

## Comparison between Dynamic Surya Namaskar and High Intensity Interval Training to Determine their Effectiveness on Cardiorespiratory Endurance among Physiotherapy Students: An Experimental Study

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### How to cite this article:

Vikas. M. Dhimmar, Prince T. Ahir, Ravi A. Solanki, *et al.* / Comparison between Dynamic Surya Namaskar and High Intensity Interval Training to Determine their Effectiveness on Cardiorespiratory Endurance among Physiotherapy Students: An Experimental Study / Physiotherapy and Occupational Therapy Journal. 2022;15(4): 173-179.

### ABSTRACT

**Background:** Cardio-respiratory and muscular endurance are the priority for the field of physiotherapy, this profession demands more physical effort to treat patients. So good cardiorespiratory endurance of physiotherapy students is must, in order to improve cardiorespiratory endurance, there must be exercise training included in the curriculum which is less time consuming and also have good results, and for the improvement of cardiorespiratory endurance there is two well known exercise protocol is there the Dynamic surya namaskara and High intensity interval training Hence this study was undertaken to compare both the protocol and find which one is good for physiotherapy student by measuring their cardiorespiratory endurance after the training and comparing them from the previous endurance value taken before the training. And the comparison is also made between both groups average value of endurance improvement.

**Purpose of the Study:** Aim of this study is to compare 6 weeks exercise protocols effectiveness of two different cardiorespiratory endurance trainings namely the Dynamic surya namaskara and High intensity interval training and state which training is good for physiotherapy student to have in their curriculum for improve their cardiorespiratory endurance and yet it should not impact their study time and be less time consuming.

**Method:** A experimental study was conducted in M.B Gohil institute of medical science and research centre Navsari, Gujarat. The study has included 32 physiotherapy students, divided into two groups using convenient sampling who have normal BMI and no other cardiopulmonary diseases according to our inclusion and exclusion criteria, one group undergone dynamic Surya namaskar training and other group undergone high intensity interval training, the study was conducted over a period of 6 weeks. Outcome of the cardiorespiratory endurance was measured

by using Harvard step test both before and after the training with prior informed consent.

**Outcome Measure:** Harvard Step Test.

**Statistical Analysis:** Statistical analysis was done using Microsoft office excel 2010.

**Result:** Study was done among the 32 students who completed the full training protocol whereas 16 students was undergone Dynamic Surya Namaskar training and other 16 students was undergone High intensity

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**Received on** 12.10.2022

**Accepted on** 08.12.2022

interval training. Cardiorespiratory endurance of students was measured by performing Harvard step test both previously and after the training protocol then comparison of previous values and post values were done to check the improvement in endurance, the endurance was increase in both the groups, 37.45% in Dynamic Surya Namaskar group and 58.31% improvement in High intensity interval training group so both the trainings are very effective to improve cardiorespiratory endurance. Comparison was done Among the two training Dynamic Surya Namaskar and High intensity interval training but there was no significant difference observed thus both the training are somewhat equally effective to improve cardiorespiratory endurance.

**Conclusion:** The present study showed that both the trainings are very good to improve cardiorespiratory endurance here high intensity interval training has slightly better improvement result then dynamic Surya namaskar training, but it is not significant enough to state that High intensity interval training is far better than dynamic Surya namaskar training. Considering the limitation of High intensity interval training, dynamic Surya namaskar training is a very good alternative with similar results on cardiorespiratory endurance according to our research.

**Keywords:** High intensity interval training (HIIT); Dynamic Surya namaskar; Cardiorespiratory endurance; Harvard step test; Navsari; Physiotherapy students.

## INTRODUCTION

Physical fitness is a state of health and well being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Physical fitness is generally achieved through proper nutrition, moderate vigorous physical exercise, and sufficient rest.

