

EFFECT OF SHORT TERM YOGA PRACTICES ON CARDIO-RESPIRATORY FITNESS PARAMETERS

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ABSTRACT

Background: In recent times ,medical fraternity is much attracted towards yoga. It is claimed that yoga practices improve general health and fitness. **Aim:** To find effect of short term Yoga practice on cardio-respiratory fitness. **Objective:** To measure cardio-respiratory fitness parameters before and after Yoga practice. **Material:** The present study was conducted on 60subjects, who came voluntarily as subjects for the project. **Setting and Design:** It was a cohort study. I M.B.B.S.students ,60 in number(40 boys and 20 girls).Their age ranged between 18 to 20 years. **Method:** Pulse rate and respiratory rate measured in supine position.B.P. measured using mercury sphygmomanometer. 40 mm Hg endurance test was conducted by using mercury sphygmomanometer. **Results:** Resting pulse rate, Respiratory rate and blood pressure was found to be decreased and 40mm endurance time was found to be increased in both male and female subjects. **Conclusion:** From this study we conclude that yoga practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.

Key words: yoga, cardio-respiratory efficiency,40mmHg endurance time

INTRODUCTION

Now-a-days, more persons are interested in physical fitness than any time before. Health and physical fitness depend highly on cardio-respiratory efficiency of an individual. It is claimed that yoga practices improve general health and fitness.Yoga is a science practiced in India over thousands of years. In recent times medical fraternity is much attracted towards yoga. Yoga practice mainly consist of Asana (posture- a particular position of the body which contributes to steadiness of body and mind) and Pranayama (to control the breathing in a superior

and extra-ordinary way to get maximum benefits.),and meditation. It produces consistent physiological changes and have sound scientific basis¹. Yogic exercises have been found to be beneficial for better maintenance of bodily functions, even in normal healthy subjects. In view of this we planned to undertake a study on effects of yoga training on various cardio-respiratory fitness parameters.

AIMS & OBJECTIVES

1. To measure the cardio-respiratory fitness parameters like pulse rate, systolic and diastolic blood pressure, respiratory rate, and 40 mm endurance time before starting yoga practice.
2. To measure above mentioned parameters in the same subjects after 12 weeks yoga practice.
3. To note the difference, if any, in the values of the above parameters obtained before and after yoga practice and to discuss the results in view of the results obtained by other workers.

MATERIAL AND METHODS

In the present study , I M.B.B.S.students ,60 in number (40 boys and 20 girls) participated voluntarily. Their age ranged between 18 to 20 years. They all were informed regarding the nature of the study and written consent was obtained. The vital data was collected which included name,age,sex,height and weight of the subject. Mean height - 165 cm Mean Weight - 55 kg.

Exclusion Criteria:-

1. Past or present history suggestive of cardiovascular or respiratory illness or any other systemic illness.
2. History of major surgery in the recent past.
3. Family history of asthma or allergic diseases.

4. History of cigarette smoking, tobacco chewing, alcohol intake etc.
5. Previous experience of YOGA training
6. History of active sports training.

Students were instructed not to do any other physical exercises like sports, athletics or resistance training during the present study.

The following parameters were recorded.

1. **Pulse rate :-** Pulse rate was counted for a complete one minute after 10 min. rest in supine position.
2. **Blood Pressure :-** Systolic and diastolic blood pressure was recorded by sphygmomanometer by auscultatory method in a supine position after 10 min. rest.
3. **Respiratory Rate :-** Respiratory rate was counted for a complete one minute after 10 min. rest in supine position.
4. **40 mm Hg endurance test:-** 40 mm Hg endurance test was conducted by asking the student to take in a full breath and blow against the mercury column of sphygmomanometer to the pressure of 40 mm, maintaining it as long as possible. The time (in seconds) for which the student could maintain the mercury level at 40 mm Hg was noted. The lips were secured tightly around the mouthpiece with the help of fingers to ensure that there was no leak. Care was taken to see that the subjects did not use oral muscles or tongue to develop pressure or to block tubing².

After recording above parameters, subjects were trained by experts from Yoga Kendra for two weeks. Then, the subjects performed the Yoga Practice (Asanas & Pranayama) in the evening for one hour, six days in a week, for 12 wks under expert's observation. Yoga practice consisted of -

Sr.No.	Name	Total Duration
1	Prayer & Omkar Recitation	5 min.
2	Asanas (Naukasana, Matsyasana, Bhujangasana, Shalabhasana, Dhanurasana, Shavasana)	30 min
3	Breathing Exercises (Kapalbhati, Yogic Shwasan)	10 min.
4	Pranayama (Nadi Shuddhi, Bhastrika, Bhramari)	15 Min
	Total	60 min

YOGA PRACTICE -

They had a similar pattern of diet and activity during yoga practice. After 12 wks all the parameters were recorded again and Data was analyzed statistically using 'z' test, separately for males and females, using spss software.

