Influence of Treadmill and Cycle Ergometer Training on Maximal Oxygen Uptake and Percent Body Fat among Sedentary Males

P.K.Senthilkumar, Assistant Professor, and

Grace Helina, Professor and Head, Dept of Exercise Physiology and Biomechanics, Tamilnadu Physical Education and Sports University, Chennai-48.

Abstract

The aim of this study was to examine the influence of treadmill and cycle ergometer training on maximal oxygen uptake (VO_2 Max) and percent body fat in sedentary men. For the purpose of the study a total of forty five subjects were selected and their age ranged between 19-23 years. They were divided into three groups' namely experimental group I (Treadmill training group), experimental group II (cycle ergometer training group) and control group; each group consists of fifteen subjects. Each subject performed an incremental exercise on treadmill and cycle ergometer for eight weeks. The collected data were analyzed by ANCOVA and followed by Scheffe's post hoc test. It was concluded that treadmill and cycle ergometer training significantly altered maximal oxygen uptake (VO_2 Max) and percent body fat of the sedentary males.

Key words: Treadmill, Cycle ergometer, Maximal oxygen uptake (VO_2 Max), Percent body fat

Introduction

Exercise training elicits numerous physiological adaptations which may lead to increased exercise performance. Improved metabolic, cardiovascular, and pulmonary adaptations delay the onset of fatigue, potentially allowing for improved exercise performance. Maximal oxygen consumption (VO_2 Max) has been accepted by majority of authors as the best indicator of aerobic capacity of an organism, and at the same time, the best measures of the individual's cardiorespiratory capacity. Maximal oxygen uptake (VO_2 max) refers to the intensity of aerobic processes, and actually represents the capacity of the organism to utilize at a certain moment the maximum amount of oxygen. 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)**.

The assessment of body composition is not only common in sport and exercise sciences but also in medicine. Most of the interest is in quantifying body fat in relation to health and to sports performance. The "fat mass and fat-free mass" model of body composition assumes that the combined weight of fat mass and fat-free mass equals total body weight. The assessment of body composition typically results in the prediction of body fat percentage, or the proportion of total weight that is composed of fat.

Review of Related Literature

Gormley et al. (2008) conducted a study to determine whether various intensities of aerobic training differentially affect aerobic capacity. Sixty-one health young adult subjects were matched for sex and VO_2max and were randomly assigned to a moderate, vigorous, near-maximal-intensity, or a non-exercising

control group. Fifty-five subjects completed a 6-wk training protocol on a stationary bicycle ergometer. VO_2max significantly increased in all exercising groups. When volume of exercise is controlled, higher intensities of exercise are more effective for improving VO_2max than lower intensities of exercise in healthy, young adults. **Velez, et al. (2010)** investigated the impact of a 12-week resistance training program on body composition of Hispanic adolescents. Resistance training group had significant reductions in %BF, whereas control group had slightly increased %BF.

Purpose of the Study

The purpose of the study was to examine the influence of treadmill and cycle ergometer training on maximal oxygen uptake and percent body fat among sedentary males.

Hypothesis

1. It was hypothesized that there would be a significant improvement on maximal oxygen uptake and percent body fat due to treadmill and cycle ergo meter training group compared to control group.

2. It was hypothesized that the treadmill training would significantly improve maximal oxygen uptake and percent body fat and would be better than cycle ergometer training.

Methodology

A total of forty five subjects were selected from Chennai city to achieve the purpose of the study. They were in the age group of 19 and 23 years and divided into three groups and each group consisting of fifteen subjects. Experimental group I under went treadmill training for three days per week, Experimental group II under went cycle ergometer training for three days per week and the control group did not undergo any experimental treatment. The study was formulated as a true random group design, consisting of a pre-test and post-test. After the experimental treatment post test scores were collected and the obtained data were subjected to statistical treatment using ANCOVA. In all cases the level of significance 0.05 level of confidence was fixed as appropriate.

Results of maximal oxygen uptake (VO_2 Max)

Table I shows that the pre test mean scores of maximal oxygen uptake were 3.04 for treadmill training group, 2.95 for cycle ergometer training group, and 2.96 for control group. As the obtained F- ratio 0.38 was lesser than the required table F-value of 3.22. It shows that there was no significant difference among the groups.

The post test mean scores were 3.71 for treadmill training group, 3.48 for cycle ergometer training group, and 3.08 for control group. The calculated F ratio 15.39 was greater than the required table F value of 3.22, which indicated that there was a significant difference between post test means at 0.05 level of confidence for the degrees of freedom 2 and 42.

Table-I

**Computation of Analysis of Covariance on VO$_2$ Max
(Scores in liter/minute)**

Test	Treadmill training Group	Ergometer training Group	Control Group	Source of Variance	SS	Df	MS	F
Pre Test	3.04	2.95	2.96	Between	0.06	2	0.03	0.38
				Within	3.81	42	0.09	
Post Test	3.71	3.48	3.08	Between	2.96	2	1.48	15.39*
				Within	4.04	42	0.09	
Adjusted Mean	3.65	3.51	3.11	Between	2.43	2	1.22	39.67*
				Within	1.25	41	0.03	
Mean Gain	-0.66	-0.53	-0.13					

Table F-ratio at 0.05 level of confidence for (df) 2 at 42 = 3.22 and for (df) 2 at 41 = 3.22: *Significant at 0.05 level of confidence

The adjusted post test mean scores for treadmill training group, cycle ergometer training group, and control group were 3.65, 3.51 and 3.11 respectively. The obtained F ratio 39.67 was greater than the required table value of 3.22. Hence significant differences were observed among the groups for maximal oxygen uptake (VO$_2$Max).

