

EFFECT OF PHYSICAL TRAINING ON LUNG FUNCTION IN HEALTHY YOUNG ADULTSSilpa Gantela¹, Srilatha Choppa²**HOW TO CITE THIS ARTICLE:**

Silpa Gantela, Srilatha Choppa. "Effect of Physical Training on Lung Function in Healthy Young Adults". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 86, October 26; Page: 14973-14979, DOI: 10.14260/jemds/2015/2126

ABSTRACT: BACKGROUND: Constant and consistent exercise will improve the efficiency of a vital organ, our lungs, and that all people, even young subjects, need to work this organ along with the rest of their body for a healthier life. Hence the present study was under taken to show that consistent aerobic activity, would exhibit a significantly greater lung capacity. **OBJECTIVES:** To compare the lung volumes and pulmonary functions of young trained men with those of healthy sedentary age-matched controls, to determine whether physical activity (Exercise) and lifestyle effects the pulmonary function and delays decline of lung function. **MATERIAL & METHODS:** A total of 100 subjects comprising physically active men who exercised for 90minutes every day from one year and sedentary men were assessed for pulmonary function test. The parameters used as determinants of lung function were FVC, FEV1, PEF 50% and FEV1% were recorded as per standard procedure using Medspiror. **RESULTS:** Pulmonary Function Profile was analyzed and compared between the two groups. In our study the physically active group were having higher mean of FVC 4.98 ± 0.15 FEV1 of 4.077 ± 0.115 , PEF 50% of 4.462 ± 0.108 and FEV1% of 82.48 ± 0.441 as compared to sedentary group. **CONCLUSION:** The FVC, FEV1, PEF 50% and FEV1% were higher in physically active young men than in the normal sedentary control individuals. This study proves that a physically active lifestyle improves the lung functions and probably delays the decline in the lung functioning as well. **KEYWORDS:** Pulmonary function tests, exercise, Sedentary.

INTRODUCTION: Stronger, healthier lungs make for stronger, healthier people. We all know that exercise⁽¹⁾ is important in our daily lives, but we may not know why or what exercise can do for us. It's important to remember that we have evolved from nomadic ancestors who spent all their time moving around in search of food and shelter, travelling large distances on a daily basis. Our bodies are designed and have evolved to be regularly active.

The main aim of our study is to prove that exercise improves the lung function and any activity that gets you moving, gets your heart rate and respiratory rate up is good in almost every way.

Pulmonary function tests (PFTs) are noninvasive diagnostic tests that provide measurable feedback about the function of the lungs, lung volumes, capacities, rates of flow, and gas exchange.

Spirometry⁽²⁾ includes tests of pulmonary mechanics – measurements of FVC, FEV₁, FEF values, forced inspiratory flow rates(FIFs), and MVV, PEFR. Measuring pulmonary mechanics assesses the ability of the lungs to move large volumes of air quickly through the airways. Using computerized spirometer (Spiro lab) on subjects with physical activity like dynamic exercising people and sedentary subjects are inducted into the present study. An attempt is made to study the variations in pulmonary function tests in the above study population.

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MATERIAL AND METHODS: The present study was conducted on 100 young adult males with age groups ranging from 22–26 years, who are physically and clinically in good health, devoid of any pulmonary, cardiovascular, hematological and clinical abnormalities and also their hemoglobin is more than 10gms/100ml. Amongst the 100, 50 males were physically trained for 90 minutes every day, and were considered as the Test Group. 50 were sedentary and had a dormant lifestyle, who were considered as the Control Group. To avoid the anthropometric variation, all the 100 subjects are taken from height range of 1.6mtrs.

Group A control Group: Males sedentary from age 22– 26 years.

Group B Test Group: Male physically active from age 22–26 years.

All the subjects are well informed of the experimental protocol and are thus educated to give maximum co-operation during the study and also their consent was obtained. The lung function tests were carried on all these subjects as per the standards mentioned by M.R Miller et al.^(3,4) The informed consent was obtained and procedure was explained to each subject during test. The tests were carried by a well-trained doctor familiar with Medspiror (Computerized spirometry) after reinforcing the method of test to each subject.

The study was conducted in the pulmonary function tests laboratory of the department of Tuberculosis and Chest diseases at Katuri Medical College & Hospital, Guntur and different parameters (FVC, FEV1, FEV1/FVC%, PEF 50%, RR) of the study are recorded.

The heights and weights of all the subjects were recorded and also the pulse & blood pressures were recorded. The subjects were asked to come in the post lunch session between 2-4 pm i.e., 2-3 hours after lunch and were also asked to empty their bladder and to sit in front of the computerized spirometer with mouth piece held firmly between the lips and the nose clip is applied, the subject is asked to inhale and exhale into the spirometer and such three readings are taken, out of which the average (Mean) is taken as a standard reading for the study.

STATISTICAL ANALYSIS: Data are reported as mean and standard deviation (+SD). Means are compared between two groups by (Students unpaired) t test.

A p value of <0.05 was considered statistically significant.

$$\sigma_{12} = \sqrt{\frac{\sigma_1^2 n_1 + \sigma_2^2 n_2}{n_1 + n_2}}$$

σ_1 - Standard deviation of group 1, n_1 - no. of samples group 1.

