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Study of Pulmonary Function Tests in Young Adults Engaged in Gymnasium

Amarjeet Singh Chhabra[1], Manjula Mehta[2], Ravindra Wadhwani[3]

Author's Affiliations:
[1,3]Associate Professor
[2]Assistant Professor, Department of Physiology, Mahatma Gandhi Memorial Medical College, Indore, Madhya Pradesh 452001, India.

Corresponding Author:
Ravindra Wadhwani
Associate Professor
Department of Physiology
Mahatma Gandhi Memorial Medical College, Indore, Madhya Pradesh 452001, India.
E-mail: amarjeet_singh_c@rediffmail.com

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Abstract

Background and Objectives: As the latest modern and well equipped gymnasiums are coming up, more and more youngsters are diverting towards gymnasium. As the studies on pulmonary functions of individuals doing exercise in Gymnasium are less available, the present study was carried out to assess the pulmonary function. of young adults of 18-30 years of age group. *Method:* This study was carreid out in the department of physiology, M.G.M. Medical College, Indore with recruitment of 60 subjects. The subjects were categorized into 2 groups - study group and control group each of 30. Subjects of study group (n=30) were performing physical activity in Gymnasium for minimum two years and of control group (n=30) were M.B.B.S students not doing any regular exercise. Various lung volumes were measured by spirometer andstatistically analyzed. *Results:* It was observed that pulmonary functions of study group were greater than the control group though the difference was statistically not significant. *Interpretation and Conclusion:* Present study showsimportance of exercise in Gymnasium on lung functions.

Keywords: Gymnasium; Exercise; Pulmonary Functions.

Introduction

Exercise if performed regularly has beneficial effects on lung functions [1,2,]. In present days, people are more aware of their health hence there is increasing trend of exercise in modern gymnasium.Previously various authors have observed that persons engaged in any kind of routine physical activity have higher lung volumes along with better wellness including improvement in joint flexibility, muscle strength etc.in comparison to sedentary persons [3]. However, the lung functions of persons engaged in exercise in modern Gymnasium have been studied less so far; hence this study was taken up.

Aims and Objectives

In present study we measured the lung volumes of persons doing physical activity in Gymnasium and compare these values with pulmonary functions of young healthy adults of same age group with sedentary life style.

Methodology

Site of study – M.G.M. Medical college, Indore and Nehru stadium Gymnasium

Type of study – Cross Sectional Study

Sample size - Sixty participants

Type of sample: Purposive

Equipments Used:

Electronic weighing machine for recording weight

Stadiometer for recording height

Sphygmomanometer for recording blood pressure

Modern Computerized Pulmonary Function Test Machine for measuring lung functions

Modern Computerized Pulmonary function test machine manufactured by Ganshorn Medizin Electronic (Gmbh) Germany was used to measure the lung functions. The software used for measuring

and interpretation has predicted values both for adults and children which are corrected to body surface area and body temperature and pressure saturated with water vapour (B.T.P.S.).

Inclusion Criteria

- Non smoker with no addiction (alcohol or tobacco)
- Engaged in exercise in Gymnasium for at least past 2 years

Exclusion Criteria

- Smokers with history of addiction
- History of any medical illness of long duration especially - respiratory illness
- History of any surgical procedure performed

This study was carried on 60 male volunteers classified into 2 groups.

Group 1: Consistsof 30 young adults (18-30 yrs) performing exercise regularly in the Gymnasium for the past 2 years.

Group 2: Consists of 30 healthy medical students, having sedentary lifestyle acted as age matched controls. After taking ethical committee clearance, an informed written consent was taken from all the participants.

All the participants were subjected to self made questionnaire to obtain information regarding relevant personal (according to Kuppuswamy's scale), past and family history with specific exercise history.

The participants of study group were engaged in the following exercises in the Gymnasium -

- Warm up exercises
- Sit ups
- Push ups
- Rock and roll movement of the abdomen
- Lying on the back, raising the legs straight and touch the floor on the back of the head
- A combination of short sprints, backward and side to side running.
- Body conditioning- Weight training, gradual, giving importance to particular muscle group. Weight training is not direct lifting of weights; it is indirect through the media of pulling etc.

Height and weight were recorded using standard protocol. Vital data - pulse and blood pressure were recorded and all the participants were examined clinically to rule out any physical illness.

Following Lung Function Parameters were Recorded

- Forced Vital capacity (FVC)
- Tidal Volume(TV)
- Inspiratory Vital Capacity (IVC)
- Inspiratory Reserve Volume (IRV)
- Expiratory Reserve Volume (ERV)
- Forced Expiratory Volume in first second (FEV_1)
- Peak Expiratory flow rate (PEF)
- Maximum Expiratory Flow Rate (MEF)

Observations

Data thus obtained were compiled, tabulated and statistically analyzed using unpaired student 't' Test.

Results

The anthropometric measurements of the two groups are shown in Table 1 the two groups did not differ significantly on these parameters except for the weight and Body surface area.

