

RESEARCH ARTICLE

Physical fitness score and academic performance in medical students

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ABSTRACT

Background: Physical fitness in physiological term is the ability of body to cope the acute exercise stress. As the well-known saying goes that healthy mind lies in a healthy body, a physically fit student will be able to cope academic stress in a better manner. Various studies have shown that both acute and chronic stress can affect physical fitness. **Aims and Objectives:** The aim is to study physical fitness in MBBS students before professional examination and to correlate the level of physical fitness with their academic performance. **Materials and Methods:** A total of 24 male volunteer, age range 18 to 23 yr, MBBS students were recruited for the study. Their weight, height, body mass index (BMI), basal heart rate, and physical fitness index using Harvard Step test with height adjusted for Indians were taken before university examination. University marks were noted from mark sheet. Physical fitness score (PFS), BMI, and university marks were correlated. **Results:** There was a significant correlation between BMI and PFS. Furthermore, we got a statistically significant correlation between PFS and university marks' result. **Conclusion:** Above study will reinforce the concept of healthy body and healthy mind in medical students and will encourage them to maintain their fitness in their busy medical career.


KEY WORDS: Physical Fitness; Academic Performance; Harvard Step Test

INTRODUCTION

To a physiologist, "physical fitness" implies the ability to make adequate physiological adjustments to the stress imposed by a specific task. Good cardiorespiratory function, as reflected by the ability to deliver oxygen to the tissues to maintain continuous activity, is an important physiological factor in this aspect. Furthermore, there are various fitness tests in which maximum oxygen intake may be predicted by recording only the heart rate during and immediately after the exercise, and these tests are quite reliable.^[1] Harvard Step test

with height modification is used for Indian population in one of the studies.^[2]

Stress, both acute and chronic, may have effect on physical fitness and vice versa. Physically fit person will be able to cope stress in a better manner. Psychoneurological influence of acute performance stress and correlation of cortisol level with physical fitness have been studied in few studies.^[3,4] Various studies have been done to study cardiorespiratory functions of medical students and prevalence of physical activity among medical students.^[5,6] Medical students are chosen for the study with the idea that there has been found a strong association between self-awareness for physical activity and attitude toward physical activity counseling provided to patients by the doctors.^[7,8] An essential aspect of the medical carrier is to achieve academic excellence, and it is important to find the association between physical fitness and academic performance. There are studies which show that regular physical activities can improve academic performance.^[9,10] Although a meta-analysis

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also reports some association between physical activity and academic performance, these studies were mostly done on school children.^[11] Studies showing correlation between physical fitness and academic performance of medical students in our region are few.

Therefore, this work aims to study physical fitness through Harvard Step test, in medical students before second professional MBBS examination, and to correlate the level of physical fitness with their second professional examination result.

MATERIALS AND METHODS

A total of 24 male volunteer, age range 18–23 years, MBBS students, who fulfilled the following inclusion criteria, were recruited for the study. A written informed consent was taken from all participants. Prior Ethical Approval was taken from Research Ethics Committee of the Institute.

Inclusion Criteria

The following criteria were included in the study:

- Male students.
- Age 18–23 years.

Exclusion Criteria

The following criteria were excluded from the study:

- History of alcohol and smoking.
- History of previous cardiac disease/surgery.
- History of injury/deformity in the lower limb.
- History of any medical or surgical disease.

Among the selected students, following parameters were recorded.

Parameters Recorded

1. Weight (kg) was recorded by a digital weighing machine with subject wearing light clothing and without shoes.
2. Height (meters) was recorded by a stadiometer with subject standing straight, without shoes, looking in horizontal plane and heel approximated.
3. Body mass index (BMI) (kg/m^2) was calculated using the following formula: $\text{BMI} = \text{Weight (kg)}/\text{Height (m)}^2$. The WHO criteria were used for BMI categories cutoff values.^[12]
4. Baseline heart rate (beats/min) was recorded in all subjects.
5. Physical fitness score (PFS) from Harvard Step test.
6. University marks were noted from the mark sheet.

Harvard Step Test

Before the professional examination, students were asked to take up the Harvard Step test.

On the day of the test, subjects were asked to wear light clothes. Subjects were instructed properly before starting the test. A 41 cm high heavy, wooden, step was used. Step count was 30 complete steps up and down per minute. The sequence of step was to be kept constant and the foot which was lifted first was brought down first. An electronic metronome was used to mark a beep for each second [Figure 1]. This exercise was performed for 5 min duration only or earlier, if subject became exhausted and could not maintain stepping rate for 15 s, or became dyspneic. Duration of exercise in seconds was noted using stopwatch. Recovery heart rate at the end of Harvard Step test was recorded in all subjects. Post-exercise pulse rate was taken between 1 min and 1.5 min, 2 min and 2.5 min, and 3 min and 3.5 min after exercise.

PFS was calculated using the following formula:^[13]

$$\text{PFS} = 100 \times \text{total exercise duration in seconds} / 2 \times \text{total pulse count}$$

If the PFI score is below 50, it is interpreted as poor, between 50 and 80 as average, and above 80 as good.

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences, version 16.0. Data were presented as mean \pm standard deviation (SD), and Pearson correlation was used to compare and correlate the data. $P < 0.05$ was considered as statistically significant.

RESULT

The study group comprised of 24 male students, age 20.04 ± 1 years (mean \pm SD). Various parameters recorded are presented in Table 1. Percentage of students in various categories of BMI has been presented in Figure 2. Percentage of students in various categories of PFS obtained after Harvard Step has been presented in Figure 3. There was a significant correlation between BMI and PFS ($P < 0.001$) [Figure 4]. Furthermore, we got a statistically significant correlation between PFS and university marks result ($P = 0.035$) [Figure 5].