σ_2 - Standard deviation of group 2, n_2 - no. of samples group 2.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sigma_{12}} \times \sqrt{\frac{n_1 * n_2}{n_1 + n_2}}$$

\bar{X}_1 - Statistical Mean of Group 1 samples.

\bar{X}_2 - Statistical Mean of Group 2 samples.

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RESULTS : The mean forced vital capacity (FVC) in male sedentary subjects of 22-26yrs age group i.e., group A which is 4.46 ltrs±0.07 is compared with the mean forced vital capacity (FVC) of male physically active group B which is 4.98±0.15 of age group 22-26yrs.

These results showed an increased mean forced vital capacity (FVC) in physically active males by 16.65% (P<0.001) which is statistically significant.

The mean forced expiratory volume in one second in male sedentary subjects of age group of 22-26yrs i.e., group A which is 3.58 ltrs±0.05 is compared with mean forced expiratory volume in one second in physically active males of 22-26yrs age Group B which is 4.07 ltrs±0.11. These results showed an increased mean forced expiratory volume in one second in physically active males who practice regular dynamic exercise by 13.68% (P<0.001) which is statistically significant.

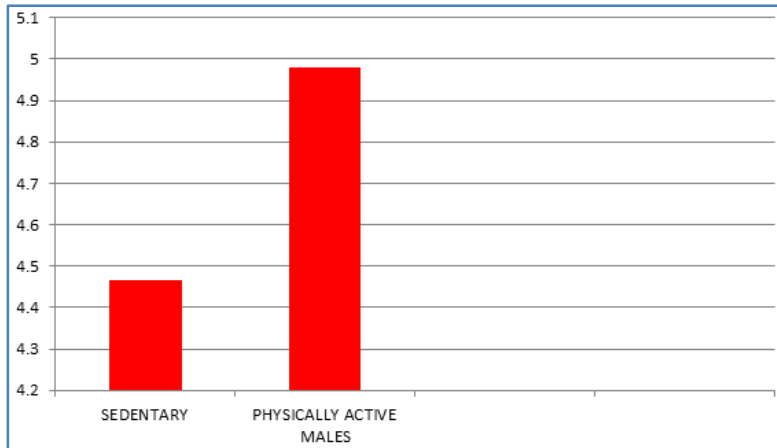
The mean forced expiratory volume percentage in male sedentary subjects of age group of 22-26yrs i.e., group A which is 80.4%±0.68 is compared with mean forced expiratory volume percentage in physically active males of age group of 22-26yrs i.e., Group B is 82.48%±0.44. These results showed an increased mean forced expiratory volume percentage in physically active males by 2.58% (P<0.001) which is statistically significant.

The mean peak expiratory flow(PEF) in male sedentary subjects of 22-26 yrs. age group i.e., group A which is 4.1ltrs per second ±0.07 is compared with mean peak expiratory flow (PEF) in physically active males of age group of 22-26yrs i.e., Group B is 4.46ltrs per second±0.1. These results showed an increased mean peak expiratory flow (PEF) in physically active males by 8.78% (P<0.001) which is statistically significant.

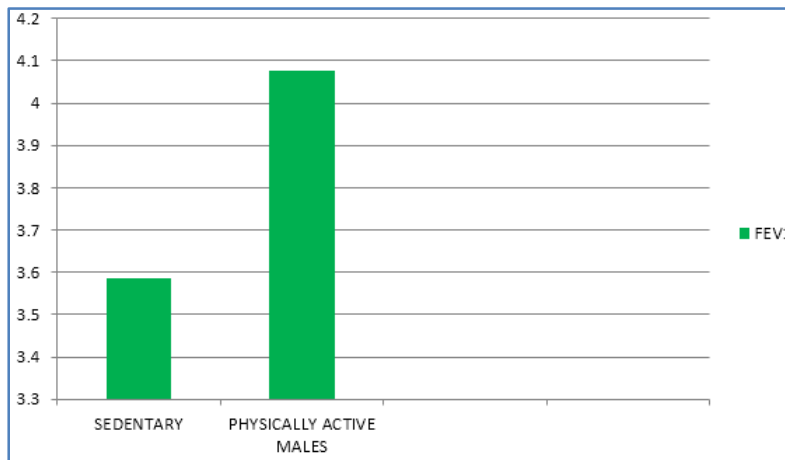
PFT	SEDENTARY		PHYSICALLY ACTIVE MALES		CSD	T value	P value	% ↑↓
	Mean	SD	Mean	SD				
FVC	4.467	0.074	4.98	0.15	0.1182	15.342	<0.001	11%↑
FEV1	3.585	0.051	4.077	0.115	0.0889	19.563	<0.001	13%↑
FEV1%	80.4	0.68	82.48	0.441	0.573	12.832	<0.001	2%↑
PEF50 %	4.104	0.0789	4.462	0.108	0.0945	13.391	<0.001	8%↑

Table Showing Comparison of Mean Pulmonary Function Test Values in Male Sedentary and Physically Active Males of 22-26Years Age Group

