

# Effect of Pranayama and Suryanamaskar training on Breath Holding Time and Cardiovascular Endurance of male Students

Dr Nimeshkumar D. Chaudhari  
Assistant Professor  
Gujarat Vidyapith, Ahmedabad  
Faculty of Physical Education and Sports Science,  
AT. Sadra, Ta. Dist. Gandhinagar.(Gujarat)  
Pin No. 382320.

## Abstract

The purpose of the study was to find out “Effect of Pranayama and Suryanamaskar training on Breath Holding Time and Cardiovascular Endurance of male Students” The study was formulated as a true random group design, consisting of a pre-test and post-test. The sample of the study is thirty Pranayama (N=30), thirty Suryanamaskar (N=30) & Control Group (N=30) male school Students were taken as the subjects for the Study from Gyandhara Shikshan Tirth, Sadra; Gujarat, India. Thus total number of subjects were (N=90) ninety only. The age group of the subjects was ranged from (18-25) years. Pre-tests were conducted for all the subjects on selected Breath Holding Time and Cardiovascular Endurance variables. The experimental groups participated in their respective Pranayama training and Suryanamaskar training for a period of 9 weeks. The post-tests were conducted on the above said dependent variables after a period of 9 weeks training on all the three groups, namely, experimental group-I, experimental group-II and group-III control group. The differences between the initial and final scores on selected dependent variables were considered as the effect of selected experimental treatments. To test the statistical significance, the obtained data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the hypothesis.

**Keywords:** Pranayama, Suryanamaskar, Breath Holding Time, Cardiovascular Endurance.

## INTRODUCTION

*“Lack of activity destroys the good condition of every human being, while movement and methodical physical exercise save it and preserve it”.*

~Plato~

The body is the temple of soul and to reach a harmony of the mind, body and spirit, the body must be physically fit (Charles A. Bucher). Throughout the ages, man has had to be physically active in order to procure his daily food to succeed in the battle of survival. For every individual physical activity is essential for harmonious physical and mental development.

Fit people make a fit nation. Fitness is that State which characterizes the degree to which a person is able to function more efficiently. Fitness is an individual matter. It implies the ability of each person to live most effectively within his potentialities (HockeyEd.'1985)

India has a rich tradition of yogic practices. Nowadays yoga, the ancient practice of postures, breathing, and meditation, is gaining a lot of attention from health-care professionals.[1] During practicing of yoga, metabolic activities increase, and therefore both the ventilation and the cardiac systems work harder to meet the increased demand. To do so, an increase in the number of breaths, heart beats per minute, tidal volume, and stroke volume is necessary. Prana is the vital life force or energy that acts as a catalyst in all activities and pranayama is the expansion or control of this force. Pranayama, in which the rhythm of nose breathing and deep abdominal predominance prevails throughout the whole process, is a

systematic, controlled exercise of respiration that makes the lungs stronger, improves blood circulation, and makes the individual healthier. This prana is the basic fabric of this universe, both inside and outside our body. The basic translation of Suryanamaskar is salutations to the God sun. It is a very ancient Indian tradition, which has been in existence since the Vedic age. The physical basis of the Suryanamaskar practice links together 12 asanas in a dynamically performed series. These asanas are performed in such a way that they alternately stretch the spine backward and forward. When performed in the usual way, each asana involves alternate inhalation and exhalation. A full round of Suryanamaskar consists of 2 sets of the 12 poses with a change in the second set to moving the opposite leg first through the series. A study performed on a group of elderly persons indicated that a short-term yoga practice (Suryanamaskar and pranayama) was beneficial and prevented development of primary respiratory problems by increasing the efficacy of respiratory muscles.

Cardio Respiratory efficiency is an important quality to be developed to the sportsmen. Man needs to participate in physical activities in order to achieve growth development and maintain good health. It is natural and inborn quality of a child to participate in such activities as running, throwing, jumping etc. Cardiovascular endurance is the ability to perform whole body activities for extended periods of time. The cardio respiratory system provides a means by which oxygen is supplied to the various tissues of the body. Without oxygen, the cells within the human body cannot possibly function and ultimately death will occur. Thus the cardio respiratory system is the basic life support system of the body.

The resting pulse rate or heart rate varies greatly among different people and in the same person under different situations. American heart rate association accepts as normal a range from 50 to 100 beats per minute. Some endurance athletes with very strong and efficient hearts have rate as low as 45 beats per minute. Women have heart rates 5-10 beats faster than men. This is primarily due to their size. Good cardio respiratory condition would be indicated by a pulse rate of 60 for women and 50 for men. The lesser the pulse rate given good performance for all the sports and games.

