Indian J Physiol Pharmacol 1991; 35(4): 281-282

EFFECT OF YOGA ON AEROBIC AND ANAEROBIC POWER OF MUSCLES

BHAWANI BALASUBRAMANIAN*
AND M. S. PANSARE**

*Department of Physiology,
B. J. Medical College,
Pune and

**Department of Physiology,
New Medical College,
Bharati Vidyapeeth, Dhankawadi, Pune

(Received on September 23, 1991)

Abstract : Aerobic Power ($\dot{V}O_2$ max) and anaerobic power were estimated in medical students before and after six weeks of yogic training. A significant increase in aerobic power and a significant decrease in anaerobic power was observed. This may be due to conversion of some of the Fast Twitch (F.T.) muscle fibres into Slow Twitch fibres (S.T.) during yogic training.

Key words: aerobic power, anaerobic power, slow twitch fibre (S.T.), fast twitch fibres (F.T.), yogic training

INTRODUCTION

It is well known that excellence in sports activities depends on the aerobic and the anaerobic metabolic capacities of an individual, which in turn depends on the percentage of Slow Twitch (S.T.) fibres and Fast Twitch (F.T.) fibres present in the skeletal muscles. Effects of yogasanas on cardio respiratory function have been amply demonstrated (1, 2, 3, 4 and 5). The present study was undertaken to observe the differences, if any, in the aerobic and anaerobic activities, as a result of certain yogasanas.

METHODS

Subjects consisted of 17 healthy medical students (both boys and girls) aged 16 to 18 years. Cardiovascular and respiratory disorders were clinically ruled out. Those having prior exposure to yoga, were also excluded. They were given Yogic training for one hour daily, from 5 to 6 p.m., for six weeks, the training consisting of relaxation, yogic postures, Shudhikriyas, Bandas and Pranayama.

The following investigations were carried out on the subjects, both before and after completing the 6 weeks training.

(1) *$\dot{V}O_2$ Max in litres/minute (Astrand Rhyming Test) :* Bench stepping test was conducted at the rate of 22 steps/min for 5 minutes, the height of the step being 33 cm for women and 40 cm for men. $\dot{V}O_2$ max was was predicted from Astrand-Rhyming Nomogram, from the pulse rate achieved immediately following the test and the subject's body weight. All 17 subjects undertook this test.

(2) *Anaerobic Power in kgmetre/sec(Margaria's step test)*: The test consisted of climbing a stairway, as fast as possible, three steps at a time, each at a height of 15 cm. Time (t) taken to climb from the third to the ninth step was recorded in millisecs. Anaerobic power was calculated as follows :

$$\frac{\text{Body weight in kg} \times \text{Distance in metres}}{\text{Time in secs}}$$

The result was expressed in kgmetre/sec.

Only 14 subjects undertook this test.

*Corresponding Author

RESULTS

TABLE I: Effect of Yogic exercises on Aerobic Power ($\dot{V}O_2$ Max. in Lit/Min) and Anaerobic Power (kg m/sec).

Sr. No.	Test	n	Before Yoga training	After Yoga training	t-test
01.	$\dot{V}O_2$ Max	17	1.95 ±0.51	2.29 ±0.76	*P < 0.005
02.	Margaria step Test	14	74.73 ±26.64	54.11 ±16.48	*P < 0.001

n = No. of subjects
* = Highly significant

OBSERVATION

After training there is a significant increase in Aerobic Power and a significant decrease in the Anaerobic Power.

DISCUSSION

A significant increase in the $\dot{V}O_2$ max afters Yogic Training indicates improved cardiorespiratory efficiency (1, 2, 3, 4, 5).

Increase in $\dot{V}O_2$ max is due to increased Oxygen consumption by the muscles as a result of Yogic practices (9), which in turn suggests increase in muscle blood flow. This may be due to a generalised decrease in vascular tone resulting from stimulation of parasympathetic activity during Yogic Training (10).

The Slow Twitch (ST) and Fast Twitch (FT) muscle fibres are classified further according to their metabolic activity into Slow Oxidative (SO), Fast Glycolytic (FG) and an intermediate type called Fast Oxidative Glycolytic (FOG) (8).

The SO fibres contribute to aerobic power, the FG fibres are responsible for anaerobic power (8), whereas the FOG fibres have the capacity for aerobic as well as anaerobic power. Percentage of SO fibres increases in endurance training (12). Conversion of FT fibres into ST fibres was observed in endurance training (11,14). It is suggested that this conversion takes place mainly in the intermediate fibre types (FOG), which by improving the Oxidative capacity contribute to increase in aerobic power (8). Perhaps a similar mechanism operates in present study leading to increase in aerobic power. Consequently, the total FT fibre activity decreases leading to a fall in anaerobic power.

REFERENCES

1. Bhole MV, Karambalkar PV, Gharote MC. Effect of Yogic training on Vital capacity and Breath holding time. *Y.M.* 1972; Vol. XIV: 3 & 4 ; 19-26.
2. Bhole MV. Study of respiratory functions during Kapalbhati. Yoga Review 1982; II.4, 211-222. Indian Academy of Yoga, B.H.U., Varanasi, India.
3. Ganguly SK. Effect of short term Yogic training programme on cardiovascular endurance. *SNIPE's Journal* 1981; Vol. 4.2: 45-50.
4. Ganguly SK, Gharote MC. Cardiovascular Efficiency before and after Yogic training. *Yoga Mimamsa* Vol. XVIII :1974; 89-97.
5. Gharote MC. Effect of Yogic training on physical fitness. *Yoga Mimamsa* Vol XV 1973; 4: 31-35.
6. Astrand P, Rhyming. A nomogram for calculating the aerobic and anaerobic capacity from pulse rate and Submaximal work. *Journal of Applied Physiology* 1954; 1 : September, 218.
7. David H Clark. Exercise Physiology 1975; p 270.
8. Bruce J Noble. Physiology of exercise and sport education 1980.
9. Karambalkar PV, Deshpande RR, Bhole MV. Oxygen consumption during Ujjayi Pranayama. *Yoga Mimamsa* 1985; Vol. XXI : 3 & 4: 7-13.
10. Gharote MC. A psychophysiologicalsudy of the effect of short term Yogic training on Adolescent High school boys. *Yoga Mimamsa* 1971; Vol XIV No 1-2: 92-99.
11. Peter N, Spreryn. Sport and Medicine, Butterworth Publication, 1983.
12. Gollinick PD. Glycogen depletion of mainly S.T. fibres following Low intensity Dynamic exercise. *Jorunal of Applied Physiology (London)* 1974a; 241:45-57.
13. Costill DL, Fink WJ, Pollock ML. Muscle fibre composition and Enzyme activities of Elite distance runners. *Medical Science Sports Exercise* 1976; 8:96.
14. Pette D. Activity induced Fast to Slow training in Mammalian Muscles. *Medical Science Sports Exercise* 1984: 16:517.