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Dr. R Rajaram
Assistant Professor,
Department of Physical Education and Sports Sciences,
Annamalai University, Tamil Nadu, India

Correspondence
Dr. R Rajaram
Assistant Professor,
Department of Physical Education and Sports Sciences,
Annamalai University, Tamil Nadu, India

Effect of aerobic cross training and aerobic training on selected physiological variables

Dr. R Rajaram

Abstract
The purpose of the present study was to find the effect of aerobic cross training and aerobic training on inspiratory reserve volume and expiratory reserve volume. For this purpose, thirty subjects studying bachelor degree in the age group of 19–21 years were selected. They were divided into three equal groups, each group consisted of ten subjects, in which group–I underwent aerobic cross training, group– II underwent aerobic training and group–III acted as control group who did not participate in any special training. The training period for this study was three days in a week for twelve weeks. Prior to and after the training period the subjects were tested for inspiratory reserve volume and expiratory reserve volume. It was concluded after the aerobic cross training and aerobic training, that training groups have increased the level of inspiratory reserve volume and expiratory reserve volume significantly.

Keywords: aerobic cross training, aerobic training, physiological variables

1. Introduction
Sports training is a scientifically based and pedagogically organized process which through planned and systematic effect on performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competition (Hardayal Singh, 1991) [1].

Sport training is done for improving sports performance. The sports performance as any other type of human performance is not the product of one single system or aspect of human personality. On the contrary it is the product of the total personality of the sports person. The personality of a person has several dimensions e.g., physical physiological, social and psychic. In order to improve sports performance the social and psychic capacities of the sports person also have to be improved in addition to the physical and physiological ones. In other words the total personality of a sportsman has to be improved in order to improve his performance. Sport training therefore directly and indirectly aims at improving the personality of the sportsman. No wonder therefore sports training is an educational process. (Hardayal Singh, 1991) [1]

Physical training brings about changes in the muscles, improved neuromuscular co-ordination activities and a series of more general cardio-respiratory as mentioned below:

An increase of maximum respiratory minute volume in exercise.

1. Possibly a slight increase in oxygen diffusing capacity.
2. 10-30 percent increase of maximum oxygen uptake (depending on initial fitness)
3. An increase in stroke volume and maximum cardiac output.
4. An increase in size of heart
5. An increase in total haemoglobin and blood volume (Lange K. Anderson, 1971) [2].

Aerobic (or cardio respiratory) endurance is the ability of the body to supply oxygen and energy to the cells and remove waste products in order to sustain prolonged rhythmical exercise. The heart pumping oxygenated blood through the arteries to the cells accomplishes this. At the cellular level, the cells absorb oxygen and waste products are removed and carried away by the blood. An adequate supply of oxygen prevents the build up a lactic acid, which produces fatigue in the muscle, and also, follows for the production of adenosine triphosphate (ATP): the basic energy source in the muscle.

The heart then pumps this blood to the lungs to de-oxygenated and returned to the heart via the pulmonary veins to begin systemic circulation cycle once again.

Dr. Cooper, an avowed exercise enthusiast, was personally and professionally puzzled about why some people with excellent muscular strength were still prone to poor performance at tasks such as long-distance running, swimming, and bicycling. He began measuring systematic human performance using a bicycle ergometer, and began measuring sustained performance in terms of a person's ability to use oxygen. His groundbreaking book, *Aerobics*, was published in 1968, and included scientific exercise programs using running, walking, swimming and bicycling. The book came at a fortuitous historical moment, when increasing weakness and inactivity in the general population was causing a perceived need for increased exercise. It became a bestseller. Cooper's data provided the scientific baseline for almost all modern aerobics programs, most of which are based on oxygen-consumption equivalency (www.wikipedia.org) [3].

2. Methods

The purpose of this study was to find out the effect of aerobic cross training and aerobic training on selected physiological parameters, such as, inspiratory reserve volume and expiratory reserve volume.

Thirty college aged male subjects, between 19 and 21 years (mean age = 20 years ± 01 months) were randomly selected and divided into three equal groups of ten subjects each, out of which group–I (n = 10) underwent aerobic cross training, group–II underwent aerobic training (n = 10) and group-III (n = 10) remained as control. For the purpose of collection of data on inspiratory reserve volume and expiratory reserve volume, the wet spirometer was used. The subjects were asked to report in early morning, one day prior to the commencement of training and one day after the training. The post-test data was taken after 48 hours after the completion of 12 weeks training period.

