

THE EFFECT OF AEROBIC EXERCISE ON PULMONARY FUNCTION IN YOUNG HEALTHY ADULTS



Physiology

KEYWORDS: Aerobic exercise, running, pulmonary function test

Dr. Rakesh Singh Gadhwal

Assistance Professor Department of Physiology, NSCB MC College Jabalpur , MP INDIA.

Dr. Rajendra S Kushwah

Associate Professor Department of Anatomy, NSCB MC College Jabalpur1, MP INDIA.

ABSTRACT

Aim of this study is evaluation the effect of aerobic exercise and its duration on pulmonary function in young healthy adults. Pulmonary function tests were done before and after aerobic exercise of 6 weeks duration in 46 healthy adults. Mean value \pm SD of FVC (3.74 ± 0.44 liters), FEV₁ (3.29 ± 0.35 liters), FEV₁/FVC (89.30 ± 4.54 liters) before the running and after the running it became FVC (3.77 ± 0.45 liters), FEV₁ (3.33 ± 0.40 liters), FEV₁/FVC (89.65 ± 4.96 liters) respectively. P value are FVC (0.32), FEV₁ (0.16) and FEV₁/FVC (0.50) which are not statically significant. Aerobic exercise of more than 6 weeks duration are required to bring change in the Lung functions.

INTRODUCTION:

Pulmonary functions are usually determined by the strength of respiratory muscles, compliance of the thoracic cavity, airways resistance and elastic recoil of the lungs. The parameters used to measure lung function are the lung volumes, lung capacities and flow of air in airways. It is well known that pulmonary functions may vary according to the physical characteristics including age, height, weight and may be affected by environmental factors such as altitude.

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. Examples: walking, jogging, running, skipping, dancing, swimming etc.

Many studies show the benefits of aerobic exercise on respiratory system. These benefits are seen by long duration of aerobic exercise .Duration is more important than intensity as changes in lungs developed gradually over the period of time . Aerobic exercise of 12-16 weeks duration brings change in function of lungs in young healthy adults^{1,2}.

One year of intensive swimming training caused change in lung volumes, airway resistance and in the flow-volume relationship in prepubertal girls³. The study of varsha akhade et.al showed that there is significant difference in the FVC and FEV₁ of runners, who are doing running since 2- 6 years, as compare to sedentary subjects of same group⁴. Athletes has higher FVC and FEV₁ than non- athletes⁵. Y J Cheng et.al study showed that change in physical activity is associated with change in cardiorespiratory fitness but change is in respiratory system little over the follow up period of 5 years⁶. Improvement in function of lungs is developed after the years of aerobic exercise.

So, Purpose of this study was to examine effect of aerobic exercise and its duration to bring change in lung function.

MATERIAL AND METHODS:

This study was carried out in the Department of Physiology, MGM Medical College, Indore. 46 healthy young adults aged between 18 to 25 years were included in the study to test effect of running on pulmonary function . Written informed consent was obtained from all of the participants.

Criteria of inclusion: Subjects were included who do not have any history of cardiac, respiratory, neuromuscular and endocrine disease.

Criteria of exclusion: Subjects who develop any kind of discomfort

during running.

Procedure and Equipment: Pulmonary function test (PFT) was done by using Ganshorn LT8 computerized Spirometry machine. Subjects were comfortably seated, the procedure was explained .Weight was measured using a digital scale (kg) and height was measured by stadiometer (cm). After appropriate placement of mouthpiece and nose clip, subject was asked to do a forcefully and quickly expiration after maximum inhalation. After doing at least three acceptable and repeatable FVC maneuvers, best maneuvers was taken for analysis. Spirometry depends significantly on subject's effort, performance and quality of equipment⁷.

FVC: Forced vital capacity (FVC) is the volume of the air that is expired rapidly with a maximum force following a maximum inspiration.

FEV₁: Forced expiratory volume in one second (FEV₁) is the volume expired in the first second of maximal expiration after a maximal inspiration and is a useful measure of how quickly lungs can be emptied. It represents the volume of air expired in the first second of FVC. Estimation of FEV₁ is the most commonly used screening test for airway diseases. Normally FEV₁ is about 80% of the FVC and it is useful in distinguishing between restrictive and obstructive diseases of lung.

FEV₁/FVC: It is ratio of amount of air exhaled in 1st second to the force vital capacity.

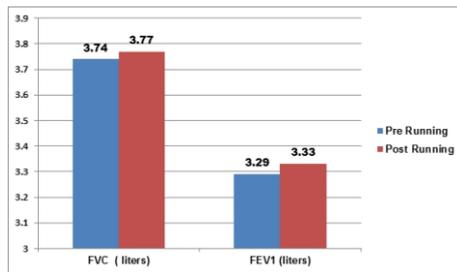
Aerobic Exercise: Running was done in morning for 30 minutes daily for 6 weeks on dry mud track in stadium.