The best training is achieved simply by carrying out the activity for which one is trained, physical training may influence a number of the factors, which constitute physical performance capacity that is, it may cause changes not merely in muscle strength and through both the mouth and nose. Force deep breathing is often done by runners, just prior to the start of the race. The purpose or importance is to build up a maximum store of oxygen in the blood and lungs. Breath holding time is the time taken by one who holds his breath at rest. Many athletic events are performed with the breath hold, notably in swimming and track sprints.

#### *Breath Holding Time:-*

Breath holding time is defined as the duration of time through which one can hold his / her breath without inhaling and exhaling after a deep inhalation.

There are two types of breath hold time:

- Positive Breath holding time
- Negative Breath holding time

Endurance type of training will improve the breath holding time. Breath holding time also plays a vital role in the sports performance (Strukic, P.J. 1981).

#### *Cardio-vascular Endurance:-*

Cardio-Vascular Endurance is the ability of the heart, blood vessels, blood and respiratory system to supply oxygen and fuel to the muscles at a steady rate for a considerable length of time. (<http://www.teachnet.ie/coconnor/definition.html.definition>) Cardio-vascular endurance may be defined as the ability of lungs and heart to taken in a transport adequate amount of oxygen to the working muscles.

The physiology of the study was to find out “Effect of Pranayama and Suryanamaskar training on Breath Holding Time and Cardiovascular Endurance of male Students.” all of which are important in the light of recent research.METHODOLOGY :

The purpose of the study was to find out whether there would be any significant improvement on selected physiological variables as a result of Pranayama and Suryanamaskar. Selection of subjects, experimental variables, tester reliability, and instrument reliability, orientation of the subject, test administration a statistical techniques were discussed.

The sample of the study is thirty Pranayama (N=30), thirty Suryanamaskar (N=30) & Control Group (N=30) male School Students were taken as the subjects for the Study from Gyandhara Shikshan Tirth, Sadra; Gujarat, India. Thus total number of subjects were (N=90) ninety only. The age group of the subjects was ranged from (18-25) years.

The selected subjects were randomly divided into three groups and each groups contain thirty subjects. Group one acted as experimental group-one and group-two acted as experimental group-two and group-three acted as control group. Experimental group-I was given 9 weeks Pranayama, experimental group-II Suryanamaskar was given 9 weeks Pranayama and Suryanamaskar the control group was not given any treatment except of their routine.

The investigator reviewed the available scientific literature pertaining to the study from books, journals, periodicals, magazines and research papers. Taking into consideration of the feasibility variables the following variables were selected.

### Independent Variables

1. Pranayama
2. Suryanamaskar

### Dependent Variables

Physiological Variables

- 1) Breath Holding Time
- 2) Cardiovascular Endurance

### Experimental Design

The study was formulated as a true random group design, consisting of a pre-test and post- test. The subjects (n=90) were randomly assigned to three equal groups of thirty men Students. The groups were assigned as Experimental Groups-I, II and control group respectively. Pre-tests were conducted for all the subjects on selected physiological variables, such as breath holding time, cardiovascular endurance. The experimental groups participated in their respective pranayama and Suryanamaskar for a period of 9 weeks.

#### 1. Breath Holding Time

**Objective:-**The purpose of this test was to measure the breath holding time.

**Equipments:** For recording the breath holding time, a stop watch (1/10th of second) and nose clip were used.

**Administration:** The subject was instructed to stand at ease and to inhale deeply after which he holds his breath for a length of time possible by him. A nose clip was placed on nose to avoid letting the air through nostrils. The duration from the time of holding his breath until the movement he let air out was clocked by using the stop watch to the nearest one tenth of a second as breath holding time. The co- operation of the subject to let out the air by opening the mouth was sought to clock the exact breath holding time.

**Scoring:** The time is recorded in seconds and the beset of two trials were recorded (Mathew, 1988).

#### 2. Cardiovascular Endurance: (Cooper's 12 Minutes Run/Walk Test)

**Purpose:-**To measure endurance.

**Equipment:-** 400 M track and stop watch.

**Age and Sex:-**School boys in the age group of 14 to 16 were administered of the tests Precautions: Care was taken to remove the stones etc. on the running path of the subjects. Trial runs were allowed before the subjects perform running. Subjects were also instructed that if they could not run for twelve minutes continuously they can also walk for some time and then start running.

