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A comparative study on effect of acute exercise on pulmonary function test of first year M.B.B.S. Students

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Abstract
Exercise is the body's most common physiologic stress, and it places major demands on the cardiopulmonary system. Spirometry is considered the most practical test of assessing the respiratory function.so the present study was carried out to know the effect of acute excercises on pulmonary function test. A total of 100 1st M.B.B.S. students (M=50, F=50,) were included in the study and the changes in PFTs before and after acute exercise of 6 minutes (queen's step test) of those Students were recorded. Results were analyzed using paired and unpaired t-test. The study concluded that the spirometric variables increased after acute exercise and the values were higher in boys than in girls.

Keywords: Exercise, pulmonary function test

1. Introduction
Exercise is a subset of physical activity that is planned, structured and repetitive and has a final or an intermediate objective of improvement or maintainance of physical fitness [1]. Exercise is a stressful condition which produces a marked change in body functions and lungs are no exception [2]. Exercise testing is a noninvasive tool to evaluate the cardiopulmonary response to stress under carefully controlled conditions. There are several studies that have shown significant improvement in pulmonary functions as a result of the effect of exercise [3, 4] However, there are studies which show non -significant change in pulmonary functions as an effect of exercise [5, 6]. Most of the previous studies shows the beneficial effect of long term exercise on pulmonary function and there is very less information regarding acute effect of exercise, Hence the present study was undertaken to study the effect of acute exercise on pulmonary function test of first year M.B.B.S. students.

2. Materials and Methods
This study was conducted in the Department of Physiology, Assam medical college, Dibrugarh. A total of 50 male and 50 female, first year M.B.B.S. students of the Assam medical college, participated in the study. They were aged 17-24 years. Their ages, smoking habits, physical status and health conditions were recorded by using a questionnaire. The ethical committee clearance and an informed consent of the subjects were taken. Subjects with clinical abnormalities of the vertebral column and the thorax, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, chronic bronchitis, bronchiectasis, emphysema and malignancy, and those who smokes, chews tobacco and those who had undergone abdominal or chest surgery and those with BMI≥25were excluded from the study. Weight was recorded without shoes and with light cloths on a bathroom type of weighing machine and Height was measured using an Anthropometer consisting of graduation (0 – 200) in cm. Subject's anthropometric parameters are fed into the device which include Age, Sex, Weight and Height. The lung function tests were carried on all the subjects as per the standards mentioned by M.R Miller *et al*. [7, 8] by using a Medspiror (Recorders and Medicare System, Chandigarh). Lung function parameters like Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), FEV1 / FVC Ratio and Peak Expiratory Flow Rate (PEFR) were recorded. Pulmonary function were recorded in the same time of the day in sitting position at rest and immediately after step up and down exercise in Queens college steps (The subject steps up and down on the platform at a rate of 22 steps per minute for females and at 24 steps per minute for males) for 3 minutes and the results were compared.

Data analysis

The data was analyzed by using Microsoft Excel and Statistical Package of Social Sciences (SPSS version 20.0). The mean and standard deviation (SD) were calculated and reported for the quantitative variables. The statistical difference in the mean values was tested by paired and unpaired t-test. A p-value of < 0.05 was considered as statistically significant.

3. Result

The study population consisted of 50 male and 50 female, first year M.B.B.S. students of age group 17-24 years. The two groups did not differ significantly with respect to age and anthropometric parameters. The mean±SD of the various lung function parameters before and after exercise in boys is shown in table 1 and figure 1 and 2.The mean values FVC, $FEV_{1}$and PEFR in boys after exercise was higher than values recorded before exercise and the difference was statistically significant. The mean values of $FEV25_{\%-75\%}$ showed an increase after exercise, but it was statistically not significant. The value of FEV1/FVC showed a decline after exercise which was statistically not significant. The mean±SD of the various lung function parameters before and after exercise in girls is shown in table2 and figure and 4. There was statistically significant increase in values of FVC, FEV1 and PEFR after exercise in girls. The mean values of $FEV25_{\%-75\%}$ showed an increase after exercise, but it was statistically not significant. The values of FEV1/FVC in girls decreased after exercise and it was statistically not significant. The comparision of lung function parameters in boys and girls before and after exercise is shown in table 3 and table 4 respectively. The mean values of FVC, FEV_{1} and $FEV_{25\%-75\%}$was more in boys as compared to girls both pre and post exercise. The values of FEV1/FVC were higher in boys than in girls both pre and post exercise, but it was statistically not significant. PEFR values were more in boys as compared to girls and the difference was statistically significant before exercise but was insignificant statistically after exercise.

