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Effect of Yogic exercises on aerobic capacity (VO2 max)

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Research Article

***Abstract*:** Yoga is considered to be a very good exercise for maintaining proper health. It produces consistent physiological changes and have sound scientific basis. It is claimed that yoga practices improve various cardiorespiratory fitness parameters. **Aim:** To find the effect of short term Yoga practice on aerobic capacity (VO2 max.) **Objective:** To measure aerobic capacity (VO2 max.) Before and after Yoga practice. **Material and Methods:** The present study was conducted on 60 M.B.B.S. students (40 males and 20 females) within the age group of 18-20 years. VO2 max was measured using bicycle Ergometer in our 'Exercise and Sports Physiology' laboratory. It was recorded at start of study (baseline) and then after 12 weeks of yoga therapy. **Results:** For both the genders VO2 max was found to be increased after yoga therapy for 12 weeks. **Conclusion**: the present study concludes that yoga practice can be used to perk up cardio-respiratory fitness.

***Keywords*:** Yoga, VO2 max, Cycle ergometer.

1. Introduction

Now-a-days, more persons are interested in 'physical fitness' than any time before. Physical fitness depends mainly on cardio-respiratory endurance of an individual. VO2 max (maximal oxygen uptake / maximal aerobic power/ aerobic capacity) is widely accepted as the best measure of cardio-respiratory endurance. VO2 max refers to the level of oxygen consumption beyond which no further increase in oxygen consumption occurs with further increase in the severity of exercise. It is expressed as 'milliliters of oxygen used in one minute per kilogram of body weight'(ml/kg/min). VO2 max is probably the best physiological indicator of a person's capacity to continue severe work. In sports, where endurance is an important component in performance, such as cycling, rowing, cross-country skiing, swimming and running,

2. Materials and Methods

In the present study, a total of 60 M.B.B.S. students (40 male and 20 female) in the age group of 18-20 yr participated voluntarily. All the volunteers were fully informed about the study and written informed consent was obtained. The volunteers with past or present history suggestive of cardiovascular or respiratory illness or any other systemic illness, history of major surgery in the recent past, family history of asthma or allergic diseases, history of cigarette smoking, tobacco chewing, alcohol intake etc, subjects with previous experience of YOGA training or any other active sports training were excluded from the present work. After being selected in the study, detail history was noted from each volunteer. All the participants were instructed not to do any other physical exercises like sports, athletics or resistance training during the present study. Then height, weight and BMI were recorded. VO2 max was measured using Astrand-Rhyming cycle ergo meter test in **'Exercise & Sports Physiology'** laboratory of Dr. VMGMC, Solapur. The subject is asked to pedal at 50 revolutions per minute and try to keep it constant for at least 6 minutes. The continuous monitoring of heart rate by counting the pulse for the last 10 seconds of each minute of ride was done. Load was adjusted such that heart rate should rise to a level in the target range (125 to 170 beats /min) and then this level was maintained relatively constant during last few minute of ride. Final count was made during last 10 seconds of the sixth minute of ride. Estimation of VO2 max was done by using modified Astrand Rhyming nomogram.2 After measuring world class athletes typically have high VO2 max.1 In baseline VO2 max, students were trained by experts recent times, medical fraternity is much attracted towards beneficial effects of Yoga. It is claimed that yoga practices improve various cardio-respiratory fitness parameters. In view of this, the present study was undertaken to see whether yoga has any effect on VO2 max. Also, to note the difference, if any, in the values of VO2 max obtained before and after yoga practice and to discuss the results in view of the results obtained by other workers from Yoga Kendra. Then they performed the Yoga Practice (Asanas & Pranayama) in the evening for one hour, six days in a week, for 12 weeks under expert's observation. Yoga practice consisted of - Prayer & Omkar Recitation (5 minutes) followed by in sequence Asanas like Naukasana,

Matsyasana, Bhujangasana, Shalabhasana, Dhanurasana, Shavasana (for next 30 minutes), then breathing exercises like Kapalbhati andYogic Shwasan (for next 10 minutes), then followed by Pranayama like Nadi Shuddhi, Bhastrika and Bhramari (for last 15 minutes). After 12 weeks VO2 max was measured again and Data was analyzed statistically using 'z' test separately for males and females using SPSS software. Stimulation of parasympathetic activity during Yogic Training. Conversion of some of the Fast Twitch muscle fibers into Slow Twitch muscle fibers during yogic training. Slow twitch fibers have high.

