



A STUDY OF CARDIORESPIRATORY RESPONSES OF MEDICAL STUDENTS AND TRAINED ATHLETES TO HARVARD STEP TEST

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ABSTRACT **Introduction:** Cardiorespiratory responses to exercise stress tests are useful in assessing how physically fit and healthy a person is. Impaired cardiorespiratory function is associated with morbidity and mortality. The present study was undertaken among 100 adults (50 apparently healthy Medical students and 50 trained athletes) to study the cardiorespiratory parameters after physical exertion. **Materials and methods:** Harvard step test was performed in both the groups. **Results:** Pre and post exercise blood pressures and respiratory rate were recorded; it was found that increase in all these parameters post exercise were higher in the medical students than in the trained athletes. **Conclusion:** Physical activity is an important determinant of physical fitness. Medical students should be encouraged to take part in various physical activities. Also exercise testing is done increasingly now a days to assess cardiorespiratory endurance.

KEYWORDS : Harvard step test, Systolic blood pressure, Diastolic blood pressure, Respiratory rate.

INTRODUCTION

Cardiorespiratory fitness is the ability of the body's circulatory and respiratory systems to supply fuel and oxygen during sustained physical activity. Cardiovascular fitness reflects the ability of the lungs, blood, heart, muscles and other organs and organ systems to transport and utilize O₂ via the aerobic metabolic pathways thus determining a person's level of cardiorespiratory fitness. There are only a few studies about cardiorespiratory responses to exercise stress test in medical students and trained athletes in this part of our country. The study has been undertaken keeping this in mind. The aim of the study was to assess and compare the physical activity and cardiorespiratory condition between healthy young medical students and trained athletes.

MATERIALS AND METHODS

The present cross-sectional observational study was conducted on 100 healthy young adults (18 to 25 years of age), 50 of them MBBS Students of our college and 50 of them were trained athletes of a sports club of Milan Jyoti Sangha Dibrugarh. The detailed procedure was explained as well as demonstrated to the participants in advance. The study was conducted in the Department of Physiology of Assam Medical College Dibrugarh.

INCLUSION CRITERIA:

1. Healthy young male and female medical students and trained athletes of Milan Jyoti Sangha Dibrugarh.
2. **Age group:** 17 to 25 years

EXCLUSION CRITERIA:

1. History of any disorders like diabetes mellitus, hypertension, bronchial asthma, cardiovascular disorders.
2. History of alcohol intake, smoking habits and tobacco addicts.
3. History of any drug intake.
4. Undergone major surgery.
5. Locomotor and musculoskeletal abnormalities.
6. Presence of obesity, anaemia and chronic diseases.
7. Any endocrine disorders were excluded from the study.

PROCEDURE: Systolic blood pressure, Diastolic blood pressure, Respiratory rate and Tidal volume were recorded in both pre and post exercise phase of each subject. Subjects were made to perform Harvard step test with step height of 20 inches. The subjects were asked to be lightly clothed. They were asked to take rest for 5 min, thereafter they were asked to perform the stepping exercise on 20 inches high step without shoes. The step used was a heavy wooden step, so that it remained steady during the test. The subject stepped up and down the steps 30 complete steps /minute (1 step every 2 seconds). As the signal starts, the subject places one foot on the platform, steps up places other foot on the platform, straightens both legs and the back bone and then step down bringing down the same foot that he placed up first. The subjects were directed to lead off with the same foot each time and not the alternate foot. Subject performed this exercise as long as

he/she could, but not in excess of 5 min. After the cessation of exercise, the subjects were made to sit quietly on a chair. After exact 1 minute, the pulse rate was recorded for 30s with the help of stop watch.

PRECAUTION: If the subject was dyspnoeic, felt exhausted or felt pain in chest or legs during the exercise, he was asked to discontinue the exercise immediately. The subject performed the exercise for 5 min. unless he stopped earlier due to exhaustion. If the subject could not maintain the stepping rate of 30 times/min. for 20s, he was assumed to be exhausted and the step-test was discontinued.

RESULTS AND OBSERVATIONS

Systolic and diastolic blood pressure responses

Table 1: It can be seen that the mean value of Systolic Blood Pressure (SBP) and Diastolic Blood Pressure in trained and untrained group in the pre-exercise phase were 114.32 mm of Hg and 12.36 mm of Hg respectively. There was a very highly significant increase in the mean value of SBP and DBP in the untrained group compared to that of the trained group (P value < 0.001)

Group	No of cases	SBP(mm of Hg)	DBP(mm of Hg)
		Mean ± SD	Mean ± SD
Trained	50	114.32 ± 6.83	72.56 ± 3.75
Untrained	50	121.36 ± 6.67	76.80 ± 4.08
Significance		Very highly significant	Very highly significant
P value	<0.001	<0.001	

Table 2: Shows the SBP and DBP in mm of Hg in the post-exercise phase in both the groups. There was a very highly significant difference in the SBP and DBP in the post exercise phase when both groups were compared.

Group	No of cases	SBP(mm of Hg)	DBP(mm of Hg)
		Mean ± SD	Mean ± SD
Trained	50	121.44±2.62	72.64±4.14
Untrained	50	130.72±9.29	76.88±4.10
Significance		Very highly significant	Very highly significant
P value	<0.001	<0.001	

Respiratory rate response

Table 3: Showing the comparison of respiratory rate between trained and untrained group in pre-exercise phase. It was found to have no statistical significance.

Group	No of cases	Respiratory rate (per minute)
		Mean ± SD
Trained	50	13.84 ± 1.11
Untrained	50	13.44 ± 0.50
Significance		Not significant
P value		>0.05

Table 4: Showing the comparison of Respiratory rate between trained and untrained group in post-exercise phase. It was found to be statistically highly significant

Group	No of cases	Respiratory rate(per minute)
Trained	50	19.48±1.55
Untrained	50	22.50±0.51
Significance		Highly significant
P value		<0.01

DISCUSSION

The aim of the study was to compare the pre and post exercise cardiorespiratory parameters between medical students and trained athletes. The Systolic and Diastolic Blood Pressure in both pre and post exercise phase was found to be higher in medical students when compared to the trained athletes. Systolic blood pressure depends on the cardiac output which rises with exercise. Changes in post exercise Diastolic Blood Pressure in both groups was not significant. This is because Diastolic Blood Pressure depends on Peripheral Resistance.

The comparison of respiratory rate in the pre exercise phase in both groups was not significant statistically. Respiratory rate increases in the post-exercise phase in both the groups, the increase being higher in the untrained group.

CONCLUSION

Regular physical exercise helps to make better circulatory adjustments such that it can even reduce Blood Pressure in mild hypertensive persons due to decrease in sympathetic activity. Training affects the breathing pattern i.e., there is greater depth and slower rate and the work of breathing is reduced.

Thus, it can be concluded that regular physical exercise is essential for maintaining good health with good cardiorespiratory function.

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