**Procedure:** Students could run individually or in groups of a dozen or more. When students ran in groups, they were paired. While 8 students ran the partners listened for the time to call out his partner's time when he crossed the finish line, and then relay this time to the scorer. Students entered space running with periods of walking and were encouraged to pace themselves, when a group was running. The time was called out as each student crossed the finish line. The score was the time elapsed.

**Scoring:-**Record time in minutes and seconds.

### *Training of Yoga Exercise*

All the subjects were asked to practice yoga daily for about 1 h. Yoga classes started with a brief prayer. Preparatory practices such as breath-body coordination and joint-loosening exercises were undertaken for 10 min. As mentioned earlier, the duration of the study was 9 weeks; the yoga was performed for daily 30 min for 5 days a week. This was followed by 30 min of either (group I) pranayama or (group II) Suryanamaskar.

At the end of yoga training exercise, attendance was taken and the subjects were motivated to practice regularly. Some of the classes were preceded by talk on diet and lifestyle modification in controlling chronic lifestyle disorders.

The assessment of parameters for Breath Holding Time and Cardiovascular Endurance specific to pranayama, and Suryanamaskar was performed on the students before and after 9 weeks.

### **STATISTICAL TECHNIQUE :**

To find out the significant effects of Pranayama and Suryanamaskar training on selected physiological variables and motor ability components, ANCOVA statistical technique was used. When the F-ratio was found to be significant, Scheffe's post hoc test was applied to test which of the possible comparison among the mean is significant.

### **RESULTS AND DISCUSSION :**

Results On Breath Holding Time: The statistical analysis comparing the initial and final means of Breath Holding Time due to Pranayama and a Suryanamaskar training among male Students is presented in Table-I.

**Table 1**  
**Computation of Analysis of Covariance of Breath Holding Time**

	Pranayama training	Suryanamaskar training	Control Group	Mean Difference	Source of Variance	Sum of Squares	df	Mean Squares	'F'
Pre-Test Mean	32.90	29.30	32.70	03.77	Between	168.80	2	84.40	2.10
					Within	3459.70	87	40.18	
Post-Test Mean	36.67	32.80	32.83	2.90	Between	296.74	2	148.20	5.53*
					Within	2331.60	87	26.80	
Adjusted Post-Test Mean	35.91	34.17	32.20	0.13	Between	204.60	2	102.30	15.49*
					Within	568.10	86	06.61	

\*Significant Table F-ratio at 0.05 level of confidence for 2 and 87 (df) =3.10, 2 and 86 (df) =3.10.

As shown in Table-I, the obtained pretest means on Breath Holding Time on Pranayama training group was 32.90, Suryanamaskar training group was 29.30 and control group was 32.67. The obtained pre-test F-value was 2.10 and the required table F-value was 3.10, which proved that there was no significant difference among initial scores of the subjects. The obtained post-test means on Breath Holding Time on Pranayama group was 36.67, Suryanamaskar group was 32.80 and control group was 32.83. The obtained post-test F-value was 5.53 and the required table F-value was 3.10, which proved that there was significant difference among post-test scores of the subjects. Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was



done and the obtained F-value 15.49 was greater than the required value of 3.10 and hence, it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post-hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table-II

**Table 2**  
**Scheffe's Confidence Interval Test Scores on Breath Holding Time**

Pranayama training	Suryanamaskar training	Control Group	Mean Difference
35.91	34.17		1.74*
35.91		32.22	3.69*
	34.17	32.22	1.96*

The post-hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Pranayama group and control group Mean Difference: 3.69. There was significant difference between Suryanamaskar group and control group Mean Difference: 1.96. There was significant difference between treatment groups, namely, Pranayama and Suryanamaskar group. Mean Difference: 1.74. The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure-I.

**Table 3**  
**Computation of Analysis of Covariance of Cardiovascular Endurance**

	Pranayama	Suryanamaskar training	Control Group	Mean Difference	Source of Variance	Sum of Squares	df	Mean Squares	'F'
Pre-Test Mean	1805.33	1835.67	1856.67	72.67	Between	39962.20	2	19981.10	1.46
					Within	1193700	87	13720.70	
Post-Test Mean	1878.00	1950.67	1843.33	115.00	Between	180026.67	2	90013.33	7.21*
					Within	108673.33	87	12491.20	
Adjusted Post-Test Mean	1894.37	1948.80	1828.84	-13.33	Between	215020.90	2	107510.45	14.11*
					Within	655175.40	86	7618.30	

\*Significant Table F-ratio at 0.05 level of confidence for 2 and 87 (df) =3.10, 2 and 86 (df) =3.10.

