Good, 71-80: Very Good, 81-90: Excellent, >90: Superb.



Figure 1. Measuring Waist Hip Ratio



Figure 2. Performing Star Excursion Balance Test



Figure 3. Performing Modified Harvard Step Test

PROCEDURE: [1,27,28,29,30]

30 participants were selected based on inclusion and exclusion criteria. They were explained about the procedure and a consent form was signed from all participants. The protocol begins with 5 minutes of warm-up period. Then the subject performs Surya namaskars. Each pose was held for 10 seconds. This is to be followed by cool-down period of 5 minutes. The complete protocol duration was 4 weeks with 5 sessions per week. Exercise intensity: All the participants were asked to perform Surya namaskar until they reach rate of perceived exertion (RPE) of 7 on a 10 scale, that is, 'very hard' on the modified Borg's scale.

1. **Pranamasana (Prayer Pose)**- The subject was asked to stand straight with palms held close to the chest in prayer pose and she was instructed to only inhale, without making any other movement of the body.
2. **Hastauttanasana (Raised Arm Pose)**- The subject was asked to Raise both arms overhead, tilting the head, neck, and upper body gently back backward while gazing up at the thumbs.
3. **Hasta Padasana (Hand to Foot Pose)**-The subject was asked while exhaling start bending forward in the waist and place the palms on the floor quite in line of the toes, without bending the legs in the knees.
4. **Ashwa Sanchalasana (Equestrian Pose)**- The subject was asked while inhaling take the left leg back and rest the knee of the left leg on the floor. Press the waist downwards and raise the neck upwards. Stretch the chest forward and push the shoulder back.
5. **Dandasana (Stick Pose)**- The subject was asked to hold the breath and raise the knee of the left leg. Take the right leg back. Then straighten both the legs and arms. Keep the neck, spine, thighs, and feet in a straight slant line.
6. **Ashtanga Namaskara (Salute with Eight Parts)**- The subject was asked while exhaling bend both the arms in the elbows. The forehead, chest, both the palms, both the knees and toes touch the floor. Do not allow the nose and abdomen to touch the floor.
7. **Bhujangasana (Cobra Pose)**-The subject was asked to inhale, straighten the arms in the elbows, and stretch the shoulders upwards. Keep the toes and knees resting on the floor. Keeping the arms straight, raise the chest off the floor and curve the back.

8. **Parvatasana (Mountain Pose)**- The subject was asked to exhale and altogether bend the neck downward place the chin in the throat; push the body backward and get the heels on the floor. Do not change positions of the toes and the palms on the floor.
9. **Ashwa Sanchalāsana (Equestrian Pose)**- The subject was asked to inhale and bring the right leg to the front and place it between the palms of the two arms.
10. **Hasta Padasana (Hand to Foot Pose)**- The subject was asked to exhale and bring the left leg forward. Place it between the two palms.
11. **Hastauttanasana (Raised Arm Pose)**- The subject was asked while inhaling, raise both arms off the floor and overhead with palms touching while tilting the head, neck, and upper body backward.
12. **Pranamasana (Prayer Pose)**-The subject was asked while Exhaling, bring the hands down and forward and straighten the back, taking the initial position.



