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Original Research Article

Physical Fitness Index of Male Medical Students in Tertiary Health Care Hospital: A Cross-Sectional Study

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Abstract

Introduction: A healthy lifestyle includes physical activity as a key element. A significant risk factor for non-communicable diseases is insufficient physical activity. Considering that medical students are the future healthcare providers, it is important to assess their physical condition. Modified Harvard step test is a tool used for assessing Physical Fitness. The goal of the current study was to compare the physical fitness of inactive medical students with medical students who played regular football.

Materials and Methods: In a tertiary care hospital, this cross-sectional study was carried out between January 2022 and June 2022. The study enrolled 60 male first-year MBBS students between the ages of 18 and 22. out of 60 students 30 were athletes and 30 were non-athletes. Their height, weight, body mass index, basal heart rate, and physical fitness index using the Harvard Step test with Indian height adjustment were measured. Chi-square test and t-test were used for the statistical analysis, and a p-value < 0.05 was regarded as significant.

Result: Athletes had an average age of 20.84±1.43 years, whereas nonathletes had an average age of 20.86±1.74 years. Athletes had average BMI of 20.62±2.04kg/m^2, whereas non-athletes had an average BMI of 22.32±2.86 kg/m^2. Athletes had lower resting and post-exercise recovery pulse rates than non-athletes, which was statistically significant. The Physical Fitness Index (PFI) was found to be significantly higher in athletes than in non-athletes. Thus, it was found that athletes had greater physical fitness than non-athletes.

Conclusion: The study found that students who participated in regular physical activity had higher levels of fitness than inactive students.

Keywords: Modified Harvard step test, Physical fitness index, Body Mass Index, Physical activity.

Introduction

Physical fitness is regarded as a key health indicator, as well as an indicator of morbidity and mortality from a variety of non-communicable diseases.[1] "Physical fitness" connotes to a physiologist the capacity to adapt physiologically to the demands of a particular task's stress. A key physiological feature in this aspect is good cardiorespiratory function, as represented by the ability to supply oxygen to the tissues to maintain continuous activity.[2]

Medical students, as health care providers, will impact their patients' attitudes towards maintaining optimal physical fitness and

encouraging good health physical activity. Students should be healthy and physically strong in order to be more productive.[3] As a result, students must monitor and analyse their physical condition for their own advantage.

Therefore, the current study focuses on assessing physical fitness among young medical students in a tertiary care hospital using a heart rate that is assessed in terms of maximum aerobic capacity (VO2 max). The World Health Organisation considers VO2 max to be the single best indication of cardiorespiratory fitness.[4] Cardiorespiratory fitness refers to the overall capacity of the cardiovascular and respiratory systems, as well as the ability to perform rigorous exercise for extended periods of time. It is one of the most commonly mentioned quantitative components of physical fitness, along with muscular endurance, muscular strength, body composition, and flexibility. The maximal oxygen consumption reached during a graded maximal activity until voluntary exhaustion is defined as 3 VO2 max.[5,6]

The Harvard Step Test (HST) has been used to assess students' VO2 max since it is regarded a realistic field test for assessing individual aerobic fitness.[7] Johnson et al developed the Harvard Step Test (HST) to test an individual's physical fitness.[8] It consists of stepping up and down a 20-inch (50.8-cm) high step 30 times per minute.[9] The greater an individual's fitness, the lower the increase in heart rate and the faster the recovery. However, as the name implies, the HST's 20" step is designed for western anthropometrics and is rather high for Indians, whose height is significantly lower. As a result, the Harvard step would present a greater workout challenge to an Indian of ordinary height. As a result, the modified HST used in India has a reduced step height (16.5", or 41 cm).[10] Because of the test's simplicity and veracity, the application of the Harvard step test in an individual's physical performance capacity has piqued curiosity.[11]

The current study aims to compare the physical fitness index of medical students who are regular football players with inactive medical students.

Materials and Methods:

From January 2022 to June 2022, this cross-sectional study was carried out in the Physiology Department of the Surabhi Medical College in Siddipet, Telangana. The approval of the Institutional Ethical Committee was obtained, and written informed consent was obtained from all study participants.

Inclusion criteria:

The athletes were male medical students aged 18 to 22 years who played football for one hour in the morning and evening, five days a week, for a minimum of three months. The non-athletes were male age-matched medical students who did not engage in regular physical activity in the form of any exercise and/or who engaged in structured physical activity for less than 20 minutes per day.

Exclusion criteria:

students with a history of acute or chronic respiratory illness, cardiovascular disease, or any other medical condition, as well as those taking medications and those with a history of smoking or tobacco addiction. Students unwilling to provide informed consent to participate in the current study.

