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Study of physical fitness index using Harvard step test in relation body mass index with pulmonary function in adult

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Abstract
Title: Modified Harvard step test (HST) is fairly accurate and reliable method for calculating Physical Fitness Index (PFI).Body mass index affect cardiorespiratory endurance and pulmonary function. In Present study assess body mass index affect cardiac and pulmonary fitness.
Method: In study, Forty-nine healthy adults aged 25-35 years performed Harvard step test for calculating physical fitness index. For Pulmonary function performed pulmonary function test.
Results: Person's correlation test was used to Correlated body mass index to physical fitness index and pulmonary function test.
Conclusion: Body mass index was negative correlated to physical fitness index and pulmonary function test.

Keywords: BMI, PFT, PFI, harvard's test

Introduction

Physical Fitness Index (PFI) is one of the important criteria to assess the cardiopulmonary efficiency of a subject [1]. The American Alliance for Health, Physical, Education Recreation and Dance (AAHPERD) recommended this test to study health related physical fitness programme in youth [2]. Physical fitness is defined as ability to carry out daily tasks with vigour and alertness without undue fatigue with ample energy to enjoy leisure time pursuits, to meet unusual situations and unforeseen emergencies [3].

The Harvard's step test is a type of cardiac stress test for detecting and diagnosing cardiovascular disease. It is also a good measurement of fitness and a person's ability to recover after a strenuous exercise by checking the recovery rate. It is a sub maximal cardiovascular endurance test. The test computes the capability to exercise continuously for extended intervals of time without tiring. The standard 50.8 cm step of Harvard step test is tailored to western anthropometrics and is rather high for the average Indian whose height is relatively less. Therefore, the height of step is lower 33 cm in modified Harvard step test [4-7]. In this study use modified Harvard step test.

Pulmonary function test (PFT) are an important tool in the investigation and monitoring of patients with respiratory pathology. They provide important information relating to the large and small airways, the pulmonary parenchyma and the size and integrity of the pulmonary capillary bed. Test evaluates lung capacity, endurance and lung function [8].

Body mass index (BMI) are affect cardiac as well as respiratory health. Height, weight, muscle mass also affect physical fitness. The body mass index (BMI), or Quetelet index, is a measure of relative size based on the mass and height of an individual. The index was devised by Adolphe Quetelet during the course of developing what he called "social physics", between 1830 and 1850. A frequent use of the BMI is to assess how much an individual's body weight departs from what is normal or desirable for a person of his or her height. The weight excess or deficiency may, in part, be accounted for by body fat (adipose tissue) although other factors such as muscularity also affect BMI significantly. The WHO regards a BMI of less than 18.5 as underweight and may indicate malnutrition, an eating disorder, or other health problems, while a BMI greater than 25 is considered overweight and above 30 is considered obese [9].

Purpose of the present study is to evaluate how body mass index correlate with physical fitness and pulmonary function.

Methodolgy

Forty-nine adults participated in study. Both gender were 25-35 age included in study. Any co morbidities were excluded in study. They performed modified Harvard's test. The height of step was 33 cm in modified Harvard step test. Resting and recovery period heart rate noted by pulse oximetery [10]. Gave command to "as much as can performed step up and down. When feel exertion, stop test." After stop test, The test subjects were then made to step up and down on a 33 cm stepping platform at a rate of 30 steps/min for 5 min or until exhaustion. Exhaustion is defined when the subject is not able to maintain the stepping rate for 15 s.

Subjects were informed to place the foot completely onto the platform while stepping, to straighten the knee and to keep the body erect while standing on the platform. The subject was instructed to immediately sit on a chair after completing the test. Pulse count for the first 15 s was noted and multiplied by 4 to get the recovery pulse count. Furthermore, pulse was counted between 1 and 1.5 min, 2 and 2.5 min, and 3 and 3.5 min after completing the test. count heart rate in recovery period. And calculated Physical Fitness Index (PFI) Score = (100 x test duration in seconds) / (2 x sum of heart beats in the recovery periods) [9].

Next day, performed pulmonary function Test were conducted under standard laboratory conditions (temperature: 22–25 °C, relative humidity: 55–60%). The participants were given sufficient explanation about the method and instrument use, and the tests were performed in a sitting position while wearing a nose clip.

The forced vital capacity (FVC) and the forced expiratory volume in one second (FEV1) were measured using a Quark PFT. All of the pulmonary tests were conducted following the standards presented by the American Thoracic Society/European Respiratory Society. [11]

Results

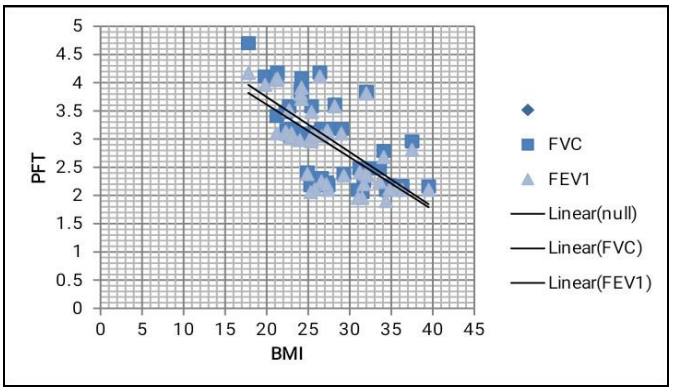
The data were analyzed using the Statistical Package for the Social Sciences (SPSS version 16.00) and the results are presented as the Mean ± standard deviation (SD). The significance of correlation between BMI and PFI were examined using the person's test. The relationships between body mass index and pulmonary function, and physical fitness index and body mass index were analyzed using simple linear regression analysis. Significance was accepted for values of $p< 0.05$ in all tests. Find out relationship between physical fitness index and pulmonary function.