Parameter	Mean ± SD (Before)	Mean ± SD (After)	p value
Pulse (/ min)	81.75 ± 4.27	76.9±4.12	<0.001
Systolic BP (mmHg)	122.5±5.61	118±3.92	<0.001
Diastolic BP (mmHg)	82.7±5.51	78.7±3.62	<0.001
Respiratory rate (/min)	16.5±3.33	13.5±2.2	<0.001
40mm endurance (sec)	30.97±3.25	40.13±2.51	<0.001

Results : Table 1- Mean values of various parameters in males (n = 40)

Parameter	Mean ± SD (Before)	Mean ± SD (After)	p value
Pulse (/ min)	80.5±4.25	77.5±4.12	<0.001
Systolic B.P. (mmHg)	120.6±55.33	116.5 ±4.28	<0.001
Diastolic B.P. (mmHg)	80.5±6.39	76 ±4.12	<0.001
Respiratory rate (/min)	15±2.2	12±2.51	<0.001
40mm endurance (sec)	26.95±3.47	34.73±3.41	<0.001

Table 2- Mean values of various parameters in females (n = 20)

Table 1 shows changes in cardio-respiratory fitness parameters in male subjects whereas Table 2 represents changes in cardio-respiratory fitness parameters in female subjects. Both the groups show statistically significant decrease in pulse rate, Systolic B.P., Diastolic B.P. and Respiratory Rate and statistically significant increase in 40mm endurance time.

DISCUSSION

As shown in table 1 and 2 all the parameters in males and females show statistically significant improvement with regular practice of yoga.

1. Pulse Rate : A. A. Khanam et al (1996)³, Kaviraja Udupa et al (2002)⁴, Jyotsna Bharashankar et al (2003)⁵ observed statistically significant reduction in heart rate after short term Yoga training. Our study also showed Statistically significant reduction in pulse rate after regular practice of yoga and it is attributed to increased vagal tone and decreased sympathetic activity^{6,7}. Decreased sympathetic activity in turn reduces catecholamine secretion and also leads to vasodilation leading to improvement in peripheral circulation. It is also observed that regular yogic practices reduce basal metabolic rate and resting oxygen consumption⁸. All these may be responsible for reduction in resting pulse rate.

2. Blood Pressure : Jyotsna Bharshankar et al (2003)⁹, Gandhi et al (2006)¹⁰ found statistically significant decrease in both SBP and DBP after Yoga training. Kalwale P.K., Shete A.N. et al (2006)¹¹ observed significant decrease in SBP after one month of pranayama training, but no change in DBP.

Wallace and Benson (1972)¹² showed antistress effect of 'shavasana' by measuring galvanic skin resistance (GSR). Bagchi and Wenger (1961)¹³ showed antistress effect of yoga practice by noting changes in EEG.

Our study showed Statistically significant reduction in both systolic and diastolic blood pressure.

Increased vagal tone decreases the work load on heart leading to decrease in cardiac output and hence systolic blood pressure. Yogic practices alter the hypothalamic discharges⁸ leading to decrease in sympathetic tone and peripheral resistance and hence the diastolic blood pressure.

Antistress Effect: - Shavasana - It is the yogic technique that is claimed to have particular anti-stress effect. In shavasana, as the position of body is horizontal and relaxed, no system of body is required to work against gravity. Thus, flexor and extensor muscles can relax at the same time as there is no need to balance the body against gravity. This reduces frequency and intensity of

proprioceptive and viscerosensitive impulses. Further, the person practicing shavasana remains inwardly alert but is less conscious of the external environment. It is therefore postulated that shavasana influences hypothalamus through continuous feedback of slow, rhythmic proprioceptive and viscerosensitive impulses. The hypothalamus, in turn, acts on vasomotor center and reduces blood pressure^{12,14}.

To summarize, yoga practice causes significant decrease in systolic as well as diastolic blood pressure by :-

1. Increased vagal tone.
2. Decreased sympathetic discharge.
3. Anti-stress effect of shavasana.

3. Respiratory Rate :

L. N. Joshi et al (1992)¹⁵ and S. Telles et al (1993)¹⁶ found significant reduction in respiratory rate, after short term yoga practices. The present study also showed statistically significant reduction in respiratory rate. During daily practice of Pranayama the basic activity of bulbopontine complex is modified in such a way as to slow down its rhythm by voluntarily prolonging the phases of inspiration and expiration by stretching to their fullest extents. Thus making the lungs to work to their maximal extent to take O₂ and expire CO₂ maximally^{15,17}. Thus by practicing Pranayama for few weeks, the bulbopontine complex is adjusted to a new pattern of breathing which is slower than its basal rhythm leading to decrease in respiratory rate.

4. 40mmHg endurance time :

Madanmohan et al (1992)¹⁸ and Chibber R. et al (2006)¹⁹ found significant increase in 40 mm endurance time after short term yoga practice. 40mm endurance test in our study also showed statistically significant improvement. It appears that regular practice of Yoga improves the efficiency of the higher centers and prolongs 40 mm Hg endurance time by –

1. Decreased responsiveness of respiratory center to CO₂,
2. Pranayama produces a wakeful hypometabolic

state of the body characterized by decreased O_2 consumption and decreased CO_2 production.