Before the Industrial Revolution, fitness was defined as the capacity to carry out the day's activities without undue fatigue or lethargy. However, with automation and changes in lifestyles, physical fitness is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations.<sup>1</sup>

An individual is considered to be fit for a particular task or activity when he can accomplish it with a reasonable degree of efficiency without undue fatigue and with rapid recovery from the effect of exertion. Physiological fitness implies the capacity for skilful performance and rapid recovery. Physiological effort is estimated from the magnitude of the heart rate change during exercise and from the rapidity of return of the heart rate to normal following the exercise.<sup>2</sup>

Physiotherapy students during the course of physiotherapy education is subjected to different kinds of stressors predominantly the pressure of academics leading to the successful completion of the educational course. Physical & mental fitness are the key to such a successful outcome. Physical fitness is used in two close meanings: general fitness-a state of health and well-being and specific

fitness a task oriented definition based on the ability to perform specific aspects of sports or occupations. It is the result of regular exercise, proper diet and nutrition, and proper rest for physical recovery. There has been a decrease in physical activity due to a more sedentary lifestyle. However, evolution has not kept pace with automation and humans have not adapted effectively to the sedentary lifestyles. Inadequate physical activity is responsible for approximately 30% of all deaths mainly due to heart disease, diabetes & colon cancer.<sup>4</sup> Rising levels of obesity are also contributing to these diseases. This has reached epidemic proportions in many parts of the developing world and is beginning to affect developing countries like India as well. Obesity, if present in adolescence leads to obesity in adult life. There is substantial evidence that obesity in childhood lays the metabolic groundwork for adult cardiovascular disease. Beginning an active lifestyle could significantly reduce mortality from these events. Regular physical exercise is known to have beneficial effects even in the untrained person and in diseased states like Diabetes, Obesity & Hypertension.<sup>2</sup>

Many studies conclude that Cardiorespiratory fitness of the Physiotherapists students was low therefore there is a need to motivate the students to achieve optimal level of fitness levels. It is recommended that the students should engage in physical activities. Institutions should include the different physical activities in their curriculum.<sup>3</sup> Which is easy and less time consuming, so it could not interfere with the busy schedule life of the physiotherapy students therefore we have found two techniques which consume less time

approximately half an hour per session and gives good results.

## THERE ARE TWO TYPES OF TECHNIQUES

### *Dynamic Surya namaskar*

The basic translation of Surya namaskar is salutation to the sun. it is a very ancient tradition which has been in existence since the Vedic age. The physical basic of the practice link together twelve asanas in a dynamically performed series. These asanas are ordered so that they alternately stretch the spine backwards and forwards. When perform in the usual way, each asana is move into with alternated inhalation and exhalation. A full round of Surya namaskar is considered to be two sets of the twelve poses with a change in a second set to moving the opposite leg first through the series. With increasing scientific research in yoga, its therapeutic aspect are also being explored Surya namaskar gives more benefits with less expenditure of time. It is claimed that Surya namaskar practice improves general health and fitness.<sup>4</sup>

### *High intensity interval training (HIIT)*

The fitness industry has recently seen a surge of interest in high intensity interval training (HIIT) a burst and recover cycle that is suggested to be a viable alternative to the traditional approach to enhancing aerobic fitness, namely continuous endurance training. Some studies, however, have suggested that HIIT leads to improvements in both aerobic and anaerobic fitness.<sup>5</sup> The present study is taken with the objective to analyse and compare the effect of dynamic Surya namaskar and high intensity interval training (HIIT) on physical<sup>4</sup> fitness of Physiotherapy students. Physical fitness is the basis of all the activities of our society. If we fail to encourage physical development and powers, we will undermine our capacity for thought and for work.

## METHODOLOGY

### *Study Setting*

M.B. Gohil Institute of Medical Science and Research Centre, College of Physiotherapy, Navsari, Gujarat, India.

### *Study Population*

Physiotherapy students of M.B Gohil college of

physiotherapy

### *Study Design*

Experimental study

### *Study Duration*

The study will be undertaken for a total 6 months.

### *Study Sample Design*

Convenient Sampling

### *Sample Size*

32 students depending upon availability.

