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RESEARCH ARTICLE

A comparative study of lung function of rowers and runners of Manipur

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ABSTRACT

Background: Prolonged training as in trained athletes results in the overall increase in muscular mass, metabolic power, and strength which also includes respiratory muscles. Enhancement of the respiratory muscle mass and strength can in turn result in increased respiratory efficiency which will be reflected in the increased lung function values. **Aims and Objectives:** The aim of this study was to assess the lung function of rowers and runners and to compare the lung function values of athletes in the two sports disciplines. **Materials and Methods:** This is an observational comparative study conducted on 41 trained athletes consisting of 17 rowers and 24 runners who were selected on the basis of consecutive random sampling method. The participants were asked to come to the department where anthropometric data and cardiovascular variables were recorded which was followed by the recording of lung function values using MEDSPIROR a computerized pneumotachometer. **Results:** Runners recorded higher lung function values than rowers. Forced vital capacity for runners was 3.36 ± 0.402, rowers was 2.22 ± 0.28, and *P* value was 0.0001. Forced expiratory volume$_1$ for runners was 3.18 ± 0.29 and for rowers was 2.005 ± 0.28 with a *P* value of 0.0001. Maximum voluntary ventilation for runners was 151.58 ± 21.24, and for rowers, it was 119.80 ± 22.93 with a *P* value of 0.0001. Peak expiratory flow rate value for runners was 9.67 ± 2.71, and for rowers, it was 5.69 ± 1.65 with a *P* value of 0.0001. **Conclusion:** The study shows a significant difference between the rowers and runners in their lung function. Runners have a higher lung function values than rowers. Running is therefore a better sports discipline for the enhancement of respiratory efficiency than rowing.

KEY WORDS: Forced Vital Capacity; Forced Expiratory Volume$_1$; Maximum Voluntary Ventilation; Peak Expiratory Flow Rate; Trained Athletes; Rowers; Runners

INTRODUCTION

Trained athletes are known to have an overall increased muscular mass and strength. The enhancement of mass, metabolic power,[1] and strength of body muscles as a result of prolonged and especially the respiratory muscles ensure the adequate supply of oxygen as well as the adequate removal of carbon dioxide. The performance level of the sportspersons depends a great deal on the efficiency of the respiratory system and the strength of all respiratory muscles. However, the physical exertion due to prolonged training is different for different sporting activities because of the different muscle involvement and demand for oxygen. Hence, it will be interesting to study the lung function of sportsperson of different disciplines and to find out if there is any difference in the lung parameter. Some studies have shown, though not very significant, the existence of difference in the lung function of athletes in five different sports disciplines.[2] However, study involving all sports discipline will be of a magnitude that is far beyond the scope of this study because the number of sports discipline

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existing today is so numerous, and also, it is difficult to find trained athletes in all of them. Studies of this nature are few and there is no study so far that compares the lung function of rowers and runners. This study had managed to find state and national level trained rowers and trained runners from the state of Manipur and therefore aimed in assessing the lung function of the rowers and the runners only and to compare the lung function values of athletes in these two disciplines.

MATERIALS AND METHODS

This is an observational and comparative study which was conducted on a total of 41 trained athletes consisting of 17 rowers and 24 runners in the age range between 15 and 30 years of age. The participating athletes were selected on the basis of a consecutive random sampling method. The exclusion criteria were athletes with any systemic and pulmonary illnesses.

After recording the anthropometric data and the cardiovascular variables, the lung function variables were recorded using the MEDSPIROR (recorders and Medicare system, Chandigarh), a computerized pneumotachometer which included forced vital capacity (FVC), forced expiratory volume (FEV_1), peak expiratory flow rate (PEFR), and maximum voluntary ventilation (MVV). The lung function values were recorded at room temperature in the morning between 10 am and 12 am in a sitting position.

The data were expressed as mean and standard deviation. Student unpaired *t*-test was used for comparing between rowers and runners. A $P < 0.05$ was taken to be statistically significant.

RESULTS

The anthropometric data as reflected in Table 1 shows that the mean age in rowers and runner is 21.75 ± 5.25 years and 19.37 ± 2.96 years, the mean weight is 55.354 ± 4.608 kg and 58.58 ± 5.45 kg, and the height is 160.186 ± 5.039 cm and 167.47 ± 5.02 cm, respectively.

The cardiovascular variables were also recorded and as reflected in Table 2, the resting heart rate was 68.042 ± 6.57 bpm in rowers and 63.00 ± 8.69 bpm in runners, the systolic blood pressure was 110.83 ± 3.14 mmHg in rowers, and 114.47 ± 7.05 mmHg in runners and the diastolic blood pressure was 74.16 ± 2.95 mmHg in rowers and 73.16 ± 6.72 mmHg in runners.