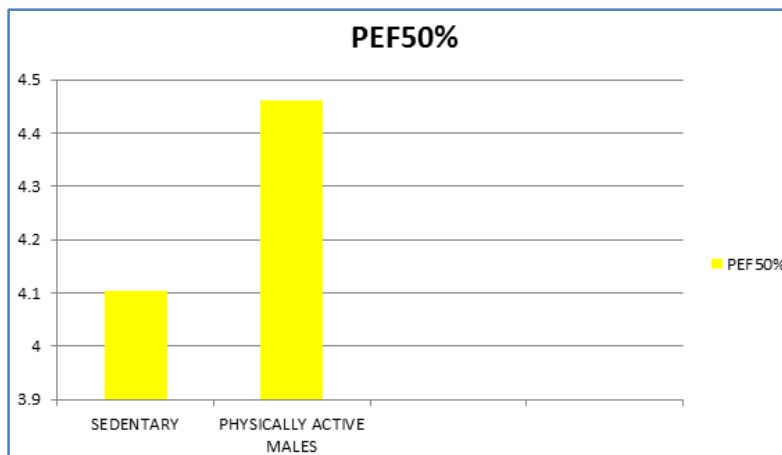
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Comparison of forced vital capacity in Group A and Group B



Comparison of FEV1 in Group A and Group B



Comparison of PEF50% in Group A and Group B individuals

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DISCUSSION: Regular aerobic exercise strengthens and tones the lungs, enabling the pulmonary system to increase the maximum amount of oxygen that the lungs can handle.

Exercise makes muscles stronger and improves range of motion in joints, assisting in performing tasks that require physical exertion.

Immediate effects.⁽⁵⁾ when first exercising are, Increased rate of breathing and Increased depth of breathing – rise in tidal volume. Effects of regular training are Increased strength of diaphragm and intercostal muscles, Greater number of alveoli, Increased ability of the lungs to extract oxygen from the air, Increased vital capacity, Increased amount of oxygen delivered to, and carbon dioxide removed from, the body.

All these changes the respiratory system, would improve the Forced Vital Capacity, Forced expiratory volume in 1sec, FEV1/FVC Ratio, Peak Expiratory flow rate, and respiratory rate.

Hamilton P. Andrew GM.⁽⁶⁾ tested FVC,TLC,RV,FEV1,PEF in well trained athletes which is in correlation with our study.

Shivesh Prakash, Sushant Meshram and Ujwal Ramtakker.⁽⁷⁾ observed increased pulmonary function test values like Forced expiratory volume in one second(FEV1), Forced vital capacity(FVC), Peak expiratory flow(PEF), Forced expiratory flow(FEF)(25-75%) in sports persons when compared to sedentary control individuals of the same age of athletes which is in agreement with our work.

As is observed by William E. Amonette and Terry L. Dupler.⁽⁸⁾ found increased values of forced vital capacity, forced expiratory volume in one second, FEV1/FVC ratio, peak inspiratory flow in runners which is in correlation with our study.

A. K. De, Mandal M B, Kumar S.⁽⁹⁾ observed reduction in vital capacity and Peak expiratory flow rate(PEFR) in sedentary life style person when compared to sedentary control individuals of the same age of athletes which is consistent with our study.

James M Hagberg, John E Yerg II and Douglas R. Seals.⁽¹⁰⁾ observed increased values of vital capacity, FEV1, FVC, MVV, FEV1/FVC%, PIF, PIF 75%, PIF50%, PIF25%, in exercising persons which is in correlation with our study.

Douglas G. Stuart and WD Collings.⁽¹¹⁾ have compared the vital capacity and maximum breathing capacity of athletes and nonathletes and their findings are in accordance with our study.

J. W. R. Twisk, A. J. Staal, M. N. Brinkman, H.C.G.Kemper, W. Van Mechelen.⁽¹²⁾ have tracked the longitudinal relationship of lifestyle with the lung function parameters and have concluded that an active lifestyle will improve the lung function.

L Cordain.⁽¹³⁾ have identified improved Maximal respiratory pressures and pulmonary function in male runners which correlates with our study.

CONCLUSION: The study revealed that the parameters chosen to reflect the pulmonary functions were best among dynamic exercising people. The study revealed that the dynamic exercising people's performance was better when compared with sedentary subjects.

In this study, physically active men were compared with sedentary life style men, there was an increase in the forced vital capacity, forced expiratory volume, peak expiratory flow rate in physically active men, thus, enhancing the pulmonary functional capacity in them. Therefore, physical activity improves the lung function.

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AUTHORS:

1. Silpa Gantela
2. Srilatha Choppa

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Physiology, Katuri Medical College,
2. Assistant Professor, Department of Physiology, Rangaraya Medical College.

FINANCIAL OR OTHER

COMPETING INTERESTS: None

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Silpa Gantela,
Assistant Professor,
Department of Physiology,
Katuri Medical College,
Chinakondrupadu,
Guntur-522019.
E-mail: shilpa.gantela@gmail.com

Date of Submission: 03/10/2015.
Date of Peer Review: 05/10/2015.
Date of Acceptance: 16/10/2015.
Date of Publishing: 24/10/2015.