Table 1: Showing the pulmonary function test values in boys before and after excercise

Parameters	Before Exercise	After Exercise	P-Value	Significance
Fvc	3.033±0.379	3.9477±0.29	<0.05	S
Fev_{1}	3.0037±0.322	3.55±0.2699	<0.05	S
$Fev_{25\%-75\%}$	3.8633±0.2908	4.449±0.3295	>0.05	Ns
Fev1/Fvc	91.16±5.3	90.28±5.9	>0.05	Ns
Pefr	6.476±0.273	7.3573±0.35	<0.05	S

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

Table 2: Showing the pulmonary function test values in girls before and after exercise

Parameters	Before Excercise	After Excercise	P-Value	Significance
Fvc	2.5±0.298	3.0583±0.22	<0.05	S
Fev_{1}	2.3170±0.28	2.7217±0.2361	<0.05	S
$Fev_{25\%-75\%}$	3.264 ±0.22	3.3947±0.25	>0.05	Ns
Fev1/Fvc	92.8±5.78	89.08±5.98	<0.05	S
Pefr	5.924±0.228	6.1507±0.35	<0.05	S

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

Table 3: Showing the pulmonary function test values in boys and girls before exercise

Parameters	Boys	Girls	P-Value	Significance
Fvc	3.033±0.379	2.5+0.298	<0.05	S
Fev_{1}	3.0037±0.322	2.3170+0.28	<0.05	S
$Fev_{25\%-75\%}$	3.8633±0.2908	3.264 ±0.22	<0.05	S
Fev1/Fvc	91.16±5.3	92.8+5.78	>0.05	Ns
Pefr	6.476±0.273	5.924±0.228	>0.05	Ns

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

Table 4: showing the pulmonary function test values in boys and girls after exercise

Parameters	Boys	Girls	P-Value	Significance
Fvc	3.9477±0.29	3.0583±0.22	<0.05	S
Fev_{1}	3.55±0.2699	2.7217±0.2361	<0.05	S
$Fev_{25\%-75\%}$	4.449±0.3295	3.3947±0.25	<0.05	S
Fev1/Fvc	90.28±0.59	89.08±5.98	>0.05	Ns
Pefr	7.3573±0.35	6.1507±0.35	<0.05	S

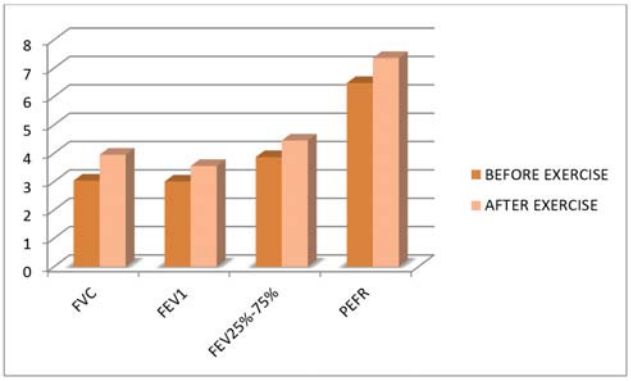

Fig 1: Showing the pulmonary function test values in boys before and after exercise