Two groups 16 students each

### *Materials Used*

1. Step Bench- 33 cm
2. Stopwatch
3. Measuring tape
4. Paper and pen
5. Sphygmomanometer
6. Stethoscope
7. Pulse Oximeter
8. Metronome
9. Yoga mat
10. Weight machine

## SELECTION CRITERIA

### *Inclusion Criteria*

1. Healthy young male & female Physiotherapy students.
2. Age between 18 to 24 years
3. Body Mass Index (BMI) {18.5-24.9}
4. 6-minute walk test

### *Exclusion Criteria*

1. Student with Locomotor & Musculoskeletal disability
2. History of Cardiovascular disorder
3. History of Respiratory disorders
4. History of Diabetes mellitus, Hypertension
5. History of Major surgery in the recent past
6. History of Alcohol & Smoking

**Outcome Measure**

1. Pre and post vital signs (pulse rate, respiratory rate, blood pressure).
2. Physical fitness index score-PFI = Duration of exercise in seconds x 100/2 (pulse 1+2+3)

**Procedure:** The Subject is advised to step up on the modified Harvard steps of 33cms height once every two seconds (30 per minute) for 5 minutes, a total of 150 steps. At one, three and five minutes during the test, pulse rate was recorded as

(a) PR1 (Pulse Rate 1) – 1 min after exercise

(b) PR2 (Pulse Rate 2) – 3 min after exercise.

(c) PR3 (Pulse Rate 3) – 5 min after exercise.

**Classification of fitness according to Harvard index**

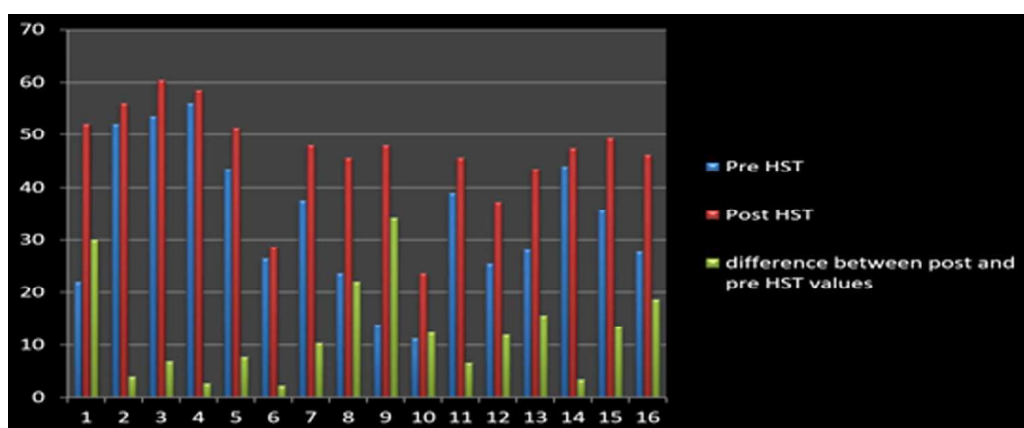
| Category     | Harvard index |
|--------------|---------------|
| Poor         | <55           |
| Low Average  | 55 – 64       |
| High Average | 65 – 79       |
| Good         | 80 – 89       |
| Excellent    | 90 & Above    |

**RESULT**

In total 32 samples were taken for study where 16 are included in Dynamic Surya namaskar training and other 16 are included in High intensity interval training.

