



## RESEARCH ARTICLE

### CHANGES OF PHYSIOLOGICAL VARIABLES IN HYPERTENSIVE MEN PRACTICING YOGA AND BRISK WALKING

<sup>1,\*</sup>Manivannan, L., <sup>2</sup>Prabhusaran, N. and <sup>3</sup>Elangovan, R.

<sup>1</sup>Department of Physical Education, Chennai Medical College Hospital and Research Centre, (SRM Group), Tiruchirapalli, India

<sup>2</sup>Department of Microbiology, Chennai Medical College Hospital and Research Centre, (SRM Group), Tiruchirapalli, India

<sup>3</sup>Department of Yoga, Tamilnadu Physical Education and Sports University, Chennai, India

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#### ABSTRACT

The main objective of this investigation was to find out the effect of yoga and brisk walking on selected physiological variables (blood pressure and pulse rate) among hypertensive men. Subjects included in this study were equally divided into three major groups comprised of 30 per group. The detailed description are Group I underwent yogic practices, Group II underwent brisk walking and Group III acted as control. The study was formulated by the random design, consisting of a pre test and post test. Pre test were conducted for all the 90 subjects on selected physiological variable including blood pressure (both systolic and diastolic) and pulse rate. The experimental groups participated in their respective yoga and brisk walking exercises for a period of twelve weeks. The post tests were conducted for all the subjects again after experimentation of yoga and brisk walking exercises. The data obtained were analyzed by Analysis of Covariance (ANCOVA) to assess the significant difference among the groups on post test for physiological variables. It is concluded that regular practices of yoga decreased blood pressure and pulse rate effectively among hypertension middle aged men than the control group. Brisk walking also reduced effectively blood pressure and pulse rate among hypertension middle aged men than the control group. It is found that yoga are slightly effective than brisk walking on systolic blood pressure whereas yogic practices and walking both are equally effective in diastolic blood pressure and pulse rate.

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## INTRODUCTION

Yoga is a science and its practice harmonizes the body and mind. Yoga is immensely useful for promoting total health. It also works effectively as a therapy in three ways preventive, curative, rehabilitative (Shiv, 2015). Now a days, physical fitness among Indian school level students, today, is really questionable. Easily access of modern amenities restricts them to do hard physical labour (Lohan, 2002; Sushil, 2010). Gradually, they become sedentary. In their sedentary lives, physical inactivity leads towards most common metabolic disorders that may cause not only the morbidity and mortality, but also cause numerous health complications (Sushil, 2010).

##### \*Corresponding author: Manivannan, L.,

Department of Physical Education, Chennai Medical College Hospital and Research Centre, (SRM Group), Tiruchirapalli, India.

In fact, physical inactivity among school students often carries a negative social stigma that affects health along with declined physical fitness. Yoga is not religion it is a method by which one obtain Control of one's latent powers (Kalidas et al., 2015). It is the means to reach complete self realization. Yoga is a reduction of one's mental process, along with the physical. Regular practice of variety of yoga techniques have been shown to lower heart rate and blood pressure in various populations (Lakshmikanthan et al., 1979; Mahajan et al., 1999). Yoga has a sound scientific basis and is an ideal tool for improving the health of our masses. Pranayama helps us to control our emotions which are linked to breathing. Pranayama also influence our pranamayakosha including the vital energy sheath. Slow, deep and rhythmic breathing is ideal for controlling stress and overcoming emotional hangups. The practice of pranayama helps us to regulate our emotions and stabilize the mind. Hypertension is a medical condition in which the pressure of blood pushing against the blood vessel

walls is persistently high. The blood pressure is measured with an instrument called a sphygmomanometer in millimeters of mercury. The highest pressure reached during each heart beat is called systolic blood pressure and lowest between two beats is known as diastolic blood pressure. The blood pressure is considered as normal when it is 120=80 (mm of Hg) (Patel, 1975; Selvamurthy *et al.*, 1998; Kaushik, 2006). In the early 1970s, the rule of halves suggested that only half of the people who were hypersensitive were diagnosed and of those cases that were diagnosed, only half received appropriate treatment and only achieved adequate control of their blood pressure.

The ultimate goal of yoga is to make it possible to be able to fuse together the gross material (annamaya), physical (pranamaya), mental (manomaya), intellectual (vijñanamaya) and spiritual (anandamaya) levels within your being. In a yogic point of view, proper breathing is to bring more oxygen to the blood and to the brain, and to the control Prana or the vital life energy (Sunil, 2015; Yadav and Das, 2001). The union of yogic principles and brisk walking is considered as the highest form of purification and self discipline, covering both mind and body. The purpose of this study was to find out the effect of yoga and brisk walking on selected physiological variables including blood pressure (systolic and diastolic) and pulse rate among hypertensive men.

## MATERIALS AND METHODS

### Subjects

A total of 90 hypertensive middle aged men were included. All the subjects were selected from tertiary care teaching hospital and urban private hospitals of Tamilnadu, India. The age groups of the subjects were ranged between 35 and 45.