OBSERVATION:

The study sample was comprised of 46 healthy young adults. PFT was done before and after 6 weeks of aerobic exercise. The exercise program was well tolerated by all of the participants. Data was compiled and tabulated. Data was analyzed with the help of microsoft excel and SPSS software. Pair "t" test was applied to see the effect of exercise on pulmonary function. P value less than 0.005 is considered as statically significant and data is expressed as Mean \pm Standard deviation.

Table 1. Show Means Value and Standard Deviation of Force Vital Capacity, Force Expiratory Volume in 1 Sec and FEV₁/FVC.

Parameters	Pre Running		Post Running	
	Mean \pm SD	Mean \pm SD	t	P
FVC (liters)	3.74 \pm 0.44	3.77 \pm 0.45	1.00	0.32
FEV ₁ (liters)	3.29 \pm 0.35	3.33 \pm 0.40	1.40	0.16
FEV ₁ /FVC (%)	89.30 \pm 4.54	89.65 \pm 4.96	0.67	0.50

**RESULT:**

Mean value \pm SD of FVC (3.74 ± 0.44 liters), FEV1 (3.29 ± 0.35 liters), FEV1/FVC (89.30 ± 4.54 liters) before the running and after the running it became FVC (3.77 ± 0.45 liters), FEV1 (3.33 ± 0.40 liters), FEV1/FVC (89.65 ± 4.96 liters) respectively. P value are FVC (0.32), FEV1 (0.16) and FEV1/FVC (0.50) which are not statically significant. Our study showed that, there was no significant positive relationship between 6 week aerobics training and pulmonary function in healthy young adults. There was no significant change in, FVC, FEV1 and FEV1/FVC.

DISCUSSION:

Lung function parameters may vary in different settings. These are determined by genetic, environmental, and nutritional factors. Aerobic exercise of long duration affect these parameters as seen in various studies.^{3,4}

Forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV1) are strong indicators of lung function. FEV1 depends upon airway resistance, lung compliance and contraction power of respiratory muscle⁸. As the duration of 6 week is not sufficient to improve the strength of respiratory muscles. So, there is no significant changes seen in FVC and FEV1. The mean values of FEV1 as a percentage of FVC (FEV1/FVC %) were found to be almost similar in after intervention of running. The difference was not statistically significant. The subjects were healthy adults and free from any respiratory diseases, hence the ratio of FEV1/FVC was not change.

Various Studies have confirmed that athletes have larger lung volumes and capacities than non athletes of comparable age group. Strength of respiratory muscles are developed after the long duration of aerobic exercise, but duration of 6 weeks is not sufficient to develop strength of respiratory muscles or it has no effect on lung functions. Hence there was no significant improvement in pulmonary function after the 6 weeks of aerobic exercise

CONCLUSION:

Our study concluded that more than 6 week are required to improve the function of lungs. Additional research is needed to consolidate the minimum duration of exercise to improve the function of lung.

REFERENCE:

- Mahajan Shashi, Arora Anterpreet K, Gupta Pankaj (2013), "Effect of aerobics training on pulmonary functions in young male adults of punjab" pak journal of physiology :9(2).
- Chaitra, Narhare, Puranik, Maitri (2012), "Moderate intensity aerobics training improves pulmonary function in young Indian men." Biomed Research 23(2):231-233.
- Courteix D, Obert P, Lecoq AM, Guenon P, Koch G (1997), "Effect of intensive swimming training on lung volumes, airway resistance and on the maximal expiratory flow-volume relationship in Prepubertal girls." Eur J Appl Physiol Occup Physiol. ;76 (3):pages 264-269.
- Varsh Akhade.et.al (2014), "The Effect of running training on pulmonary function tests", National Journal of Physiology, Pharmacy & Pharmacology Volume 4 Issue 2 pages 168-170.
- Jaya Mary George, Kalyani Sen and Raveendran C (2014)"Evaluation of the effect of exercise on pulmonary function in young healthy adults" International Journal of Biomedical And Advance Research 05(06).
- Y J Cheng, C A Macera, C L Addy, F S Sy, D Wieland, S N Blair (2003); "Effects of physical activity on exercise tests and respiratory function" British journal of sport medicine volume 37 issue 6.
- D Bhera (2015), Textbook of Spirometry First edition pages 2-3.
- Shobha Rani Vedala, Niranjan Paul, Abhay B Mane (2013), "Differences in Pulmonary Function Test among the Athletic and Sedentary Population" National Journal of Physiology, Pharmacy & Pharmacology Vol3 Issue 2 pages 118 - 123.