

Effect of High Intensity Aerobic Training on Selected Physiological Variables among Middle Aged Men

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Abstract

The primary purpose of this study was to determine whether high intensity aerobic training has an effect on physiological capacity in middle aged men. For these purpose 30 middle aged men, aged 40 to 45 years took part in the study. Subjects were randomly assigned to either high intensity aerobic training (n=15) or control (n=15) group. The training regimen lasted for eight weeks. The selected dependent variables such as systolic blood pressure, diastolic blood pressure, breath holding time and resting pulse rate were assessed using standard tests and procedures, before and after the training regimen. Analysis of covariance was used to determine the significant difference existing between pretest and posttest on selected dependent variables. The analysis of data revealed that eight weeks of high intensity aerobic training had impact of 6.30% on systolic blood pressure, 2.83% on diastolic blood pressure, 10.87% on breath holding time, and 6.87% on resting pulse rate.

Key words: Aerobic training, Systolic blood pressure, Diastolic blood pressure

Introduction

Aerobics is a progressive physical conditioning programme that stimulates cardio respiratory activity for a time period sufficiently long to produce beneficial changes in the body. Aerobics basically means living or working with oxygen in which large muscle groups are used in rhythmic repetitive fashion for prolonged periods of time. Aerobic exercise means the exercise where all body parts/muscles are supplied with enough oxygen with the increased heart rate.

The American college of sports medicine currently recommends 20 to 60 min of exercise performed at 40/50-85% HRR or $\dot{V}\text{O}_2\text{R}$ for most adults, where 40% is considered a threshold level for reconditioned individuals and 50% is a threshold for average adults. There has been previous evidence suggesting that exercise of a higher intensity will result in greater gains in cardiovascular fitness. However, only a few reports included a sufficient number of subjects to confirm that groups training at higher intensities experienced significantly greater increases in $\dot{V}\text{O}_{2\text{max}}$ than groups training at lower intensities when the total volume of exercise was controlled, and to know the efficacy of aerobic training and its significant contribution to one's level of fitness, it was decided to take up this study.

Purpose of the study

The primary purpose of this study was to determine whether the high intensity aerobic training influences the physiological capacity of middle aged men.

Hypothesis

It was hypothesized that there would be significantly greater change in systolic blood pressure, diastolic blood pressure, breath holding time and resting pulse rate due to the effect of high intensity aerobic training.

Review of Related Literature

Research suggests that vigorous-intensity exercise results in greater increases in aerobic capacity than moderate-intensity exercise (Swain, 2002). Specifically, some training studies have compared more than one intensity of continuous aerobic exercise while controlling the total volume or energy expenditure of exercise have found significantly greater increases in aerobic capacity in the higher-intensity group (Braith, 1994; Burke, 1975; Crouse, 1997). However, several similar studies found no difference between groups performing continuous exercise at different intensities (Asikainen, *et al.*, 2003; Blair, 1980). Moreover, only a few studies have compared the effects of near-maximal-intensity exercise, which can only be performed using intervals, with continuous exercise of either moderate or vigorous intensities. Only few studies have compared near-maximal intervals with lower-intensity continuous training in healthy adults, and included only highly fit males as subjects (Esfarjani, 2007; Helgerud, 2007). Therefore, the current study aimed to confirm whether continuous exercise at a vigorous intensity is more effective for improving physiological capacity. Clinical trials have found that higher-intensity exercise resulted in greater reductions in resting blood pressure (BP) than lower intensity (Kang *et al.*, 2002; Nemoto, 2007) although not all studies have found an intensity effect (Braith, 1994). Only five studies that have controlled exercise volume between two groups exercising at different intensities measured resting HR. Further research is warranted to fully examine the question of whether higher-intensity exercise is more effective at lowering resting BP and HR than lower-intensity exercise.

Methodology

Subjects and Variables

For the purpose of this study, thirty middle aged men in the age group of 18 to 22 years were selected, with their consent. The age, height and weight of the selected subjects averaged 43.02 ± 1.65 yr, 169.6 ± 4.57 cm, and 76.48 ± 3.62 kg respectively. The selected subjects were randomly assigned to both the high intensity aerobic training and control groups of 15 each. The selected dependent variables were assessed using standard tests and procedures, before and after the training regimen. The variables and tests used are presented in table-I.

