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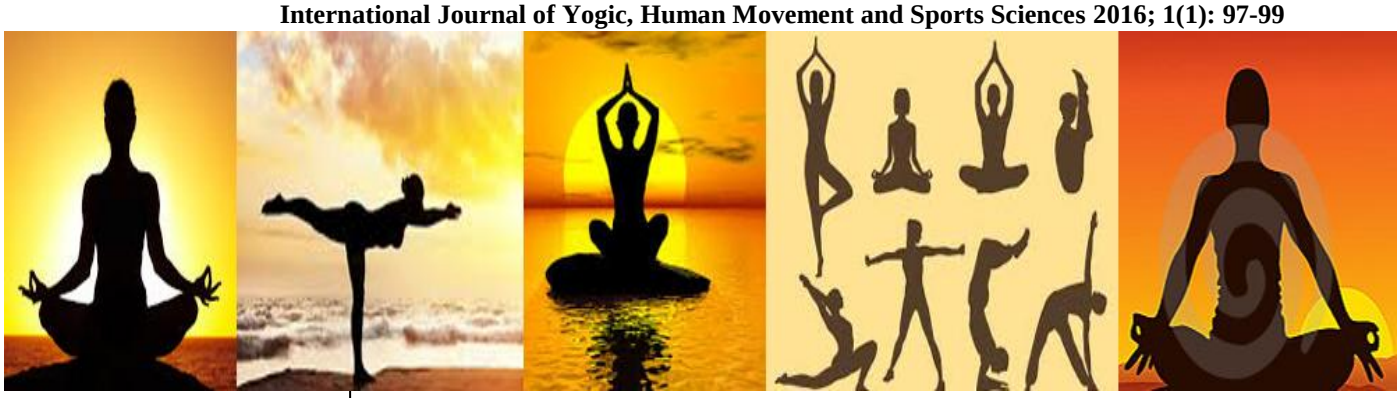

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Effect of elliptical and treadmill training on maximal oxygen consumption (VO_2 max) in sedentary men

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Abstract
The primary purpose of this study was to examine the effect of treadmill and elliptical training on selected cardiopulmonary parameters in sedentary men. The study was carried out on sixty sedentary men with the age of 35-40 years. All the subjects were randomly selected from Chidambaram town and assigned into three equal groups. Each group consists of twenty subjects they were assigned as experimental group I (Elliptical Training), experimental group II (Treadmill Training) and control group respectively. The experimental groups participated in their respective elliptical and treadmill training for a period of three days per week for eight weeks. Initial test and final test was conducted for all the subjects on VO_2 Max and resting heart rate. The difference between initial scores and final scores on VO_2 Max and resting heart rate were subjected to statistical treatment using analysis of covariance (ANCOVA) was employed. The results of the study showed that there was a significant difference were existed between the experimental groups (p<0.05) in cardiopulmonary parameters. It concluded that elliptical training has more beneficial effect on VO_2 Max and resting heart rate than treadmill training in sedentary men.

Keywords: Treadmill training, elliptical training, vo_2 max and resting heart rate

Introduction
Maximal oxygen consumption (VO_2max) has long been thought to be the single best predictor of cardiovascular fitness, aerobic performance, and overall health (Brooks *et al*., 2000). It is simply defined as the maximum amount of oxygen that can be consumed and utilized by the body. As the muscles work harder, the demand for oxygen increases, as oxygen is a critical component in the aerobic production of ATP (i.e. energy). Oxygen uptake not only is a measure of aerobic energy turnover, but also offers precise measure of the capacity to transport and utilize oxygen, i.e., the functional capacities of the lungs, cardiovascular system and muscle mitochondria combined. In general aerobic power has been recognized as one of the fundamental components of physical performance and health (Åstrand and Rodahl 1986 & Johnson 1991) [1, 2].

The term "VO_2" is derived from V-volume of O_2-oxygen. VO_2max is the maximum volume of oxygen that the body can consume during intense, whole-body exercise. This volume is expressed either as an absolute rate in liters of oxygen per minute (l/min) or as a relative rate in milliliters of oxygen per kilogram of bodyweight per minute (ml/kg/min) (Kaminsky, 2005) [9].

It is obvious that the maximum oxygen consumption or VO_2max is an important factor in the determining of the cardio respiratory function or aerobic capacity; VO_2max is the maximum oxygen that one can utilize during a maximum activity (Robergs and Roberts, 2000) [8].

A healthy adult has a resting heart rate (pulse) of 60 to 80 beats per minute (bpm), which is the rate of depolarization of the senatorial (SA) node. Heart rate less than 60 beats per minute have been reported for highly conditioned endurance athletes, whereas poorly trained, sedentary individuals may have heart rate greater than 100 beats per minute. Resting heart rate HR has been thought of as an indicator of cardiovascular endurance-it tends to lower as one become more aerobically fit.

The heart rate recovery period also decreases as a result of physical training (endurance). During exercise our heart rate should increase to meet the need of our active muscles. Normally after finishing the exercises our heart rate does not come down immediately rather it

takes some time to return to its resting rate. But due to aerobic physical exercise programme recovery process fastens. Heart rate recovery period is the time, which we take to return heart rate to normal level. In general more fit individuals recover faster after a target rate of work than the less fit individuals.

