Biomedical Research 2012; 23 (2): 231-233

Moderate intensity aerobics training improves pulmonary function in young Indian men

Chaitra B.[1], Pandurang Narhare[2], Nagaraja Puranik[3] and Vijay Maitri[4]

[1]Department of Physiology, J.J.M. Medical College, Davangere, Karnataka, India.

[2]Department of Physiology, Chalmeda Anand Rao Institute of Medical Sciences, Bommakal, Karimnagar, Andhra Pradesh, India.

[3]Department of Physiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.

[4]Department of Medicine, Command Hospital, Bengaluru, Karnataka, India

Abstract

The aim of the study was to evaluate the effect of aerobic exercise training on pulmonary function tests in healthy young men. We recruited twenty; apparently healthy male medical students aged 17-20 years. The subjects participated in a 16 weeks aerobic exercise plan. Pulmonary function test was recorded before the commencement of training and at the end of training. The data were analyzed by paired 't' test. P< 0.05 was considered significant. After the training there was significant improvement in pulmonary function tests (P < 0.05). In conclusion, the current study has shown that, there is significant positive relationship between aerobics training and pulmonary function in healthy young men.

Key words: Aerobics, Exercise, Pulmonary Function Tests, Men

Accepted January 27 2012

Introduction

Background: Aerobic exercise is an important component of pulmonary rehabilitation for patients with chronic obstructive pulmonary disease (COPD).

The American College of Sports Medicine (ACSM) defines aerobic exercise as "any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature." It is a type of exercise that overloads the heart and lungs and causes them to work harder than at rest [1]. Examples: walking, jogging, running, skipping, dancing, swimming etc..

Forced vital capacity (FVC) is the volume of the air that can be expired rapidly with a maximum force following a maximum inspiration. Forced expiratory volume in one second (FEV_1) is the volume expired in the first second of maximal expiration after a maximal inspiration and is a useful measure of how quickly full lungs can be emptied. It represents the volume of air expired in the first second of a FVC. Estimation of FEV_1 is the most commonly used screening test for airway diseases. Normally FEV_1 is about 80% of the FVC; useful in distinguishing between restrictive and obstructive diseases.

Peak expiratory flow rate (PEFR) is the highest flow value measured during forced expiration. It is an effort-dependent value. PEFR measures how fast a person can exhale air. It is one of many tests that measure how well our airways work. It is a simple method of measuring airway obstruction and it will detect moderate or severe disease [2]. Factors which determine PEFR are airway obstruction, closure and compression of small airways, strength of expiratory muscles and the lung and chest mechanics.

Impaired pulmonary functions are associated with increased mortality and morbidity [3-5]. Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic ailments [6]. There are very few studies on aerobic exercise and pulmonary function in general population [7]. Most studies on the effects of physical activity are cross sectional ones, on special populations such as athletes or patients with COPD [8-11]. Physical activity rehabilitation is widely used in patients with pulmonary diseases. Exploration of the relation between aerobic exercise and respiratory functions, will aid in understanding how aerobics improves patient's quality of life and in finding a better way to evaluate the effects of rehabilitation. The present study was carried out to investigate the relationship between aerobics training and pulmonary function in healthy young men.

Materials and Methods

This study was approved by ethics committee of the institute. We recruited twenty; apparently healthy male medical students aged 17-20 years. Informed consent was obtained. Participants were non-athletes, non-smokers, non-obese and non-alcoholics. Subjects' height and weight were measured; BMI was calculated (See table 1).

Subjects were asked to refrain from tea, coffee, chocolates and caffeinated soft-drinks on the day of recording Spirometry. The forced expiratory maneuver was demonstrated to all the subjects. PFT was recorded by a computerized spirometer (CPFS/D^{USB}, Medgraphics Company) in standing position. Subjects were instructed to take maximum inspiration and blow into the pre-vent pneumotach as rapidly, forcefully and completely as possible for a minimum of 6 seconds, followed by full and rapid inspiration to complete the flow volume loop. The best of the three trials was considered for data analysis. Calibration of spirometer and all testing protocols were performed as outlined in the instruction manual of the spirometer.