### Grouping of subjects

The selected subjects were equally divided into three groups each of 30.

1. Group I underwent yogic practices
2. Group II underwent brisk walking and
3. Group III acted as control

All the three groups were advised to continue the medicines as per the recommendations of their doctors. Ethical clearance was obtained from Institution and informed consent was obtained from the participants.

### Study design

The study was formulated by the random design, consisting of a pre and post test. Pre test were conducted for all the subjects on selected physiological variables including blood pressure (systolic and diastolic) and pulse rate. The experimental groups participated in their respective yoga and brisk walking exercises for a period of twelve weeks. The post tests were conducted for all the subjects after experimentation of yoga and brisk walking exercises. The data obtained were analyzed by Analysis of Covariance (ANCOVA) to assess the significant

difference among the groups on post test to find out the effects of yoga and brisk walking among hypertensive men patients.

### Training Programme

For all the study subjects yoga was trained between 5.45am to 6.45am for group I and experimental group II was trained with brisk walking practices between 7.00 am to 8.00am for duration of approximately an hour (5 days a week) for 12 weeks and group III acted as control where no training was given. The detailed description of the yoga, its duration and rest given between practices among the subjected included were interpreted in table 1. The details of repetitions were also determined thereby 2 repetitions were given in the first four weeks, 3 repetitions in the second found weeks and 4 repetitions in the third four weeks.

**Table 1. Details of yogic training**

S.No	Yogic Training	Duration	Rest between practices
<i>Loosening Exercises</i>			
1	Sitilikarana Vyayama	5 minutes	-
<i>Surya Namaskar</i>			
2	Surya Namaskar	4 minutes	1 minute
<i>Asanaas</i>			
3	Padmasana	30 seconds	45 seconds
4	Sasangasana	30 seconds	45 seconds
5	Padahastasana	30 seconds	45 seconds
6	Bhujangasana	30 seconds	45 seconds
7	Chandra badhana	1 minute	45 seconds
<i>Pranayama</i>			
8	Nadishodana Pranayama	1 minute	45 seconds
9	Bhramari Pranayam	1 minute	45 seconds
10	Japa Meditation	5 minutes	45 seconds
11	Savasana	5 minutes	-

### Brisk Walking Training

The selected experimental group included for brisk walking was required to undergo brisk walk for 45 minutes continuously without any rest. They underwent this training from monday to Friday for five days per week. The experimental period was for 12 weeks. Proper warming up and warm down activities was also given to the subjects during the experimental period. The walking programme for a session was included as follows and load dynamics was impregnated in Table 2.

**Table 2. Load Dynamics for walking group**

Weeks	Intensity	Duration	Description
1 <sup>st</sup> to 4 <sup>th</sup> Week	40 – 45%	45 minutes	5mins - Warming up
5 <sup>th</sup> to 8 <sup>th</sup> Week	45 – 50%	50 minutes	45mins - Brisk Walking
8 <sup>th</sup> to 12 Week	50 – 55%	55 minutes	10mins - Warm down

## RESULTS

### Blood pressure (sBP)

The physiological variable of Systolic Blood Pressure was measured and the results on the effect of yogic practices and brisk walking among hypertensive male patients are presented in Table 1.

**Table 1. Computation of mean and analysis of covariance of systolic blood pressure of experimental and control group (scores in mm Hg)**

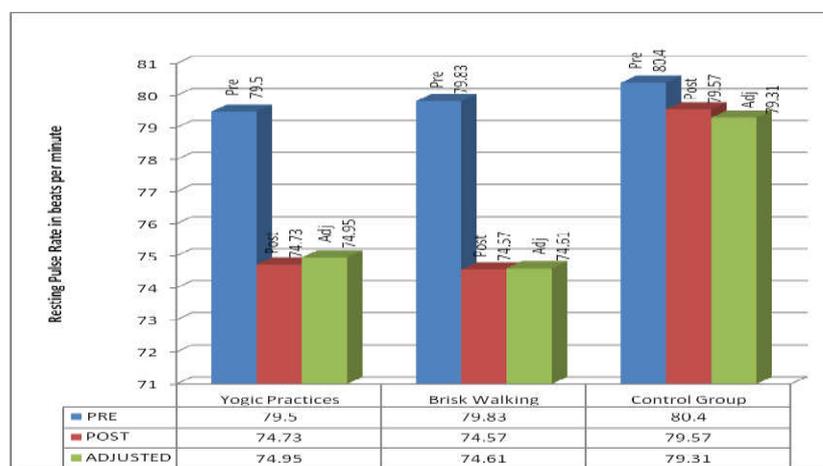
Test	Experimental Group – I (Varied Yogic Practices)	Experimental Group – II (Brisk Walking)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	141.1667	142.43	141.87	Between	2	24.16	12.078	0.88
				Within	8	1193.00	13.71	
					7			
Post-test mean	126.5	129.83	140.63	Between	2	3275.02	1637.51	125.12*
				Within	8	1138.63	13.09	
					7			
Adjusted mean	126.58	129.76	140.63	Between	2	3250.66	1625.33	124.78*
				Within	8	1120.22	13.03	
					6			
Mean Gain	14.66667	12.60	1.23					