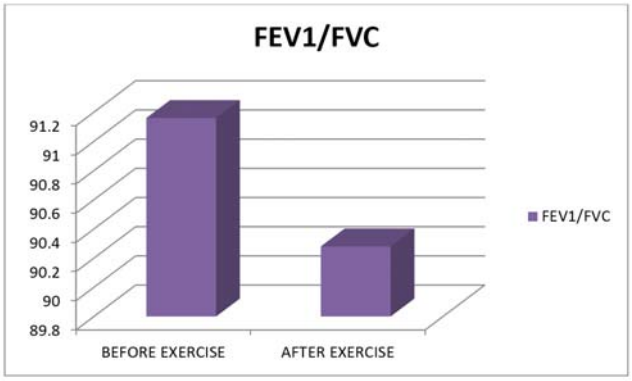

Fig 2: Showing the FEV1/FVC values in boys before and after exercise

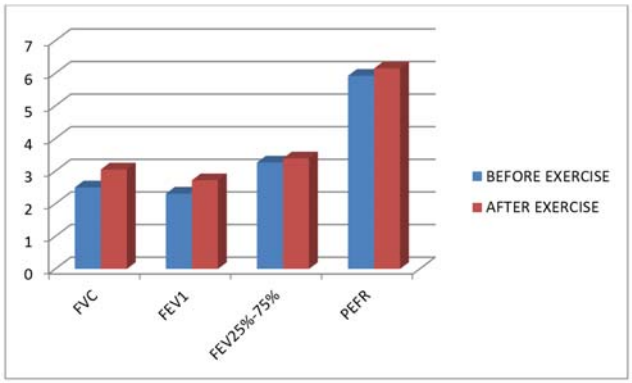

Fig 3: Showing the pulmonary function test values in girls before and after exercise

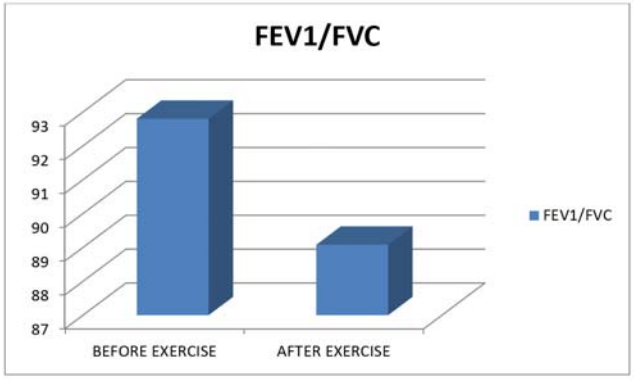

Fig 4: Showing the FEV1/FVC values in girls before and after exercise

4. Discussion

The results of the present study indicate that the values of FVC and FEV1 increased after acute exercise in both males and females. This finding is in consistent with the findings of wani P, dalvi V *et al.* [9], Zahra Hojati [18] and shashikala i *et al.* [13] However, a study by Zulkarnain H 11 shows a decrease in FVC and FEV1 after exercise which is not statistically significant. Actually, when a person begins to exercise, a large share of the total increase in ventilation begins immediately on initiation of the exercise, before any blood chemicals have had time to change. The presumed reason that the ventilation forges ahead of the buildup of blood carbon dioxide is that the brain provides an "anticipatory" stimulation of respiration at the onset of exercise, causing extra alveolar ventilation even before it is necessary [14]. Respiration is stimulated mainly by neurogenic mechanisms during exercise, Part of this stimulation results from direct stimulation of the respiratory center by the same nervous signals that are transmitted from the brain to the muscles to cause the exercise. An additional part is believed to result from sensory signals transmitted into the respiratory center from the contracting muscles and moving joints. All this extra nervous stimulation of respiration is normally sufficient to provide almost exactly the necessary increase in pulmonary ventilation required to keep the blood respiratory gases-the oxygen and the carbon dioxide-very near to normal [15].

Measurement of $FEV_{25\%-75\%}$ and PEFR after exercise was significantly higher than before exercise. Similiar results were also observed by Chaitra B *et al.* [10] and Shobha Rani Vedala *et al.* [16] $FEV_{25\%-75\%}$ is mainly dependent on airway calibre and PEFR is is mainly depended on airway caliber, alveolar elastic recoil and respiratory muscle effort. Exercise increases the strength and function of muscles, making them more efficient. The increase muscle strength helps the lung to inflate and deflate maximally. This maximum inflation and deflation is an important physiological stimulus for the release of surfactant and prostaglandin (PGE2) into the alveolar spaces thereby increasing the lung compliance and decreasing bronchial smooth muscle tone respectively, as stated by Hildebrean *et al.* [17] All the lung parameters were more in males than in females. Similar findings were also noted by Sheetal Diliprao Bhavsar *et al.* [19] and Enjeti S *et al.* [20] Value are more in males as they have larger chest size and more muscle power than females [21].

5. Conclusion

The present suggest that there is an improvement in pulmonary function following acute exercise. Different types of exercises affect body systems in variable manner. So, pursuing exercise regularly will improve pulmonary function and cause a decline in morbidity and mortality due to lung causes.

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