Table 1: BMI, PFT, PFI variable Mean±SD

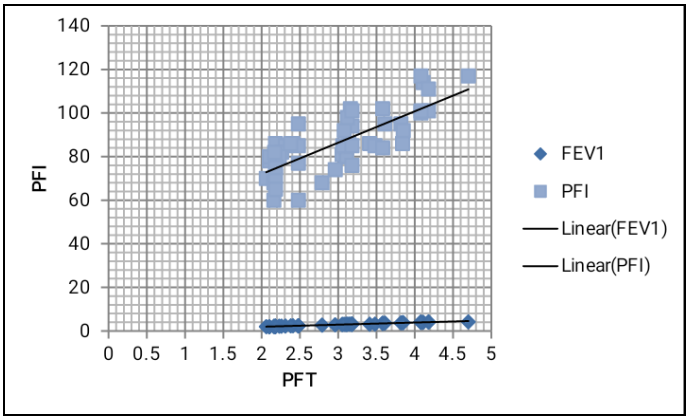
Variables	Mean±SD
BMI	27.51±5.02
PFI	86.61±13.58
FVC	3.01±0.72
FEV1	2.91±0.70

Table 2: Body mass index negatively significantly correlated to Pulmonary function test.

Person 's correlation (r)		p-value (HS)
FVC	FEV1	0.001
-0.676	-0.664	0.001



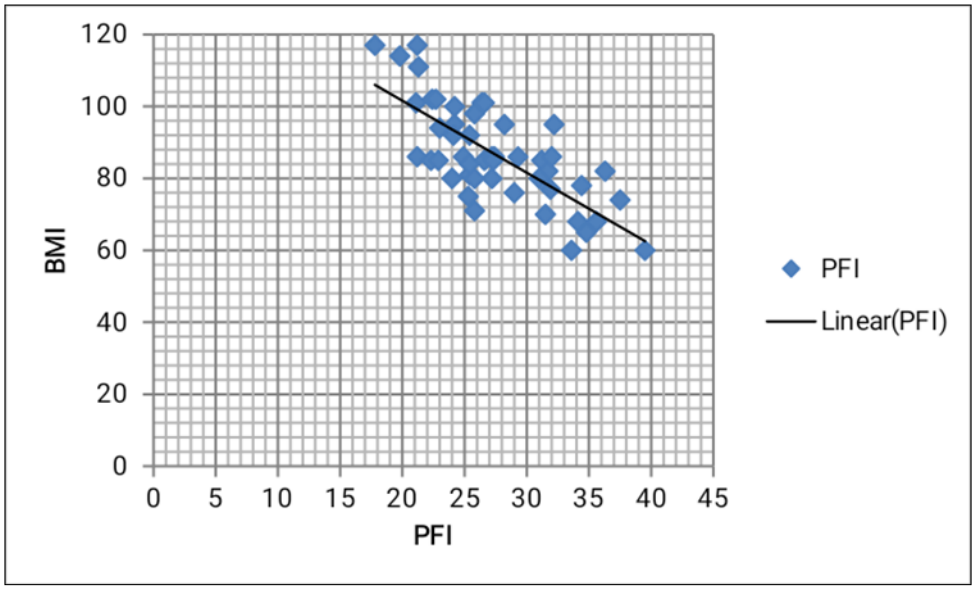
Graph 1: Body mass index negatively significantly correlated to Pulmonary function test.



Graph 2: Physical fitness Index positively non-linearly significantly correlated to Pulmonary function test.

Table 3: Physical fitness index positively non- linearly significantly correlated to Pulmonary function test.

Person 's correlation (r)		*p-value (HS)*
FVC	FEV1	0.001
-0.765	-0.763	0.001



Graph 3: Body mass Index negatively significantly correlated to Physical fitness index.

Table 4: Body mass index negatively significantly correlated to Physical fitness index.

Person 's correlation (r)	**p-value (HS)**
-0.739	0.001

Discusion

Body mass index was directly negatively correlated to physical fitness index and pulmonary function test.
Physical fitness index and pulmonary function test was positively non- linearly progression.
In this study observed that the higher the body mass index, the lower the fitness level. Conversely, when physical activity is higher, physical fitness is better. Inadequate physical activity is not only associated with an increased fat mass percentage but also causes a decrease in relative muscle mass. This is a strong correlation which signifies that an increase body mass index responsible for a decrease in physical fitness. [12]
Also observed that pulmonary function also affected in body mass index adults. Pulmonary function was reported as being correlated with age, height, weight, area of body surface, percent body fat, smoking status, and residential environment also have effects on spirometry. Height is a factor positively influencing lung function at all ages. [11]
According to this study, body mass index is directly affected to physical fitness and pulmonary function. Do exercise everyday in part of lifestyle. Maintain body mass index in normal value that is 18-23kg/m^2.

Conclusion

This study concluded that body mass index affect physical fitness index and pulmonary function. Both variables are directly significantly negatively correlated with body mass index. Healthy lifestyle and normal BMI value is mandatory for physical fitness and pulmonary function.

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