3. Results

Table 1: Effect of Yogic Exercises on VO_2 max.(ml/kg/min) in males

Test	n	Before Yoga Mean ± S.D.	After Yoga Mean ± S.D.	P value
VO_2 max	40	30.33 ± 3.50	33.1 ± 4.38	* P < 0.001

Table 2: Effect of Yogic Exercises on VO_2 max (ml/kg/min) in females

Test	N	Before Yoga Mean ± S.D.	After Yoga Mean ± S.D.	P value
VO_2 max	20	27.75 ± 2.27	30.43 ± 2.23	* P < 0.001

*(n= No. of subjects, * = highly significant)*

Table 1 shows change in VO_2 max in male subjects whereas Table 2 represents change in VO_2 max in female subjects. Both the groups show statistically significant increase in VO2 max after Yogic Exercises.

4. Discussion

$\dot{V}O_2$ max. is very importance for physical performance as well as for the health in general. It has been used as an index of cardio respiratory fitness. $\dot{V}O_2$ max can be determined using variety of exercises that activate the body's large muscle groups, provided the intensity and duration of effort are sufficient to maximize aerobic energy transfer. The usual exercises modes include treadmill running, bench stepping and stationary cycling. High $\dot{V}O_2$ max requires integration of high levels of pulmonary, cardiovascular and neuromuscular function. So, $\dot{V}O_2$ max is a fundamental measure of physiologic functional capacity for exercise.[1] Ray U.S. et al (2001)[3] observed significant improvement in VO_2 max after Yogic training. Raju P.S. et al (1997)[4] have found a significant increase in oxygen consumption per unit work after yoga training.. Bera T.K and Rajapurkar M.V in 1993[5] reported significant improvement in cardiovascular endurance as a result of yoga training. Balasubramanian B and Pansare MS in 1991[6] observed significant increase in aerobic power (VO_2 max) of muscles after yoga training.

In our study, as shown in table 1 and 2, VO_2max in males and females show statistically significant improvement with regular practice of yoga.

These effects can be explained on the following basis-

I. Increase in Oxygen Consumption by the muscles[7], which in turn suggest increase in muscle blood flow. This may be due to a generalized decrease in vascular tone resulting from stimulation of parasympathetic activity during Yogic Training .[8]

II. Conversion of some of the Fast Twitch muscle fibers into Slow Twitch muscle fibers during yogic training. Slow twitch fibers have high aerobic power.[6]

III. Yoga postures (asanas) involve isometric contraction which is known to increase skeletal muscle strength.[9]

IV. Greater involvement of active muscle mass from different parts of the body[10]

V. Increase in muscular endurance and delay in onset of fatigue[11]

VI. Improvement in lung functions and better utilization of oxygen at cellular level. Improvement in both lung functions as well as cellular machinery explain raised VO_2 max after regular practice of yoga.[12]

The yoga training regime used in the present study was of sufficient intensity and duration to produce significant changes inVO_2 max. The number of subjects used was 60 and all the volunteers were of similar age(17-20years). These points enhance the reliability of observations. Thus our study suggests that regular yoga practice improves aerobic capacity in 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.

5. Conclusion

1. Yogic Exercises done for one hour daily including asanas, breathing exercises and pranayamas seems to improve VO_2 max.
2. In spite of Yogic Exercises being not very vigorous, VO_2 max was found to increase.
3. Yogic Exercises can be of value in conditions of low cardio respiratory reserves, especially in patients in whom heavy exercises are contraindicated.
4. Yogic Exercises may be incorporated as a part of 'Physical Fitness Program' to improve cardio-respiratory efficiency in sport persons.

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