Table-I
Dependent Variables and Test

Sl. No.	Variables	Tests / Instruments	Unit of measurement
1	Systolic Blood Pressure	Sphygmomanometer	mm/Hg
2	Diastolic Blood Pressure	Sphygmomanometer	mm/Hg
3	Breathe Holding Time	Manual Method	Seconds
4	Resting Pulse Rate	Blood Pressure Monitor	Bum

Training Protocol

The experimental group underwent the high intensity aerobic training programme three days per weeks for eight weeks. The aerobic training consists of aerobic cycling exercise on a bicycle ergo meter. Training sessions consist of a 30-minute aerobic exercise period with a warming-up and cooling-down period of 5 and 3 minutes, respectively. The cardiovascular load during the training period is individually adjusted and increased from a level of 80% to 95% of the heart rate reserve (HRR). HRR is the difference between the predicted maximum heart rate and the measured resting heart rate.

Experimental Design and Statistical Procedure

The experimental design used for the present investigation was random group design involving thirty subjects. Analysis of covariance (ANCOVA) was used as a statistical technique to determine the significant difference, if any, existing between pretest and posttest data on selected dependent variables. The level of significance was accepted at $P < 0.05$.

Results and Discussions

The descriptive analysis of data collected on selected physiological variables before and after eight weeks of high intensity aerobic taining is presented in table-. II

Table-II
Computation of Mean and Standard Deviation on Selected Physiological Variables

Variables	Groups	Pretest		Posttest	
		$\bar{x}$	σ	$\bar{x}$	σ
Systolic Blood Pressure	Experimental	129.96	5.47	122.26	5.03
	Control	130.29	5.16	129.89	5.28
Diastolic Blood Pressure	Experimental	86.13	3.86	83.76	2.94
	Control	86.34	3.24	86.79	3.65
Breathe Holding Time	Experimental	43.07	2.70	47.75	2.65
	Control	42.87	2.91	43.13	2.90
Resting Pulse Rate	Experimental	74.31	4.20	69.53	4.09
	Control	73.69	4.45	73.80	4.00

ANCOVA was used to determine the significant impact of high intensity aerobic training on selected physiological variables and it is presented in table-III

Table-III
Analysis of Covariance on Selected Physiological Variables of
High Intensity Aerobic Training and Control Groups

Variables	Groups	Adjusted mean	SOV	Sum of squares	df	Mean square	'F' ratio
Systolic blood pressure	Experimental	124.07	B	187.68	1	187.68	39.02*
	Control	130.04	W	129.79	27	4.81	
Diastolic blood pressure	Experimental	84.32	B	116.47	1	116.47	10.56*
	Control	86.51	W	297.85	27	11.03	
Breathe Holding Time	Experimental	46.75	B	20.11	1	20.11	25.51*
	Control	42.98	W	21.28	27	0.79	
Resting Pulse Rate	Experimental	70.48	B	32.78	1	32.78	25.50*
	Control	73.76	W	34.71	27	1.29	

Required table value for significance at 0.05 level of confidence for df of 1 and 27 is 4.21
Significant at 0.05 level

The findings of the study shows that significant difference existing between high intensity aerobic training and control group on systolic blood pressure, diastolic blood pressure, breathe holding time and resting pulse rate, since the obtained 'F' ratio of 39.02, 10.56, 25.51 and 25.50 respectively were greater than the required table value of 4.21 for significance at 0.05 level of confidence for df of 1 and 27. It was concluded that eight weeks of high intensity aerobic training had an influence of 6.30% on systolic blood pressure, 2.83% on diastolic blood pressure, 10.87% on breathe holding time, and 6.87% on resting pulse rate.

Discussion

The main findings of the study was that the higher intensities of exercise elicit greater improvements in systolic blood pressure, diastolic blood pressure, breathe holding time and resting pulse rate over eight weeks of aerobic training period in middle aged men. The literature thoroughly supports the evidence that higher doses of aerobic exercise produce greater increases in physiological parameters. Regular participation in aerobic exercise often results in a decrease in resting heart rate (Katona *et al.*, 1982).

The American college of sports medicine's position stand on exercise and hypertension concluded that aerobic training reduces resting BP and that there is no intensity effect (Pescatello, 2004). However, clinical trials that have compared more than one intensity of training while controlling total volume generally support a greater decrease with higher intensities. Specifically, four of five such studies found a decrease in diastolic BP only in the higher-intensity group (Asikainen, 2003; Kang, 2002) one found a greater decrease in systolic BP in the higher-intensity group (Nemoto, 2007) and one found similar decreases in both systolic and diastolic BP in both groups (Braith, 1994). The current study found that high intensity aerobic training group experienced a significant decrease in either systolic or diastolic BP at rest.

Conclusions

The result of this study demonstrated that, high intensity aerobic training has significant impact on systolic blood pressure, diastolic blood pressure, breath holding time and resting pulse rate of middle aged men.

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