2.1 Selection of Aerobic Cross Training

The experimental factor selected is aerobic cross training and it's were innumerable. So, the scholar consulted with experts in the field of sports training, then selected the following different types of aerobic cross training for the experimental group:

1. Running and
2. Swimming

2.2 Training Schedule

The experimental groups underwent aerobic cross training and aerobic training for three days per week for 12 weeks. The control group was not given any specific training. The duration of running followed by swimming was fixed as recommended by Kenneth H. Cooper (www.wikipedia.org) [3]. The aerobic training group was underwent continuous running only.

3. Analysis of the Data

Table 1: Analysis of Covariance and 'F' ratio on selected criterion variables of Aerobic Cross Training Group Aerobic Training Group and Control Group

Inspiratory reserve volume								
	Aerobic Cross Training group	**Aerobic training group**	**Control group**	**Source of variance**	**Sum of squares**	**df**	**Means square**	**'F' Ratio**
Pre-test Mean	2.63	2.63	2.62	Between	0.000216	2	0.000108	0.584
Std Dev	0.013	0.013	0.013	Within	0.005	27	0.000185	
Post-test Mean	2.70	2.68	2.64	Between	0.026	2	0.013	52.96*
Std. Dev	0.201	0.013	0.013	Within	0.007	27	0.00025	
Adj. Post-test Mean	2.70	2.68	2.63	Between	0.021	2	0.010	137.98*
					0.002	26	0.000076	
Expiratory reserve volume								
	Aerobic Cross Training group	**Aerobic training group**	**Control group**	**Source of variance**	**Sum of squares**	**df**	**Means square**	**'F' Ratio**
Pre-test Mean	2.572	2.573	2.571	Between	0.00002	2	0.00001	0.056
Std Dev	0.0131	0.133	0.137	Within	0.005	27	0.000185	
Post-test Mean	2.745	2.69	2.58	Between	0.141	2	0.071	255.81*
Std. Dev	0.0196	0.017	0.0124	Within	0.007	27	0.00025	
Adj. Post-test Mean	2.745	2.689	2.581	Between	0.140	2	0.070	331.45*
					0.005	26	0.000185	

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 26 were 3.37 respectively).

Table 2: Scheffĕ S Test for the Difference between the Adjusted Post-Test Mean of Selected Criterion Variables

Adjusted Post-test Mean (Inspiratory Reserve Volume)				
Aerobic Cross Training Group	**Aerobic Training Group**	**Control group**	**Mean Difference**	**Confidence interval at .05 level**
2.70		2.63	0.07*	0.012
2.70	2.68		0.02*	0.012
	2.68	2.63	0.05*	0.012
Adjusted Post-test Mean (Expiratory Reserve Volume)				
Aerobic Cross Training Group	**Aerobic Training Group**	**Control group**	**Mean Difference**	**Confidence interval at .05 level**
2.745		2.581	0.164*	0.019
2.745	2.689		0.056*	0.019
	2.689	2.581	0.108*	0.019

The data collected prior to and after the experimental periods on inspiratory reserve volume and expiratory reserve volume on aerobic cross training group aerobic training group and control group were analysed and presented in the following table-I & II.

4. Results

Before applying the experiment all the subjects of the aerobic cross training group, aerobic training group and control group attended the pre-test, which was conducted a day prior to the commencement of the training and the data were collected on inspiratory reserve volume and expiratory reserve volume. After twelve weeks of training the post-test was conducted one day after the training period to find out any changes in the criterion variables.

The analysis of covariance (ANCOVA) was used to find out the significant difference if any, among the experimental groups and control group on selected criterion variables separately. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as appropriate. Since three groups were involved in this study, the Scheffė *S* test was used as pos-hoc test

The result of this study showed that there was a significant difference between the aerobic cross training group, aerobic training and control group in favour of experimental groups, on the changes in inspiratory reserve volume and expiratory reserve volume after twelve weeks of training. All the criterion variables have significantly improved after the training periods when compared with the control group.

5. Discussion

The results of the study reveal that there was a significant changes after the aerobic cross training and aerobic training in inspiratory reserve volume (F.E. Hass, 1987) [4]. The results of the study reveal that there was a significant changes after the aerobic cross training and aerobic training in expiratory reserve volume (Nicholas S. Hill, Cynthia Jacoby and Harrison W. Farber, 1991) [5]. The findings of this study showed that the physiological parameters such as inspiratory reserve volume and expiratory reserve volume has increased due to the aerobic cross training and aerobic training.

6. References

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