Material and Methods

The aim of the study was to determine the effect of treadmill and elliptical training on maximal oxygen consumption (VO_2max) sedentary men. Sixty sedentary men were selected from Chidambaram town and their ages ranged between 35 to 40 years. The subjects (N= 60) were randomly assigned to three equal groups of twenty male in each. The groups were assigned as experimental group I (treadmill training group), experimental group II (elliptical training group) and control group III. Before the administration of the test, all the subjects were oriented for the purpose of the experimental treatments and the tests. They were made known about the importance of the treatment and tests. All the subjects wholeheartedly co-operated for this study. Pre tests were conducted for all the subjects on VO_2 Max. The experimental groups participated in their respective experiments, namely, elliptical training and treadmill training for a period of three days for eight weeks. Elliptical training and Treadmill training program consisted of 50 minutes with 10 minutes warm up, 30 minutes training on Elliptical and Treadmill and 10 minutes cool down. Initial loading was set at approximately 60% of the maximum ability and loads were than increased every week by 5 % and were estimated by the maximum load every individual performed at the end of the week testing. After the experiment, post test scores were obtained and compared with using Analysis of covariance (ANCOVA) statistical technique was used to test the differences among the experimental groups. If the adjusted post test result was significant, the Scheffe's post hoc test was used to determine the significance of the paired mean differences. The significance level of this study was set at $p < 0.05$.

Result of study

Table 1: Computation of analysis of covariance on Vo_2 Max (Scores in ml/kg/min)

Means	Exp group- I	Exp group-II	Con group	SV	SS	df	MS	Obtained 'F'
Pretest mean	45.66	47.50	46.13	B	36.54	2	18.27	1.68
				W	620.43	57	10.88	
Post test mean	51.23	50.75	45.27	B	437.48	2	218.74	18.28*
				W	681.94	57	11.96	
Adjusted post test mean	51.86	49.86	45.52	B	419.96	2	209.98	46.32*
				W	253.83	56	4.53	

*Significant at 0.05 level

Table I shows that the pretest mean of experimental group I (elliptical training group), experimental group II (treadmill training group) and control group were 45.66, 47.50 and 46.13 respectively. As the obtained 'F' ratio of 1.68 was lesser than the required table 'F' ratio of 2.8 to be significant 0.05 level. The post test means of experimental group I (elliptical training group), experimental group II (treadmill training group) and control group were 51.23, 50.75 and 45.27 respectively. The obtained 'F' ratio of 18.28 was greater than the required table 'F' ratio of 2.8. Hence, it proved that there was significant difference among the groups after eight weeks experimental treatment on VO_2 Max in sedentary men.

The adjusted post test means of experimental group I (elliptical training group), experimental group II (treadmill training group) and control group were 51.86, 49.86 and 45.58 respectively. The obtained 'F' ratio of 46.32 was greater than the required table 'F' ratio of 2.82 to be significant at 0.05 level.

Since significant improvements were recorded, the results were further subjected to post hoc analysis using Scheffe's confidence interval test. The results are presented in Table II.

Table 2: Computation of Scheffe's Post HOC test ordered adjusted final mean difference of VO_2 Max (Scores in ml/kg/min)

Exp Group I	Exp Group-II	Con Group	Mean Difference	Confidence Interval
51.87	49.86	-	2.01*	1.57
51.87	-	45.53	6.34*	1.57
-	49.86	45.53	4.33*	1.57

***** Significant

The mean difference between the control group and experimental group I (elliptical training group) was 6.34, control group and experimental group II (treadmill training group) was 4.33, which was greater than the required confidential interval of 1.57. Hence, the difference between the groups was significant. However, the mean difference between experimental group I (treadmill training group) and experimental group II (elliptical training group) was 2.01. Hence, It was proved that there was significant differences were found between the experimental groups. The result proved that elliptical training group was significantly better than treadmill training group.

Discussion on the findings

On the basis of the findings, it was concluded that elliptical training and treadmill training significantly improved VO_2 Max in sedentary men. When compared between experimental groups elliptical training group was significantly better than treadmill training group in increasing the VO_2max in sedentary men. Gormley *et al.* (2008) [3] reported that higher intensities of exercise are more effective for improving VO_2max than lower intensities of exercise in healthy, young adults. Martin and Kouwell (1990) [6] reported that cycle ergometer training twice per week for 30 minutes per session at 70 85% of maximal heart rate may increase VO_2max. Hendriksen *et al*., (2000) reported that 3 times a week cycling may improve maximal optimal power and VO_2max.

Kunstlinger, Ludwig, & Syegemann, (1987) [5] and Viitasalo *et al*., (1987) [7] reported that Indian volleyball players have lesser value for heart rate and greater value for VO_2Max than controls. These differences were might be due to regular physical exercise and training in volleyball players. The above finding of the study supported to the present study. Hence, it was concluded that from the results of the study there was significant differences between control group and treadmill training group. Although, both the experimental groups significantly increased VO_2Max and significantly reduced resting heart rate in sedentary men. Elliptical training was significantly better than Treadmill training on VO_2 Max in sedentary male.

Conclusions

The result of this study demonstrated that, elliptical and treadmill training has significant impact on VO_2Max and resting heart rate in sedentary male.

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