Subjects participated in 16 weeks aerobic exercise plan which included five 20 minute sessions of jogging in a week with 5 minutes of warm-up and 5 minutes of cool-down exercises. The distance covered was 2.5 Km i.e. 5 laps of college ground and exercise heart rate was 116 ± 8 beats/min. This was a moderate intensity exercise according to WHO classification. PFT was repeated at the end of the training.

The data were analyzed using Microsoft Excel software. Student's paired 't' test was applied to compare the pre and post training values. Statistics were tested at the $P<0.05$ level of significance and data were reported as mean ± standard deviation.

Results

After 16 weeks of aerobics training there was significant ($P < 0.05$) increase in FVC, FEV_1 and PEFR. There was no significant change in FEV_1/FVC ratio (See table 2). There were no serious adverse events during the study and the subjects were comfortable.

Table 1. *Mean height and weight of the subjects at the beginning of the study*

No. of Subjects	**Age** (years) x ± S.D.	**Height** (cms) x ± S.D.	**Weight** (kg) x ± S.D.	**BMI** x ± S.D.
20	17-20	175.5 ± 13.5	65.9 ± 12.2	22.6 ± 2.1

x ± S.D. Mean ± Standard Deviation

Table 2. *Mean spirometry values (pre training and post training) of the subjects*

Variables (unit)	**Pre training** x ± S.D.	**Post training** x ± S.D.	**P value**
FVC (L)	3.56 ± 0.28	4.27 ± 0.36	< 0.001*
FEV_1 (L)	3.11 ± 0.28	3.42 ± 0.26	< 0.001*
FEV_1/FVC %	89.65 ± 6.57	89.34 ± 6.82	0.338
PEFR (L/min)	465.8 ± 44	532.9 ± 42	< 0.001*

** Significant, x ± S.D. Mean ± Standard Deviation*

Discussion

Physical inactivity and low cardio-respiratory fitness are recognized as important causes of morbidity and mortality [6, 7]. It is generally accepted that people with higher levels of physical activity tend to have higher levels of fitness and that physical activity can improve cardio-respiratory fitness [8].

In the present study, pulmonary function improved significantly after 16 weeks of jogging. Thus positive relationship between aerobics training and pulmonary function was supported by our data. Other studies com- paring respiratory function among men and women engaged in various sports found that sports person have better level of pulmonary function than sedentary people [12]. Our study result is supported by Cheng et al. study in which the physical activity improved pulmonary function in healthy sedentary people [13]. Farid et al. showed an improvement in pulmonary function with aerobic exercise training in asthma patients [14]. Nourrey et al. showed in a prospective study that aerobic exercise improves pulmonary function and alters exercise breathing pattern in children [15]. Fitch et al. studied the effect of five months swimming training on school children with asthma and found improved lung function, and improved posture and

fitness [16]. Nickerson et al. have shown in their study that distance running program improved fitness in asthmatic children without pulmonary complications [17]. Clark found that cardio-respiratory fitness significantly improved and breathlessness decreased over a wide range of physical work corresponding to activities of daily living [18]. Kaufman et al. studied the effect of aerobic training on ventilatory efficiency in overweight children, and found that the training helped to reverse the decrements in cardiopulmonary function observed over a period of time in overweight children [19].

Our study also showed that the subjects were able to have more powerful and more effective inspiration and expiration as opposed to what they have been able to before participating in such aerobics training. One limitation of our study is that most of our healthy subjects were from mid to upper socioeconomic strata and only male students were included in the study. This shortcoming may affect the generalization of the results to other sections of society.

Conclusion

In conclusion, the current study has shown that, there is significant positive relationship between aerobics training and pulmonary function in healthy young men. The improvement in pulmonary function could be due to increased strength of respiratory muscles.

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Correspondence to:

Chaitra B.
Department of Physiology
J.J.M. Medical College
Davangere, Karnataka
India