Original Article

ISSN: 2349 - 4891

International
Journal of Recent Research and Applied Studies
(Multidisciplinary Open Access Refereed e-Journal)

Effect of Aerobic and Anaerobic Training Programs on Forced Expiratory Volume One Second

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Received 30th December 2015, Accepted 21st January 2016

Abstract

The purpose of the study was to find out the effect of aerobic and anaerobic training on forced expiratory volume one second. To achieve this purpose, forty five female students from Annamalai University, Tamilnadu, were randomly selected and divided into three groups of fifteen each. This study consisted of two experimental variables aerobic training and anaerobic training. The allotment of groups was done at random, thus Group-I aerobic training, Group-II anaerobic training for three days per week for twelve weeks, Group-III acted as control. All the subjects were tested prior to and after the experimentation period. The collected data were statistically treated by using ANCOVA, and 0.05 level was fixed as a test the significance. When the obtained 'F' ratio was significant, Scheffe's post hoc test was used to find out the significant paired mean differences. The results of the study revealed that there was a significant difference among aerobic training and anaerobic training groups as compared to control group on forced expiratory volume one second. And also it was found that there was a significant improvement on forced expiratory volume one second due to aerobic training group as compared anaerobic training group.

Keywords: Aerobic training, Anaerobic Training, Forced Expiratory Volume One Second.

Introduction

Aerobic training is develops the oxygen transport system. The oxygen system is best trained by endurance workouts, that is, exercises of relatively long duration at submaximal level Janssen, (2001). This specific training improves the ability to continue exercising for a prolonged period and the ability to quickly recover from high-intensity exercises. Rampinini et al. (2007). Usually, the intensity and volume of aerobic exercise are inversely related. Increasing the volume (time) of aerobic training will reduce the intensity to a tolerable level. Anaerobic training brings out changes in the ATP-CP and lactic acid system. Intensive anaerobic exercises lasting between 30 seconds and 3 minutes activate and exhaust the lactate system to its maximum; thus, the lactate system can be best trained by interval workouts Janssen, (2001). Usually, it is possible to perform 4–8 repetitions per block with recovery periods of 30 seconds to 3 minutes (ratio 1:1). The number of blocks can vary between 2 and 4 based on the number of repetitions per block, Little and Optimizing, (2009), with recovery periods between blocks of 3–5 minutes. Aerobic and anaerobic training brings out physiological adaptation in the human body. However the specificity of exercise brings out relatively different changes in the energy system and relative changes at the tissue level. Aerobic exercise is physical exercise that intends to improve the oxygen system are performed at moderate levels of intensity for extended periods of time. Anaerobic exercise is exercise intense enough to trigger anaerobic metabolism. It is used by athletes in non-endurance sports to promote strength, speed and power and by body builders to build muscle mass. Muscles trained using anaerobic exercise develops differently compared to aerobic exercise, leading to greater performance in short duration, high intensity activities, which last from more seconds up to about two minutes.

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Ehteshamiafshar et al., (2001) studied EIA in elite soccer players and measured FEV1 on rest, 5 and10 minutes after 10 minutes exercise and showed 6% prevalence of EIA among these athletes. Dynamic pulmonary variables affect by different factors. Some studies have shown that endurance exercise can affect these parameters. Ghanbarzadeh et al, (2010) assessed pulmonary function variables of the elite basketball players before and after rank test and showed significant differences in PEF and FEV1 between pre-test and post-test. They stated that the reason of the significant decline in these parameters is related to fatigue special pulmonary muscles fatigue. Many studied have been shown that intense prolong exercise may lead to some problems and limitations in pulmonary system. Sallaoui (2007). However studies are very scarce related effect of exercise on pulmonary function of non-athletes females, so the present study aims at assessing the effect of aerobic and anaerobic exercise on FEV1 and to determine if any significant differences exist between the effect of maximal aerobic and aerobic exercise.

Methodology

To achieve this purpose, forty five female students from Annamalai University, Tamilnadu, were randomly selected and divided equally into three groups and each group comprised of fifteen (n=15) subjects. Group-I underwent aerobic training, group-II underwent anaerobic training and group–III acted as control. Subjects were underwent their respective training for four days per week for a period of twelve weeks. Extensive interval training and intensive interval training method was used to develop aerobic and anaerobic capacity of the subjects. The load was fixed by adopting Karvonen (3&4) method (heart rate reserve x training %) + resting heart rate. FEV1 (Force Expiratory Volume in One Second), was assessed in liters before and immediately after the training period, by digital spirometry.

Training Protocol

The experimental group performed aerobic training programmes three sessions per week on alternative days for 12 weeks. The aerobic training consisted of 20-40 minutes running, 2-3 times per week with 65-80% HRR. The running intensity was determined by a percentage of heart rate reserve (HRR). The duration of each session was increased by 5% once in two weeks as the training was progressed. The experimental group performed anaerobic training programmes and underwent intensive interval training 75% to 90% intensity of their maximum performance of 200m distance. The distance was fixed throughout training period as 200m with 5 repetition and 3 sets. The work relief ratio was 1:3 for intensive interval training group. Aerobic training group underwent 65% to 80% intensity of their maximum performance for 750m distance. The distance was 750 with 2 repetition and 2 sets. The work relief ratio was followed.1:1/2 ratio.