As shown in Table-III, the obtained pre-test means on Cardiovascular Endurance on Pranayama group was 1805.33, Suryanamaskar group was 1835.67 was and control group was 1856.67. The obtained pre-test F-value was 1.46 and the required table F-value was 3.10, which proved that there was no significant difference among initial scores of the subjects.

The obtained post-test means on Cardiovascular Endurance on Pranayama group was 1878.00. Suryanamaskar group was 1950.67, and control group was 1843.33. The obtained post-test F-value was 7.21 and the required table F-value was 3.10, which proved that there was significant difference among post-test scores of the subjects.

Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done and the obtained F-value 14.11 was greater than the required value of 3.10 and hence, it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post-hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table-IV.

Table 4

## Scheffe's Confidence Interval Test Scores on Cardiovascular Endurance

Pranayama training	Suryanamaskar training	Control Group	Mean Difference
1894.37	1948.80		54.43
1894.37		1828.84	65.53*
	1948.80	1828.84	119.96*

The post-hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between Pranayama group and control group Mean Difference: 65.53. There was significant difference between Suryanamaskar group and control group Mean Difference: 119.96. There was no significant difference between treatment groups, namely, Pranayama group and Suryanamaskar group Mean Difference: 54.43. The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure-II.

**DISCUSSION ON FINDING:**

The effect of Pranayama and Suryanamaskar on Breath Holding Time is presented in Table-I. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F-value 15.49 was greater than the required table F-value to be significant at 0.05 level. Since significant F-value was obtained, the results were further subjected to post-hoc analysis and the results presented in Table-II proved that there was significant difference between Pranayama group and control group Mean Difference: 3.69 and Suryanamaskar group and control group Mean Difference: 1.96. Comparing between the treatment groups, it was found that there was significant difference between Pranayama and Suryanamaskar group among Students.

Thus, it was found that Pranayama was significantly better than Suryanamaskar and control group in improving Breath Holding Time of the Students.

The effect of Pranayama and Suryanamaskar on Cardiovascular Endurance is presented in Table-III. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F-value 14.11 was greater than the required table F-value to be significant at 0.05 level. Since significant F-value was obtained, the results were further subjected to post-hoc analysis and the results presented in Table-IV proved that there was significant difference between Pranayama group and control group Mean Difference: 65.53 and Suryanamaskar group and control group Mean Difference: 119.96. Comparing between the treatment groups, it was found that there was no significant difference between Pranayama and Suryanamaskar group among Students.

Thus, it was found that though Suryanamaskar was better than Pranayama and control group in improving Cardiovascular Endurance of the school students, the differences were not significant.

**CONCLUSIONS:**

The Pranayama and Suryanamaskar significantly improved physiological variable such as, breath holding time of high school Students. And considering between the treatment groups, it was found that Pranayama was significantly better than Suryanamaskar in improving breath holding time.

The Pranayama and Suryanamaskar significantly improved physiological variable such as, cardiovascular endurance of high school Students. And there was no significant between the treatment groups in altering cardiovascular endurance.

**REFERENCE :**

- Ananda Sri, (2006) The complete book of yoga: Harmony of Body and Mind, New Delhi, India, Orient Paper backs (A division of Vision Books Pvt. Ltd), 14th Edition, pp No: 15, 20-21 and 29.

- Dang, K. K. (1999) *Yoga and Meditation For Health*, New Delhi, The Association of Physician of India, Volume 9, Chapter 57 pp. 502 -506.
- David, Q.T. and Jerome, E.K. (2007) *Physical Activity and Health, an Interactive Approach*, Sudbarg, Massachusetts, USA, Jones and Bartlett Publishers, 2nd Edition, p. 76.
- Harris, J.A. and Benedict, F.G (1919) *A Biometric Study of Basal Metabolism in Man*, Washington, DC: Carnegie Institute of Washington Publication, p.279.
- Heyward, Vivian H., (2002), *Advanced Fitness Assessment and Exercise Prescription, (4ED)*, Champaign Illinois: Human Kinetics Publishers Inc.
- Iyengar, B.K.S.(2010)*Light on Pranayama*, Noida, India,Harper Collins Publishers, p. 12-14.
- Iyengar, B.K.S. (1996) *Light on Yoga*, New Delhi: Harper Collins Publishers, India. p.24.
- Morrow, James R., et al., (2005), *Measurement and Evaluation in Human Performance, (3ED)*, Champaign Illinois: Human Kinetics Publishers Inc., p.371. p.373