3. In addition, increased development of respiratory musculature causes increased muscle endurance and delays the onset of their fatigue²⁰.
4. In some Yoga breathing, one uses extremely rapid, shallow breathing and in others, makes each successive breath nearly equal to his vital capacity. In these prolonged efforts at controlling the respiratory muscles, one is consciously and persistently overriding the usual excitatory stimuli to the respiratory centers, thus acquiring some degree of control over the respiration.
5. It is also possible that, Yoga training might alter the responsiveness of medullary and/or systemic arterial chemoreceptors.
6. Improved cardio respiratory endurance.

The yoga training regime used in the present study was of sufficient intensity and duration to produce significant changes in all the parameters studied. The no. of subjects used was 60 and all the volunteers were of similar age (17-20 years). They had a similar pattern of diet and activity. These points enhance the reliability of observations.

Thus our study suggests that regular yoga practice improves cardiopulmonary efficiency in healthy adolescents and is beneficial exercise for both males and females. Research on particular set of Yogic exercises like only selected asanas or pranayama is required and also further research with large sample size and for varied age groups is required for applying these results to population in general.

CONCLUSIONS

1. The short term Yogic training programme undertaken for one hour daily including various yogic practices like asanas, breathing exercises, pranayamas seems to improve cardio-respiratory efficiency.
2. In spite of Yogic training being not very vigorous, cardio-respiratory efficiency was found to increase.

3. Yoga practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.
4. By extending these results, we suggest that yoga practice may be applied as alternative therapy or as adjunct to conventional therapy in stress related diseases like essential hypertension, angina and coronary artery diseases.
5. Yoga practice may be used to improve cardio-respiratory efficiency and hence fitness in sport persons.

REFERENCES

1. K.S. Gopal et al. Effect of Yogasanas and Pranayamas on Blood pressure, Pulse rate and some respiratory function. Indian J. Physiol Pharmacol 1973; 73 (3): 273-276.
2. Ranade VG. Practical physiology. 2nd ed. 2000 Pune Vidyarthigriha Prakashan.
3. A.A. Khanam et al. Study of pulmonary & autonomic functions of asthma patients after yoga training. Indian J. Physiol Pharmacol 1996 ; (40):318-324.
4. Kaviraja Udupa and Madan Mohan. Effect of Pranayama training on cardiac function in normal Young volunteers. Indian J. Physiol Pharmacol 2002; 47(1):27-33.
5. Jyotsana R. Bharashankar. Effect of Yoga on cardiovascular system in subjects above 40 years. Indian J. Physiol Pharmacol, 2003; 47(2): 202-206.
6. Wenger M.A. and Bagchi B.K. Studies of autonomic functions in practitioners of yoga in India. 1961 Behavioral science, 312-323.
7. Vempati RP, Telles S. Yoga-based guided relaxation reduces sympathetic activity judged from baseline levels. 2002 Psycho. Rep, 90: 487-494
8. Karambelkar P.V. and Bhole M.V.. Heart control and yoga practices. 1971 Yoga Mimansa, 53-65

9. Jyotsana R. Bharashankar. Effect of Yoga on cardiovascular system in subjects above 40 years. Indian J. Physiol Pharmacol, 2003; 47(2): 202-206.
10. Gandhi A., Kumar M. et al Comparative study of effect of pranayama and meditation practice on autonomic functions in young healthy females. Indian J. Physiol Pharmacol 2006 ; 52(5) : 183
11. Kalwale P. K., Shete A. N. et al Effect of different duration of pranayama on cardiovascular parameters. Indian J. Physiol Pharmacol 2006 ; 52(5) : 159
12. The Physiology of Meditation. Scientific American 1972:84-90.
13. Bagchi B. K. and Wenger M. A. Electrophysiological correlates of some yogic practices.
First international congress of Neurological Sciences, Brussels 1957, Vol-III.
14. Gore M.M. Anatomy and Physiology of yogic practice. 4th Edition , New Age Books Delhi 2008 ;.95-135
15. L. N. Joshi et al. Effect of short term pranayama practice on breathing rate and ventilatory functions of lung.
Indian J. Physiol Pharmacol 1992; 36(2): 105-108.
16. S. Telles et al. Physiological changes in sports teachers following three months of training in Yoga.
Indian Journal of Medical Sciences, Oct 1993, Vol. 47, 235-238.
17. Samson Wright .1982, 15th edition 167-169.
18. Madan Mohan et al Effect of yoga training on reaction time, respiratory endurance and muscle strength.
Indian J. Physiol Pharmacol 1992 ; 36(4) : 229-233.
19. Chhiber R., Mondal S. et al Comparative study on effect of pranayama and meditation on pulmonary function in healthy females.
Indian J. Physiol Pharmacol 2006 ; 52(5) : 161
20. Madan Mohan, Thombre DP. Effects of yoga training on reaction time, respiratory endurance and muscle strength. 1992
Indian J. Physiol Pharmacol, 36(4): 229-233

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