**Table 1:** Dynamic Surya Namaskar

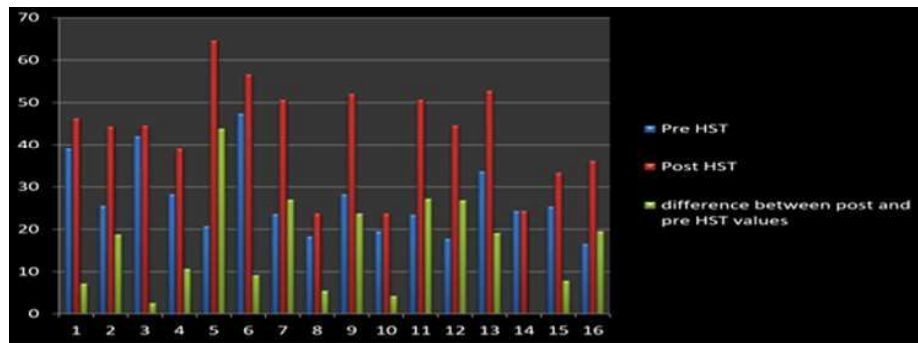
| Sample No.      | Pre HST  | Post HST | Difference Between Post and Pre HST Values |
|-----------------|----------|----------|--------------------------------------------|
| 1               | 22.08    | 52.08    | 30                                         |
| 2               | 52.08    | 55.97    | 3.89                                       |
| 3               | 53.51    | 60.48    | 6.97                                       |
| 4               | 55.97    | 58.59    | 2.62                                       |
| 5               | 43.60    | 51.36    | 7.76                                       |
| 6               | 26.35    | 28.56    | 2.21                                       |
| 7               | 37.68    | 48.07    | 10.39                                      |
| 8               | 23.65    | 45.73    | 22.08                                      |
| 9               | 13.88    | 48.07    | 34.19                                      |
| 10              | 11.28    | 23.65    | 12.37                                      |
| 11              | 39.06    | 45.73    | 6.67                                       |
| 12              | 25.40    | 37.33    | 11.93                                      |
| 13              | 27.98    | 43.60    | 15.62                                      |
| 14              | 44.11    | 47.46    | 3.35                                       |
| 15              | 35.79    | 49.34    | 13.55                                      |
| 16              | 27.64    | 46.29    | 18.65                                      |
| Mean difference | 33.75375 | 46.39438 | 12.64063                                   |



**Graph 1:** Dynamic Surya Namaskar

**Table 2:** High intensity interval training

| Sample No.      | Pre HST  | Post HST | Difference between Post and Pre HST Values |
|-----------------|----------|----------|--------------------------------------------|
| 1               | 39.06    | 46.29    | 7.23                                       |
| 2               | 25.59    | 44.40    | 18.81                                      |
| 3               | 42.13    | 44.64    | 2.51                                       |
| 4               | 28.32    | 39.05    | 10.73                                      |
| 5               | 20.78    | 64.65    | 43.87                                      |
| 6               | 47.46    | 56.66    | 9.2                                        |
| 7               | 23.65    | 50.67    | 27.02                                      |
| 8               | 18.34    | 23.73    | 5.39                                       |
| 9               | 28.31    | 52.08    | 23.73                                      |
| 10              | 19.57    | 23.75    | 4.18                                       |
| 11              | 23.45    | 50.67    | 27.22                                      |
| 12              | 17.80    | 44.64    | 26.84                                      |
| 13              | 33.68    | 52.81    | 19.13                                      |
| 14              | 24.35    | 24.35    | 0                                          |
| 15              | 25.40    | 33.33    | 7.93                                       |
| 16              | 16.61    | 36.16    | 19.55                                      |
| Mean difference | 27.15625 | 42.9925  | 15.83375                                   |

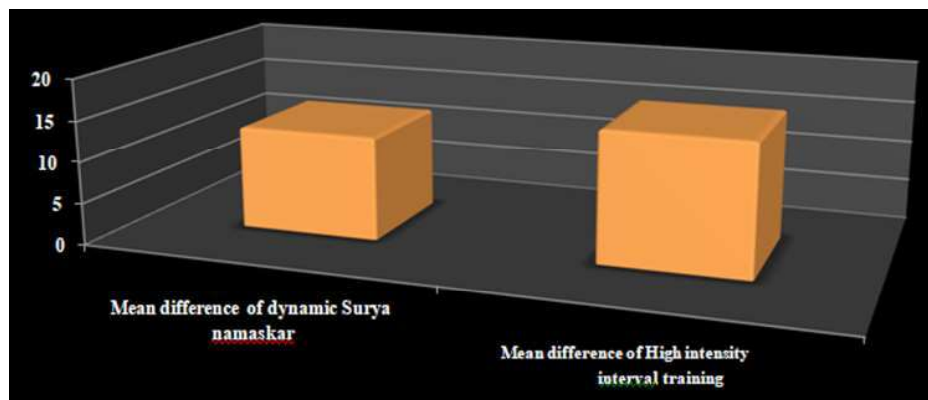


**Graph 2:** High intensity interval training

Within the group comparison was done first by using paired T test, in both groups' endurance was significantly improved.