Statistical Technique

The data collected from the three groups prior to and post experimentation were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since three groups were involved, whenever the obtained F ratio was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases statistical significance was fixed at .05 levels.

Results

Table I. Analysis of covariance for pre and post test data on forced expiratory volume in one second of aerobic and anaerobic training groups and control group

		Aerobic Training group	Anaerobic Training group	Control group	SOV	Sum of square	df	Mean squares	'F' ratio
Forced Expiratory Volume In One Second	Pre–test								
	Mean	3.01	3.04	3.03	B:	0.007	2	0.004	0.44
	SD	0.07	0.09	0.10	W:	0.31	42	0.007	
	Post–test								
	Mean	3.69	3.46	3.04	B:	3.32	2	1.66	80.74*
	SD	0.14	0.17	0.10	W:	0.86	42	0.02	
	Adjusted Post-Test Mean	3.62	3.42	3.04	B:	3.25	2	1.62	85.42*
					W:	0.78	41	0.019	

* Significant at 0.05 level of confidence.

The adjusted post-test mean on forced expiratory volume in one second for aerobic training group is 3.62, anaerobic training group is 3.42 and control group is 3.04. The obtained 'F' ratio of 85.42 for adjusted post-test mean is more than the table value of 3.22 required for significance at 0.05 level for df 2 and 41. The results of the study showed that there was a significant difference among three groups on force expiratory volume in one second.

Table II. Scheffe's post hoc test for the adjusted post-test paired mean differences on forced expiratory volume in one second

	Adjusted Post-Test means				
	Aerobic group	**Anaerobic group**	**Control group**	**Mean difference**	**Confidence interval**
EXPIRATORY VOLUME IN ONE SECOND	3.62	3.42		0.20*	0.12
	3.62		3.04	0.58*	0.12
		3.42	3.04	0.38*	0.12

***Significant at 0.05 level of Confidence.**

The table II shows that the adjusted post test paired mean difference between aerobic training group and anaerobic training group, aerobic training group and control group and anaerobic training group and control group are 0.20, 0.58 and 0.38 for force expiratory volume in one respectively. They were greater than the confidence interval value of 0.12 at 0.05 level which indicate that the twelve weeks of aerobic training and anaerobic training groups have significantly improved forced expiratory volume one second as compared to the control group. The result also reveals that the increase in forced expiratory volume one second is significantly more for aerobic training group as compared with anaerobic training group.

Discussion of Finding

The results of present study was forced expiratory volume one second has increased significantly for aerobic training and anaerobic training groups as compared to control group. However the result of the present study also reveals increase in expiratory volume one second is significantly more for aerobic training group than anaerobic training group. It is inferred the aerobic training has produced statistically significant effect on FEV1. However, FEV1 also improved significantly after anaerobic protocol. The findings of this research related to effect of anaerobic training program on FEV1 is inconsistent with the results of Ozturan et al,. (1999) however it is consistent with FVC changing. These differences may be related to their study group (basketball players) or the difference in the training program. These authors indicated that the reason of decline in FEV1 values is related to respiratory muscles fatigue. However the results in reference to FEV1 was rejected by the findings of Nitasha et al (2007) who studied the effects of different types of training methods on pulmonary function of the high school students during growth period. Verges (2004) studied pulmonary function of the skitters players for 10-year period and showed that activity in chronic cold and dry air causes significant restricting changes in the airways and increases airway resistance. The findings of this research in reference to FEV1 and FVC / FEV1 changing after maximal anaerobic training program are inconsistent with the results of Goktepe (2004). They compared two protocols of maximum aerobic and anaerobic exercise after a single session and showed that significant difference only in FEV1 indicator, but other indices did not differ significantly. Research findings of FVC changing are agreed with Ozturan et al (1999) results but there were discrepancies in the FEV1 indicator, although statistical sample was different and the subject were elite basketball players. These discrepancies may be due to different samples or protocol type. Rogers (2001) investigated changes in lung function of the multiple desert endurance athletes and reported significant difference in FEV1 and FVC of the sample.

Conclusion

Based on the results it is as suited that aerobic activities with of slow moving air flow in the trachea combines without significant changes in respiratory muscles, especially inspiratory muscles and the effort done by these subjects were not at maximal levels, so increase in FEV1 volumes accrued. But the speed of air flow is high at the beginning of anaerobic exercise and caused increasing in respiratory muscles temperature and increasing in FEV1, volumes.

1. Aerobic and anaerobic training groups showed significant increase in forced expiratory volume one second as compared to control group.
2. Aerobic training produced significant increase in forced expiratory volume one second as compared to anaerobic group.
3. Therefore it is concluded that aerobic training is better than anaerobic training in deloping oxygen transport system.

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