\*Significant at 0.05 level of confidence. (Table F- ratio at 0.05 level of confidence. For 2 and 87 (df) = 3.1, 2 and 86 (df) = 3.103)

#### Scheffe's post-hoc test for diastolic blood pressure

Experimental Group – I (Varied Yogic Practices)	Experimental Group – II (Brisk Walking)	Control group	Mean difference	Required C.I
85.15	85.09	-	0.06	1.68
85.15	-	90.82	5.73*	1.68
-	85.09	90.82	5.67*	1.68

\*Significant at 0.05 level of confidence.



**Figure 1. Pre, post and adjusted post-test values of control group, two experimental groups on resting pulse rate**

Table shows that the pre test mean scores of Systolic Blood Pressure of Experimental group I Yogic practices was 141.1667. Experimental Group II Brisk Walking was 142.43 and control group was 141.87. The post test means showed differences due to Twelve weeks of Yogic practices & Brisk Walking and mean values recorded were 126.5, 129.83 and 140.63 respectively. The obtained F value on pre test scores 0.88 was lesser than the required F value of 3.1 to be significant at 0.05 level. This proved that there was no significant difference between the groups at initial stage and the randomization at the initial stage was equal. The post test scores analysis proved that there was significant difference between the groups as the obtained F value at 125.12 was greater than the required F value at 3.1. This proved that the differences between the post test mean at the subjects were significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 124.78 was greater than the required F value at 3.1. This proved that there were significant differences among the means due to Twelve weeks of Yogic practices and Brisk Walking on the physiological variable of Systolic Blood Pressure.

#### Blood pressure (dbp)

The post test scores analysis of diastolic blood pressure proved that there was significant difference between the groups as the obtained F value at 48.00 was greater than the required F value at 3.1 among yogic practices and brisk walking. This proved that the differences between the post test mean at the subjects were significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 47.18 was greater than the required F value at 3.1. This proved that there were significant differences among the means due to twelve weeks of yogic practices and brisk walking on the physiological variable of diastolic blood pressure.

#### Resting Pulse rate

Figure 1 showed that the pre test mean scores of resting pulse rate of experimental group I yogic practices was 79.5. Experimental group II brisk walking was 79.83 and control group was 80.40. The post test means showed differences due to twelve weeks of yogic practices and brisk walking and mean values recorded were 74.333, 74.57 and 79.57 respectively.

The obtained F value on pre test scores 1.00 was lesser than the required F value of 3.103 to be significant at 0.05 level. This proved that there was no significant difference between the groups at initial stage and the randomization at the initial stage was equal. The post test scores analysis proved that there was significant difference between the groups as the obtained F value at 14.73 was greater than the required F value at 3.103. This proved that the differences between the post test mean at the subjects were significant.

## DISCUSSION

In the determination of variation of systolic blood pressure, it was found that obtained F value on pre test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post test scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.1. The post hoc analysis through Scheffe's confidence test proved that due to twelve weeks treatment the yogic practices group and brisk walking group there was significant improvement in diastolic blood pressure than control group and the differences were significant at 0.05 level.

The resting pulse rate showed improvement than control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely yogic practices group and brisk walking proved that there was significant difference. There is significant difference found between the means of all selected physiological variables (pulse rate, vital capacity & peak flow rate) of physical education students. Yoga may help control such physiological variables as blood pressure, respiration and heart rate, metabolic rate to improve overall exercise capacity (Raub, 2002; Sunil, 2015). The yogic practices for 3 months resulted in an improvement in cardio-respiratory performance. Other studies also reported that six weeks courses in pranayama improve ventilatory function in the form of lowered respiratory rate, and increases in the forced vital capacity, forced expiratory volume, maximum voluntary ventilation, peak expiratory flow rate and prolongation of breath holding time (Harinath, 2004; Joshi, 1992; Sunil, 2015). The significant increase in forced vital capacity, forced expiratory volume and peak expiratory flow rate were observed at the end of 12 weeks yoga training (Yadav and Das, 2001). Some studies found statistically significant decrease in both sBP and dBP after Yoga training (Bharshankar, 2003; Gandhi, 2006). It was also observed significant decrease in sBP after one month of pranayama training, but no change in DBP (Kalwale, 2006). There was a reduction observed in sBP, dBP and resting pulse rate in our study.

## Conclusion

1. It is found that yogic practices and brisk walking have made significant positive differences on the selected physiological variables controlled systolic blood pressure among hypertensive middle aged men. Further it is found that yogic practices are slightly effective than brisk walking.

2. It is found that yogic practices and brisk walking which had no significance between the experimental group and both are equally good in the dependent variables on the diastolic blood pressure and resting pulse rate.

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