**Table 3:** Comparison between Dynamic Surya namaskar and High intensity interval training.

| Dynamic Surya namaskar mean difference between post and pre HST values | High intensity interval training Mean difference between post and pre HST values |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 12.64063                                                               | 15.83375                                                                         |



**Graph 3:** Comparison between Dynamic Surya namaskar and High intensity interval training.

Between group comparison was done by using unpaired T test on the basis of outcome measure values in this comparison result shown no significant difference between two groups ( $p > 0.05$ ).

## DISCUSSION

The current study was conducted for a comparison between Dynamic Surya Namaskar and High Intensity Interval Training to determine their effectiveness on cardiorespiratory endurance among physiotherapy students: an experimental study.

The Dynamic Surya Namaskar training is proven to reduce pulse rate when it is performed regularly. Systematic practice of Dynamic Surya Namaskar on regular basis imputed to decrease sympathetic activity and increase vagal tone.<sup>14,15</sup> Surya Namaskar practice interacts with the organs of the body directly, by applying pressure, massaging, stretching and overall toning up the muscles. This aids the eliminative functions as well as stimulating nervous energy. It also enhances our wellbeing. In Surya Namaskar a deep rhythmic breathing process is synchronized with each movement, which empties the lungs more vigorously and refills them with fresh, clean, oxygenated air. All the alveoli of the lungs are expanded, stimulated and then cleaned. The oxygen content of the blood is increased, which improves the overall vitality and oxygenation of whole body especially heart and brain. The cardiac muscles are also strengthened. Microcirculation to the heart is increased which reduces the chances of heart attack, blood vessel disorders and general fatigue can also be eliminated. Hence sluggishness and lethargy are greatly reduced. Pratima M. Bhutkar et al (2008) concluded that regular Surya Namaskar practice improves cardiopulmonary efficiency in healthy adolescents and is beneficial exercise for both males and females. Such yogic practices can be advised to those interested in improving cardiovascular efficiency but cannot undergo strenuous physical exercise.

On the other hand, High Intensity Interval Training boosts the cardiovascular fitness faster by working harder instead of longer. It is proven that systematic practice of High Intensity Interval Training improves hearts structure such as chamber enlargement thus it increases the volume of blood the heart can pump to the rest of the body in each heartbeat. It also help to lower blood pressure and blood sugar, while improving oxygen and blood

flow. Christopher Hurst et al (2019) concluded that the efficacy of HIIT as a time efficient tool for cardiorespiratory fitness improvement with emerging data indicating potential beneficial effects on the neuromuscular system. So therefore, HIIT not only have advantageous effect on cardiorespiratory system but neuromuscular system also. The result of the study shows that which training is better and less time consuming between Dynamic Surya Namaskar and High Intensity Interval Training here in the result the difference between two training outcome is not significant to state one training is better than the other one. In the High Intensity Interval Training the average increase in the endurance is slightly greater than of average endurance increase in Dynamic Surya Namaskar Training however considering the limitation of high intensity interval training such as high risk of injury and it also need a break of a day between two session<sup>16</sup> whereas Dynamic Surya Namaskar has no such limitation and it has additional benefit that it improves flexibility of the body so that body became less prone to any kind of injury. During our research we observe that students performing HIIT were feeling more exhausted and tired then the students performing Dynamic Surya namaskar. Dynamic Surya Namaskar training is a viable alternative for improving cardiorespiratory endurance. Because exercise should not be like a burden to the student therefor, we suggest dynamic Surya namaskar to be added in physiotherapy curriculum in order to improve the much-needed cardiorespiratory endurance of students.

## CONCLUSION

Present study was done at M.B Gohil institute of medical science and research centre among the physiotherapy students to determine which training is better to improve the cardiorespiratory endurance either dynamic Surya namaskar or high intensity interval training. Both the trainings are very good to improve cardiorespiratory endurance here high intensity interval training has slightly better improvement result then dynamic Surya namaskar training, but it is not significant enough to state that HIIT is far better than dynamic Surya namaskar training. Considering the limitation of HIIT dynamic Surya namaskar training is an incredibly good alternative with similar results on cardiorespiratory endurance according to our research.

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