

Comparison of Lung Function Tests in Young Adults Involved in Gymnasium and Swimming

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Abstract

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Received on: July 12, 2018 ,

Accepted on: July 30, 2018

Background and Objectives: Now a day's people are involved in various activities for fitness. In literature, very few studies have been done to compare the various lung volumes of swimmers with those who are involved in gymnasium; hence the present study was taken up. *Method:* The present study was carried out in the department of physiology, M.G.M. Medical College and M.Y Hospital, Indore with recruitment of 60 subjects. The subjects were categorized into 2 groups – one having those involved in gymnasium and other having swimmers - each of 30. All the subjects were involved in their respective exercise for a period of minimum two years. Various lung volumes and capacities were measured by spirometer and statistically analyzed. *Results:* It was observed that lung volumes of swimmers were greater than those who were involved in gymnasium and the difference was statistically significant. *Interpretation and Conclusion:* from the present study it can be concluded that swimming is better than exercise in gymnasium as far as lung functions are concerned.

Keywords: Gymnasium; Swimmers; Exercise; Lung Volumes.

Introduction

It is a well known fact that regular physical activity has salutary effects on lung functions [1,2,3].

Exercise increases the strength of body, keep the mind relaxed, improve circulation and stimulate respiratory system. In today's era, everyone is confused which exercise should be taken up for fitness and better health. Those who workout in gymnasium are less studied as far as lung functions are concerned hence we chose them as our participants and compared their lung functions with swimmers.

Aims and Objectives

The objective of the present study was to inquire and compare the lung functions of young swimmers with those who work out in gymnasium.

Methodology

This cross sectional study was carried out in department of physiology M.G.M. Medical College and M.Y. Hospital, Indore. Subjects were taken from Tarun Pushkar swimming pool and gymnasium of Nehru Stadium Indore. Purposive sampling was done to have a sample size of 60 participants.

Following instruments were used

- Electronic weighing machine for recording weight
- Stadiometer for recording height
- Sphygmomanometer for recording blood pressure
- Computerized spirometer made by Ganshorn Medizin Electronic (GmbH) Germany which have inbuilt software with predicted values both for adults and children corrected to body surface

area; and body temperature and pressure saturated with water vapour (B.T.P.S.).

Inclusion Criteria

- Those who gave consent for participation
- Not addicted to smoking, alcohol or tobacco
- Regular in swimming and Gymnasium for at least last 2 years

Exclusion Criteria

- History of any addiction
- History of any medical illness of long duration specially of respiratory illness
- History of any surgical procedure performed

For this study we divide 60 male volunteers in 2 groups

Group A: Thirty young adults of age group 18-30 yrs who were regular in the Gymnasium for at least 2 years.

Group 2: Thirty young adults of age group 18-30 yrs who were regular swimmers

After taking ethical committee clearance, an informed written consent was taken from all the participants. All the participants were interviewed to obtain information about exercise schedule, relevant personal, past and family history along with socioeconomic status as per Kuppaswamy's scale

In the Gymnasium following exercises are regularly performed -

- Warm up exercises
- Squatting
- Bench Press
- Rock and roll movement of the abdomen
- Row
- Pull up
- HIT (high intensity training) Cardio

Measurement of weight and height were done as per norms. Vital data were recorded and all the participants were examined clinically to rule out any physical illness.

Spirometry was done in PFT lab of M.Y Hospital, Indore after giving instructions about the whole procedure to each participant

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 (FEV₁)
- Peak Expiratory flow rate (PEF)
- Maximum Expiratory Flow Rate (MEF)

Observations

Obtained data were compiled, tabulated and statistically analyzed using unpaired student-t Test.

Results

Results thus obtained shows higher values of IVC, IRV, ERV, FVC, FEV₁, MEF25%, and MEF50% in swimmers as compare to those who were involved in gymnasium which are statistically significant with p value of <0.05 in all. The values for MEF 25-75%, MEF75-85%, and PEFR were also higher in swimmers as compare to those involved in gymnasium but statistically non significant with p value >0.05. The tidal volume and FEV₁/FVC% is higher in those engaged in gymnasium than swimmers but statistically non significant with p value >0.05 Table 2.

Table 1: Comparison of Anthropometric parameters in individuals engage in gymnasium and swimmers

Anthropometric Parameters	Gymnasium group (n=30) Mean ±S.D	Swimmers (n=30) Mean ±S.D
Age (yrs)	21.5 ±3.39	21.29 ±3.33
Height (cms)	172.47 ±5.78	176.59 ±5.69
Weight (Kg)	66.96 ±6.28	65.63 ±8.62
BSA in m ²	1.79 ±0.10305	1.80 ±0.12

Table 2: Comparison of Lung volumes in individuals engaged in gymnasium and swimmers

Lung volumes (Litres)	Gymnasium group (n=30) Mean ±S.D	Swimmers (n=30) Mean ±S.D	p Value	Remark
Inspiratory Vital Capacity (IVC)	3.69±0.42	4.47±0.49	0	Significant
IRV	1.74±0.39	2.20±0.46	0	Significant
ERV	1.22±0.30	1.67±0.31	0	Significant
Tidal volume	0.82±0.39	0.77±0.27	0.99	Non -Significant
Forced Vital Capacity (FVC)	3.71±0.30	4.61±0.48	0	Significant
FEV ₁	3.32±0.29	4.16±0.41	0	Significant
FEV ₁ /FVC %	87.56±5.66	83.81±7.02	0.52	Non -Significant
MEF25-75%	4.55±0.92	5.14±0.86	0.06	Non -Significant
MEF25%	2.34±0.42	2.97±0.76	0	Significant
MEF50%	5.35±1.21	5.85±0.97	0	Significant
MEF75-85%	7.13±2.18	7.67±1.42	0.68	Non -Significant
PEFR	7.73±2.00	8.27±1.23	0.61	Non -Significant

Discussion

Physical activity definitely increases lung volumes and capacities; and delays the age related changes in the lungs [4,5]. Among the various activities swimming is considered as one of the best exercise for lungs [6,7,8]. Due to easy availability of well equipped gyms more and more people are diverted towards gym. Muscles of exercising persons having high metabolism demand more nutrients and oxygen with liberation of more carbon dioxide which needs to be washed out thereby increasing the respiratory drive which in turn improves lung functions. Our study support the fact that swimmers have higher lung volumes as compared to individuals who workout in gymnasium.

The reasons behind this may be [9]

- Swimming required immersion in water hence during immersion greater pressure is developing in respiratory muscles including diaphragm while no such immersion is required in gymnasium
- Swimming is done in lying down position that is horizontal while position of exercise done in gymnasium is vertical
- During swimming outside pressure is higher as density of water is greater than air which is the external medium in gymnasium.
- Water have higher heat conductance as compared to air

When we compared FEV₁ as percentage of FVC, we found that swimmers have less value than the individuals exercising in gymnasium. The reason for this is that in swimming as well as in gymnasium, the training of muscles of shoulder girdle leads to

an increase in the vital capacity by virtue of increased strength of the accessory muscles of inspiration. This is not accompanied by a corresponding increase in the forced expiratory volume in first second, hence the proportion of the forced vital capacity which these subjects can expire in first second tends to be relatively low in swimmers . These changes are less in gymnasium [10].

Conclusion

Although, every exercise is good for lungs; our study shows positive association between physical exercise and lung volumes which is more in case of swimmers than those who workout in gymnasium.

Acknowledgements

We are very thankful to our subjects for giving their precious time to participate in the study. The role of staff of the Department of Physiology M.G.M. Medical College, Indore, MP, India is duly acknowledged. No funding/grant of any kind was obtained for this work.

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