The lung function variables (Table 3) in rowers were FVC (l) at 2.26 ± 0.284 l, FEV_1 (l) 2.005 ±0.287 l, MVV (l/min) at 119.81 ± 22.93 l/min, and PEFR l/s at 5.69 ± 1.65 l/s. The lung function variables (Table 3) in runners were FVC at 3.36 ± 0.402 l, FEV_1, at 3.18 ± 0.29 l, MVV at 151.58 ± 21.24 l/min, and PEFR at 9.67 ± 2.71 l/s.

Table 1: Anthropometric data

Parameters	Mean±SD		*P* value
	Rowers	Runners	
Age (years)	21.745±5.25	19.37±2.96	0.0725
Height (cm)	160.18±5.03	167.47±5.02	0.0001
Weight (kg)	55.35±4.60	58.58±5.45	0.0536

SD: Standard deviation

Table 2: Cardiovascular data

Parameters	Mean±SD		*P* value
	Rowers	Runners	
Heart rate (bpm)	68.042±6.57	63.00±8.69	0.0507
SBP (mmHg)	110.83±3.13	114.47±7.05	0.0538
DBP (mmHg)	74.16±2.95	73.16±6.72	0.5640

SD: Standard deviation, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Lung function data

Parameters	Mean±SD		*P* value
	Rowers	Runners	
FVC (l)	2.26±0.28	3.36±0.402	0.0001
FEV_1 (l)	2.005±0.28	3.18±0.29	0.0001
MVV (l/min)	119.81±22.93	151.58±21.24	0.0001
PEFR (l/s)	5.69±1.65	9.67±2.71	0.0001

SD: Standard deviation, FVC: Forced vital capacity, FEV: Forced expiratory volume, PEFR: Peak expiratory flow rate

DISCUSSION

Referring to the results, the study shows that the participating sportspersons were closely of the same age, weight, and height. The cardiovascular variables were also not very different although the resting heart rate was much lower in the runners at 63.00 ± 8.69 bpm when in the rowers, it was at 68.04 ± 6.57 bpm. The lung function variables, however, showed extremely significant differences, the FVC in rowers was 2.26 ± 0.28 l, and in runners, it was 3.36 ± 0.402 l, the FEV_1 in rowers was 2.005 ± 0.28 l and runners 3.18 ± 0.29 l, the MVV in rowers was 119.81 ± 22.93 l/min, whereas in runners, it was 151.58 ± 21.24 l/min and the PEFR also shows there is a significant difference where rowers were recording 5.69 ± 1.65 l/s and runners 9.67 ±2.71 l/s. Studies of lung function in rowers are uncommon, but one study done in rowers of Kerala showed equivalent FVC as rowers in Manipur although a little lower values for FEV_1 and MVV.[3] A study on competitive runners conducted in Karnataka[4] showed a little lower lung function values than runners of this study but higher than the rowers who participated in our study. Another study done in Colorado

showed a much higher FVC in runners who were involved in a running program for 1 year.[5] Looking at these different studies conducted in these different places, we find that rowers recorded lower lung function values than runners and that lung function values in runners are consistently high. The results of our study on rowers and runners of Manipur who were athletes of state national level are found to be in concurrence with the findings of these other studies, which is a confirmation that runners indeed have a more efficient lung function than rowers. The reason that rowers showed lower values can be implicated on the nature of this sport itself. Rowing is a sport that is executed in a sitting posture or a hunched back position[3] which probably affects the use of the diaphragm which is a primary respiratory muscle. The restriction on diaphragm activity by posture can be the possible factor that reduces the efficiency of this muscle and therefore results in the lower function values. In runners, however, the diaphragm is put to maximum use resulting in an increased efficiency of this muscle and hence the higher function value.

The study could not give us information of lung function in sportsmen of various disciplines, but the involvement of numerous disciplines would be beyond the scope and scale of this study and difficult too to find trained athletes in good numbers in all the disciplines. However, this study has managed to find athletes of state and national level in rowing and running discipline in good numbers in a small state like Manipur. This study is also probably the only comparative study between rowers and runners which reveals a significant difference in the lung function of trained athletes in these disciplines and therefore opens options that can be explored to improve the performance of these trained athletes, especially the rowers.

CONCLUSION

The result of this study reveals that running is a better form of sports than rowing as far as enhancement of respiratory efficiency is concerned. It can be suggested that rowers can be trained to increase diaphragmatic efficiency, and hence, respiratory efficiency by including other form of sports such as running in their training curriculum to improve lung function and possibly improve performance as well.

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