Table 2 shows the values obtained for various lung volumes and capacities

The FVC (3.71±0.30 L) and TV (0.86±0.37 L). IVC (3.69±0.42L), IRV (1.74±0.39L), and FEV1 (3.32±0.29 L/second) PEFR (7.60±1.67 L/second), MEF between 25-75% of vital capacity (MEF 25-75%, 4.54±0.87 L/second), MEF at 50% of vital capacity (MEF 50, 5.26±1.13 L/second), Maximum Expiratory Flow rate between 75-85% of vital capacity(MEF 75-85%, 7.10±1.84 L/second)in study group were higher than the control group (FVC, 3.61±0.27 L; TV, 0.69±0.16 L; IVC, 3.46±0.27 L; IRV, 1.6±0.33 L; and FEV1, 3.31±0.26 L/second), PEF, 7.10±1.59; MEF 25-75%, 4.30±0.87; MEF 50%, 5.16±1.17; MEF 75-85%, 6.37±1.71, although difference was not significant statistically ($p > 0.05$, Table 2).

The values of FEV1 as percentage of FVC (91.2 ± 5.53%), ERV(1.32±0.35L), and MEF at 25 % of vital capacity (MEF 25%, 2.46 L/second) were higher in control group than the study group. The values of FEV_1/FVC% 87.56±6.68% ; ERV, 1.22±0.30 L; and MEF 25%, 2.30±0.78), were lower in the study group; although the difference was not significant statistically (Table 2).

Table 1: Comparison of Anthropometric parameters in study and control group

Anthropometric parameter	Study group (n=30) Mean ±S.D	Control group (n=30) Mean ±S.D	p Value	Remark
Age (yrs)	21.5 ±3.39	21.4 ±3.20	0.907	Non-Significant
Height (cms)	172.47 ±5.78	169.9 ±6.09	0.1	Non –Significant
Weight (Kg)	66.96 ±6.28	59.73 ±8.73	.001	Significant
BSA in m^2	1.79 ±0.10305	1.68 ±0.13559	0.001	Significant

Table 2: Comparison of Lung volumes in study and control group

Lung volumes (Litres)	Study group (n=30) Mean ±S.D	Control group (n=30) Mean ±S.D	p Value	Remark
I V C	3.69±0.42	3.46±0.27	0.18	Non –Significant
IRV	1.74±0.39	1.6±0.33	0.61	Non –Significant
ERV	1.22±0.30	1.32±0.35	0.8	Non –Significant
Tidal volume	0.86±0.37	0.69±0.16	0.39	Non –Significant
F V C	3.71±0.30	3.61±0.27	0.84	Non –Significant
FEV_1	3.32±0.29	3.31±0.26	1	Non –Significant
FEV_1 /FVC %	87.56±6.68	91.2±5.53	0.11	Non –Significant
MEF25-75%	4.55±0.92	4.54±0.87	1	Non –Significant
MEF25%	2.34±0.42	2.46±0.60	0.89	Non –Significant
MEF50%	5.35±1.21	5.26±1.13	0.8	Non –Significant
MEF75-85%	7.13±2.18	7.10±1.84	1	Non –Significant
PEFR	7.73±2.00	7.60±1.67	0.41	Non –Significant

Discussion

Among the various parameters affecting lung volumes like age, sex, weight and race exercise is one of the important modifying parameter [4,5,6].

Exercising people have increase metabolic demand which in turn stimulate respiration thus increasing oxygen supply to the active tissues. Our study shows that regular physical activityhas a alleviatory effect on lung functions;

It is of interest that, Individuals engaged in Gymnasium had higher values of FVC, IVC, IRV, TV, FEV_1, MEF25-75%, MEF50%, MEF75-85% and PEFR than the control group; though the differences are statistically insignificant.

The possible explanation for their greater ventilator function is that with repeated continue exercise, Alveolar ventilation is increased. These increases lung volumes both at rest and during exercise. The activities performed in Gymnasium like push-ups and sit-ups required squatting and this leads to increase in intra-abdominal pressure which in turn pushes the diaphragm up. This increases the contractility of diaphragm which is an important muscle of respiration and thus increases expiratory volumes. While performing exercise for chest expansion which causes horizontal movement of rib cage and for shoulder which cause vertical movement of ribcage ultimately causes increase expansion of chest cavity thus increase the inspiratoty volumes. This Regular activity during exercise leads to the improve functioning of respiratory muscles [7,8,10].

When we compared FEV_1 as percentage of FVC we found that individual exercising in Gymnasium have less value than the control group. The reason for this is that the training of muscles of shoulder girdle leads to an increase in the vital capacity by reason of the increased strength of the accessory muscles of inspiration. The change is not accompanied by a corresponding increase in the forced expiratory volume, so the proportion of the forced vital capacity, which these subjects can expire in first second, tends to be relatively low [11].

The ERV and MEF was insignificantly ($p > 0.05$) higher in control group than study group. It indicate that these are not influenced by exercise in gymnasium [12-16]. Further longitudinal studies are required to confirm these findings.

Conclusions

Exercise in Gymnasium is a mixture of modern and traditional pattern which involved almost every group of muscles. Hence on the basis of above discussion, we can conclude that the exercise done in the gymnesium has beneficial effects on pulmonary functions in the young male adults.

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Declaration of Interest

The authors report no conflict of interest.

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