Figure 4. Pranamasana



Figure 5. Hastauttanasana



Figure 6. Hasta Padasana



Figure 8. Dandasana



Figure 7. Ashwa Sanchalāsana

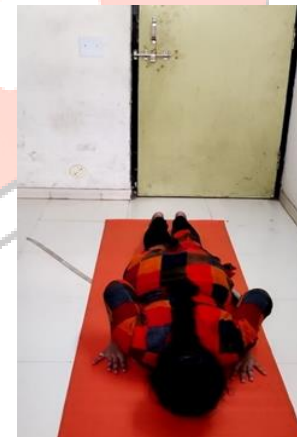


Figure 9. Ashtanga Namaskāra



Figure 10. Bhujangāsana



Figure 11. Parvatasana



Figure 12. Ashwa Sanchalāsana



Figure 13. Hasta Padasana



Figure 14. Hastauttanaasana

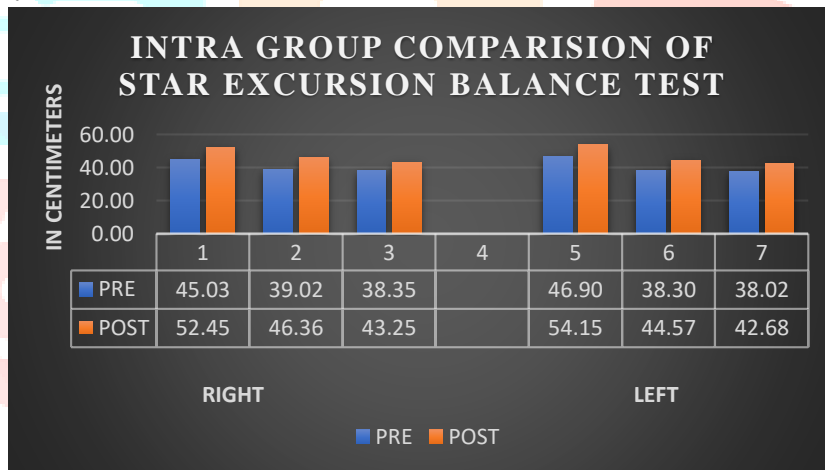


Figure 15. Pranamasana

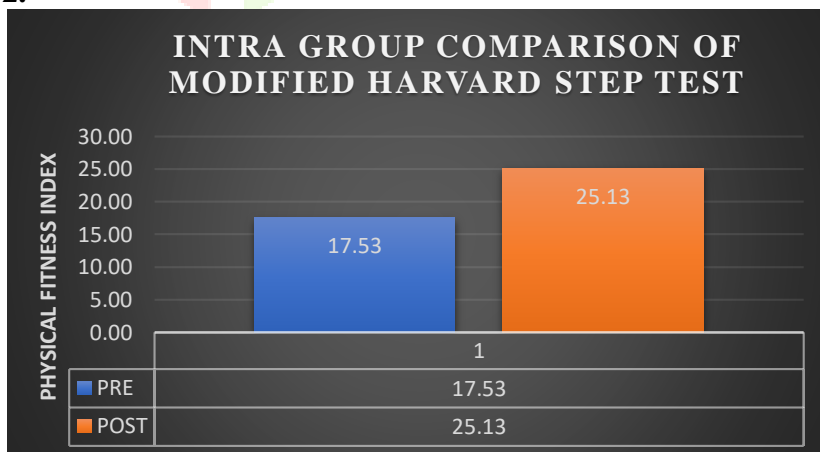
DATA ANALYSIS

- The pre and post comparison of mean values of star excursion balance test using paired t test revealed $p < 0.0001$ which is extremely statistically significant.
- The pre and post comparison of mean values of modified harvard step test using paired t test revealed $p < 0.0001$ which extremely statistically significant.
- The pre and post comparison of mean values of waist hip ratio revealed $p 0.8896$ which is statistically non-significant.

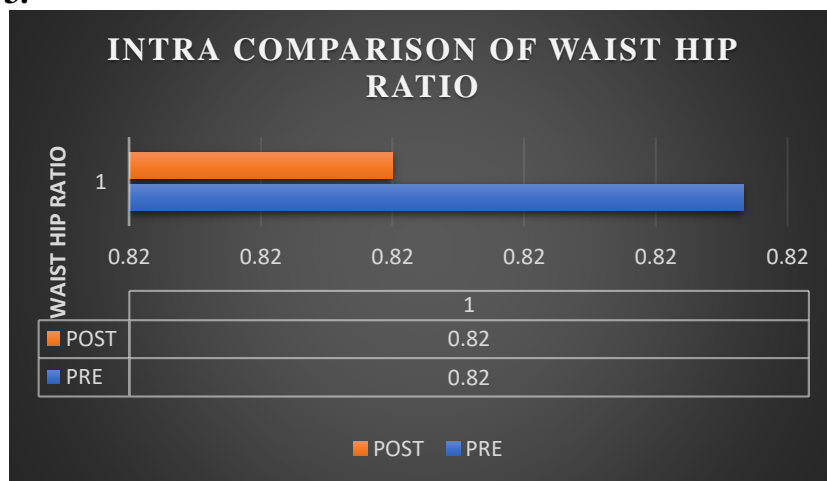
GRAPH NO 1.



GRAPH NO 2.



GRAPH NO 3.

**DISCUSSION**

The purpose of this study was to determine the effect of Surya namaskar on waist hip ratio, balance and physical fitness index among overweight college going students.

In this study, 30 overweight students were selected. Surya namaskar was performed until they reach RPE of 7 on Modified Borg's Scale. The intervention was for 4 weeks at frequency of 5 days a week, the outcome measures such as waist hip ratio, star excursion balance test and modified harvard step test were measured before and after 4-week intervention.

From the data analysis of this study, it was found that Surya namaskar has significant effect in improving balance and physical fitness index. The p value of star excursion balance test and modified Harvard step test was <0.0001 which is extremely statistically significant. Whereas Surya namaskar has low effect in reducing waist hip ratio, As the duration of study was less. The p value of waist hip ratio was 0.8896 which is statistically non-significant.

Suryanamaskar has a significant effect on improving balance. The reasons could be, Suryanamaskar training improved trunk stabilization by improving the core strength, it thereby improves balance. Suryanamaskar is performed by synchronized breathing which helps to improve neuromuscular co-ordination. Surya namaskar is an effective means of strengthening the deep abdominal muscles, thus leading in improving static and dynamic balance.^[31]

Maintenance of balance during dynamic movements, such as those involved in performing the SEBTs, involves the ability to keep the center of gravity over the stable base of support without losing one's balance.^[23]

Suryanamaskar each posture held for some time and performed repeatedly improves balance.^[33]

Johnson et al^[34] has reported that, Suryanamaskar leads to an improvement in core strength which might percolate to an enhanced balance.

Oliver Hue et.al,^[35] concluded that a decrease in balance stability is strongly correlated to an increase in body weight.

Suryanamaskar has a significant effect on improving physical fitness index. Physical fitness Index affects by body size as evidenced in positive correlation between physical fitness index with height and weight.^[24] Physical fitness index of a person depends on the post exercise recovery frequency of the pulse rate. Physical fitness index score improves due to decrease in resting pulse rate.^[25]

Surya namaskar is a moderate physical exercise which is linked with the breathing. The intensity of exercise is increased every day. Thus, it increases the stamina and cardiovascular endurance. The dynamic series known as Surya namaskar is most important for obesity management.^[32] The increase in VO_2 max is due to increased oxygen consumption by the muscles because of yogic exercise which in turn suggests an increase in muscle blood flow. The increase in VO_2 max may be attributed to increased muscular endurance from the yoga practice.^[36]

Parmar D et al.^[25], reported that overweight individuals were having less physical fitness in comparison to normal BMI individuals.

Anabel NR et al.,^[37] showed that the overweight and obese individuals exhibit lower levels of physical fitness. Suryanamaskar has a low effect on reducing waist hip ratio. As this study duration was less i.e., only for 4 weeks, due to that there was no impact on waist hip ratio.

The limitations of the study were no long term follow up of the subjects and small sample size.

CONCLUSION

The present study concludes that Surya namaskar has a significant effect on improving balance and physical fitness index. Whereas Surya namaskar has a non-significant effect on waist hip ratio, As the duration of this study was less.

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