Figure 1: Electronic metronome

Table 1: Various parameters recorded

Parameters	Mean±SD
Weight (Kg)	70.12±13.10
Height (m)	1.72±0.05
BMI (kg/m ²)	23.64±4.09
Baseline heart rate	85.17±7.95
Fitness score	60.63±19.35
University marks	367.79±71.73

SD: Standard deviation

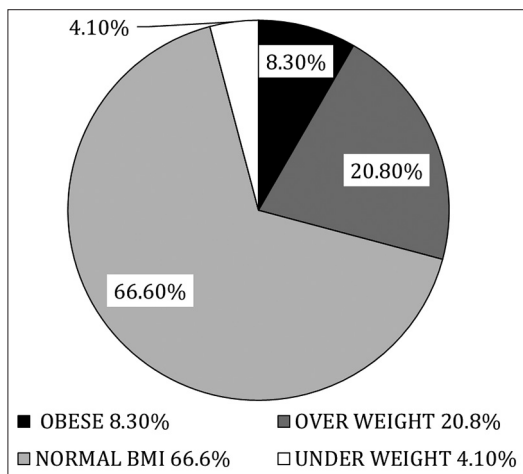


Figure 2: Percentage of students in various categories of body mass index

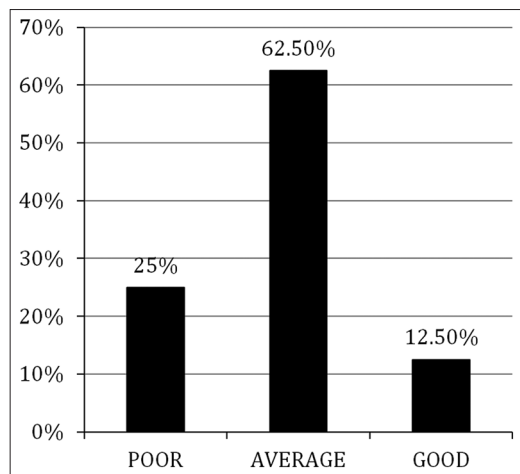


Figure 3: Percentage of students in various categories of physical fitness

DISCUSSION

This study was done to find the physical fitness status in medical students before their professional examinations and correlate their PFS with the examination results. The study group comprised of young adults with a mean age of 20.04 years. Two-third of the students in our study group had normal BMI. Of the remaining one-third of students, most students were overweight and obese, and only few were underweight. Majority of the

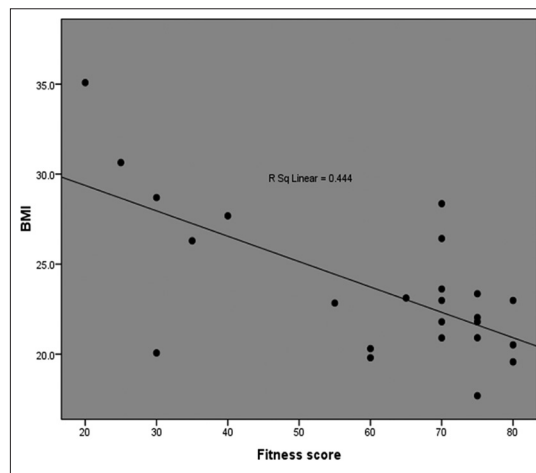


Figure 4: Scatterplot between fitness score and body mass index

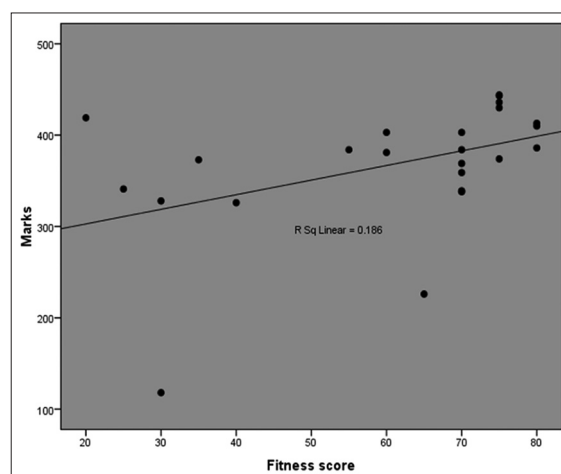


Figure 5: Scatterplot between fitness score and marks

students in our group had average PFS and only a few had good scores. Rest of the students had poor scores. Next, we found a significant correlation between fitness scores and BMI and fitness scores and marks.

Similar studies have been done on children and adolescents as well.^[14] Effect of physical activity on academic performance has been explained on the basis of an improvement in cognitive functions of brain and memory by physical activity.^[15,16] It has been proposed that physical activity tends to increase the oxygen saturation and promotes angiogenesis in region of the brain responsible for performing task.^[17,18] Physical activity improves the availability of various neurotransmitters which enhances data processing rate.^[19,20] Some neuroprotective nerve growth factors thrive with a rise in physical activity leading to an increase growth and survival of neuronal tissue in brain, as proposed by previous researchers.^[21]

This study has some limitations. We have not taken into account the female students. This would have further revealed the difference in physical activity and cognitive processing between males and females.

CONCLUSION

It seems that medical students should make regular physical activity an important part of their routine to keep their BMI within normal range and improve their cardiorespiratory reserve. This will also help in developing a prevention-oriented attitude in the budding doctors toward disease control. This study reinforces the concept of healthy body and healthy mind in medical students and will encourage them to maintain their fitness in their busy medical career.

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