Methods for data collection:

The students were given a detailed explanation of the procedure. Anthropometric parametes were noted before to the test. Using a standard height measurement scale, the subject's height (measured in cms) was determined while they were standing without shoes. Weight (Wt in kg) was measured with the individual wearing the least amount of clothing by using the standard weighing machine. Body Mass Index (BMI) is

determined by Utilising a Quetelet's index.[12]

Modified Harvard Step Test: After familiarising the students with the Harvard Step Test, the resting pulse rate was measured after 5 minutes of rest. The Subject was instructed to take 150 steps on the modified Harvard steps of 33cm height once per two seconds (30 steps per minute). After the test, the participants were asked to sit on a chair and their pulse was taken. The pulse was measured one to one and a half minutes, two to two and a half minutes, and three to three and a half minutes following the test. This is known as a recovery pulse. Physical fitness was calculated by the formula:

PFI = 100 ×Total duration of exercise in seconds 2(PR1 + PR2 + PR3)

The equation's output is rated as follows.[13]

Rating	Fitness index
1.Excellent	>96
2.Good	83-96
3.Average	68-82
4.Low Average	54-67
5.Poor	<54

Statistical Analysis:

SPSS 22 was used to analyse the data. The Chi-square test & t-test were used for the statistical analysis, and a p-value of <0.05 was considered significant.

Results

The mean age of athletes was 20.84±1.43 years and non-athletes was 20.86±1.74 years and was statistically insignificant. Athletes had a BMI of 20.62 kg/m^2 while non athletes had a BMI of 22.32 kg/m^2, which was statistically insignificant. [Table1].

Table 1: Anthropometric variables among athletes and non-athletes

Variables	Athletes	Non-athletes	P value
Age (years)	20.84±1.43	20.86±1.74	0.321
BMI (kg/m^2)	20.62±2.04	22.32±2.86	0.001*

Athletes had lower resting and recovery pulse rates than nonathletes, which was found to be statistically significant. [Table-2].

Table 2: Comparison of pulse rate between athletes and non-athletes

Pulse Rate	Athletes	Non-Athletes	P Value
P (Bpm)	71.25±7.34	79.32±7.54	0.003*
P1 (Bpm)	111.86±12.64	121.36±14.24	0.024*
P2 (Bpm)	93.53±10.53	109.36±11.23	0.002*
P3 (Bpm)	84.23±10.430	101.56±13.82	0.003*

Athletes had a higher physical fitness index than non-athletes, which was found to be statistically significant. [Table -3].

Table 3: Comparison of PFI (%) between athletes and non-athletes

	Athletes	Non-athletes	P value
PFI (%)	93.46 ±13.86	52.68 ± 13.9	0.001*

Discussion

An essential factor in determining physical fitness index is heart rate recovery. [14] the purpose of the present study was to compare the physical fitness of medical students who played football and those who were sedentary.

In this study, athletes' post-exercise pulse rates increased at a lower pace than non-athletes'. This could be because of the regular training sessions they participate in as part of their sporting activity. A study conducted by Mikhahil CM et al. revealed that post exercise recovery of the heart rate was faster in athletes than non-athletes [18]. Similar findings were provided in the current investigation.

Reduced sympathetic activity or elevated vagal tone in athletes may contribute to resting bradycardia [16]. Once the subjects started the physical exercise, which in this study was the modified Harvard step test, their heart rates started to rise. For the first 10 seconds of exercise, tachycardia occurs at all intensities of exercise [17]. This is brought on by a sharp decline in sinus node vagal tone [17].

Athletes in this study saw a smaller post-exercise pulse rate increase than non-athletes. This can be due to the regular practise they perform as part of their involvement in sports. Sportspeople recover their heart rates from exercise more fast than non-sportspeople, according to studies by Mikhahil CM et al. [18]. Similar findings were also seen in the current investigation.

While the sympathetic neural system regulates biological processes while exercising, the parasympathetic nervous system takes over once the workout is over [19]. Parasympathetic reactivation and sympathetic withdrawal [19] work together to bring about heart rate recovery after exercise. The sympathetic nervous system increases heart rate during exercise by stimulating cardiac beta-1 receptors with epinephrine [20], whereas the parasympathetic nervous system decreases heart rate during rest through muscarinic activation by acetylcholine via reactivation of the vagal nerve [20]

This study found that athletes have higher PFI than non-athletes. A comparable study by Katralli J et al. [21] found that judo players had a higher PFI than sedentary adults.

Conclusion

Students who regularly played basketball had a higher physical fitness index than inactive students. Regular exercise causes a variety of cardiovascular adaptations that can greatly improve a person's level of fitness.

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