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

Table-II
**Scheffe's Post hoc Test on Maximal oxygen uptake (VO$_2$ Max)
(Scores in liter/minute)**

Treadmill training Group	Ergometer training Group	Control Group	Mean Differences	C.I
3.66	3.51	-	0.15	
3.66	-	3.11	0.55*	0.16
	3.51	3.11	0.41*	

* Significant at 0.05 level

The mean difference between treadmill training group and cycle ergometer training group was 0.15, which was lesser than the required Scheffe's confidential interval of 0.16. Hence, the difference between the experimental groups was no significant. However, the difference between treadmill training group and control group was 0.55 and cycle ergometer training group and control group was 0.41. In both cases the mean differences were greater than the confidence interval of 0.16. Hence the differences are found to be significant at 0.05 level.

Result of Percent body fat (%BF)

Table-III
Computation of Analysis of Covariance on Percent body fat
(Scores in Percentage)

est	Treadmill training Group	Ergometer training Group	Control Group	Source of Variance	SS	df	MS	F
Test	14.85	14.7	14.51	Between	0.86	2	0.44	1.12
				Within	16.25	42	0.38	
ost est	12.45	12.66	14.37	Between	33.36	2	16.68	34.11*
				Within	20.54	42	0.48	
usted ean	12.34	12.65	14.48	Between	38.26	2	19.13	55.86*
				Within	14.04	41	0.34	
ean ain	2.41	2.03	0.14					

Table F-ratio at 0.05 level of confidence for (df) 2 at 42 = 3.22 and for (df) 2 at 41 = 3.22
*Significant at 0.05 level of confidence

Table III shows that the pre test mean scores of percent body fat of the treadmill training group was 14.85, while it was 14.70 for cycle ergometer training group, and 14.51 for control group. The differences among the pre test mean scores were subjected to statistical analysis and the obtained F value of 1.12 was lesser than the required table F value of 3.22, which indicated the no significant differences among the groups.

The post test mean scores were 12.45 for treadmill training group, 12.66 for cycle ergometer training group, and 14.37 for control group. As the calculated F ratio 34.11 was greater than the required table F ratio of 3.22 the difference among the groups for per cent body fat was significant.

The adjusted means for treadmill training group, cycle ergometer training group, and Control Group were 12.34, 12.65 and 14.48 respectively. The calculated F value of 55.86 was greater than the required table F value of 3.22. Hence, the difference among the group for per cent body fat (%BF) was significant.

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

From the table-IV, it was observed that the mean difference between treadmill training group and cycle ergometer training group was 0.32, which was lesser than the required Scheffe's confidential interval of 0.54. Hence, the difference between the experimental groups was no significant. The mean difference between treadmill training group and control group was 2.14 and the difference between cycle ergometer training group and control group was 1.82. The mean differences were greater than the required confidential interval of 0.54. Hence the differences were found to be significant at 0.05 level of confidence.

Table-IV
Scheffe's Post hoc Test on Percent body fat
(Scores in Percentage)

Treadmill Group	Ergometer Group	Control Group	Mean Differences	C.I
12.34	12.66	-	0.32	
12.34	-	14.48	2.14*	0.54
	12.66	14.48	1.82*	

* Significant at 0.05 level

Discussions on the Findings

The result presented in Table I proved that there was a significant improvement in maximal oxygen uptake (VO_2 Max) due to treadmill and cycle ergometer training compared to control group. Further more, treadmill training group was significantly better than cycle ergometer training group. The result presented in Table III confirmed that treadmill and cycle ergometer training significantly improved per cent body fat (%BF) compared to control group. However, there was no significant difference between experimental groups. It was concluded that maximal oxygen uptake (VO_2 Max) and per cent body fat (%BF) could be improved significantly due to treadmill and cycle ergometer training.

Conclusions

Based on the results of the study, the following conclusions have been arrived at.

1. It was concluded that treadmill and cycle ergometer training significantly influenced the maximal oxygen uptake (VO_2 Max) and present body fat (%BF) when comparing to the control group.

2. It was concluded that treadmill training significantly improved the VO_2 Max and present body fat comparing to control group and greater than cycle ergo meter training.

Reference

Gormley, S. E., D. P. Swain, R. High, R. J. Spina, E. A. Dowling, U. S. Kotipalli. and R. Gandrakota (2008), Effect of Intensity of Aerobic Training on VO_2, *Medicine Science Sports Exercise*, 40(7), pp. 1336-1343.

Kaminsky, L. (ed.)(2005), "**ACSM's Resource Manual For Guidelines For Exercise Testing and Prescription (5th ed.)",** Philadelphia, PA: Lippincott Williams & Williams.

Velez, A, Golem, DL, and Arent, SM. (2010), The Impact of a 12-Week Resistance Training Program on Strength, Body Composition, and Self-Concept of Hispanic Adolescents, *Journal of Strength & Conditioning Research*, 24(4), pp.1065-1073.

*****