

## Co- Relation between Physical Fitness Index (PFI) and Body Mass Index in Asymptomatic College Girls

Akre, Ambarish & Bhimani, Neha

**Article Authorship & Affiliation Details**

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**Akre, Ambarish, Associate Professor, Deccan Education society's Brijlal Jindal College of Physiotherapy, Fergusson College Campus, Pune, Maharashtra State, India - 411 004, TeleFax: (91)(020) 30866106 ; Web: [www.despune.org](http://www.despune.org), E-mail: [physioambarishakre1412@gmail.com](mailto:physioambarishakre1412@gmail.com)**

**Bhimani, Neha Final year B.P.Th. Student, Deccan Education society's Brijlal Jindal College of Physiotherapy, Pune, Maharashtra State, India.**

**Correspondence Address: Dr. Akre, Ambarish, Associate Professor, Deccan Education society's Brijlal Jindal College of Physiotherapy, Fergusson College Campus, Pune, Maharashtra State, India - 411 004, TeleFax: (91)(020) 30866106 ; Web: [www.despune.org](http://www.despune.org), E-mail: [physioambarishakre1412@gmail.com](mailto:physioambarishakre1412@gmail.com)**

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**Abstract**

Genetic variations, body built and physical activity determine the overall fitness levels of an individual. Physical inactivity and hence obesity are major risk factors for ill health. Objectives: 1. To assess the physical fitness index in asymptomatic girls. 2. To assess the body mass index in asymptomatic girls. 3. To correlate the physical fitness index and body mass index in asymptomatic girls. Materials and methods: This was a cross sectional study done amongst asymptomatic girls at Deccan Education society's Brijlal Jindal college of physiotherapy, Pune, India between August 2014 to March 2015. Total 34 female students were selected by convenient sampling. The Body mass index was calculated after measuring each subjects body weight and height. The physical fitness index was calculated by using the Harvard step test and measuring the heart rate thrice during the step test. Results & Conclusion: Spearman's correlation test was used to correlate the fitness index and body mass index. The study showed that there was a negative correction between the physical fitness index and body mass index.

### Introduction

Obesity is a medical condition in which excess body fat has accumulated to the

extent that it may have an adverse effect on health, leading to reduced life expectancy and increased health problems. The increased prevalence of obesity among adolescents may be due to modern sedentary life style, faulty food habits and lack of physical activity. Evidences suggest that sedentary and negative lifestyle habits lead to gradual deterioration of physical well-being and disability as well as incidences of cardiovascular diseases and cerebrovascular accidents<sup>1</sup>.

Determination of Physical Fitness Index (PFI) is one of the important criteria to assess the cardiopulmonary efficiency of a subject<sup>2</sup>. The American Alliance for Health, Physical, Education Recreation and Dance (AAHPERD) recommended this test to study health related physical fitness programme in youth<sup>3</sup>. 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<sup>4</sup>.

Physical Fitness Index (PFI) was measured by Harvard's step test. The Harvard Step Test is a type of cardiac stress test for detecting and/or diagnosing cardiovascular disease. It also is a good measurement of fitness and a person's ability to recover after a strenuous exercise. The more quickly the heart rate returns to resting, the better shape the person is in<sup>5</sup>.

Physical Fitness Index (PFI) Score =  $(100 \times \text{test duration in seconds}) / (2 \times \text{sum of heart beats in the recovery periods})$ .

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<sup>5</sup>.

#### AIMS AND OBJECTIVES

The aim of the study was to assess and compare the cardiovascular response to exercise in girls by correlating Physical Fitness Index (PFI) score obtained by Harvard's Step Test and the body mass index (BMI).

#### METHODS

This cross sectional study was done amongst 34 girls at the Deccan Education Society's Brijlal Jindal College of physiotherapy, Pune, India between the age group of 18-23 years. The subjects were divided into 3 groups based on BMI (Group I : BMI < 25, Group II : BMI ≥ 25 to < 30, Group III : BMI ≥ 30) and the

correlation between BMI and physical PFI fitness was assessed.

Inclusion criteria: Only apparently healthy girls in the age group of 18-23 years, who volunteered to participate in the study, were included.

Exclusion criteria: Individuals suffering from any medical and surgical conditions such as diabetics, hypertension and other cardiac, renal, respiratory disease and chronic disease, neuromusculoskeletal disorders were excluded from the study.

Materials: 17 inches stepper, Metronome software, Chair, Stopwatch, Height chart , Weighing scale, Laptop &Speakers.

The following anthropometric and physiological measurements were measured: Height in meters, body weight in kilograms, and heart rate was taken during the Harvard step test. Statistical analyses included descriptive statistics (mean, standard deviation) and analyzed by Spearman's correlation test. The study protocol was approved by ethical committee at Deccan Education Society's Brijlal Jindal College of physiotherapy, Pune, India. Written consent from the

subjects was taken before they were considered for inclusion in the study.

This test requires a 18 inch stepping platform was used for stepping. Demonstration of the correct stepping procedure was given to each subject. The subjects were asked to stand close to the stepping platform and place the foot completely onto the platform while stepping, straightening the knee and keeping the body erect while standing on the platform. The subjects were asked to step up and down on the platform at a rate of 20 steps per minute for 5 minute or until exhaustion. (Exhaustion is defined as when the client cannot maintain the stepping rate for 15 continuous second). The rate of 20 steps per minute was maintained by metronome software .After completion of the test, the subjects were allowed to sit comfortably on a chair. The post exercise pulse rate was counted immediately after completion of exercise. Pulse rate was also counted between 1 to 1.5 minutes, 2 to 2.5 minutes, and 3 to 3.5 minutes. The Physical Fitness Index score was determined by the following equation<sup>5</sup>.  
Physical Fitness Index = (100 x test duration in seconds) divided by (2 x sum of heart beats in the recovery periods).

### RESULTS

Group	N	Height (m)	Weight(mean in kg)	BMI	PFI	R VALUE*	P
Total	34	1.77	59.1	23.93	78.03	-0.5237	0.0036
Underweight	9	1.59	45.1	17.37	83.18	-0.1452	0.0752
Normal	9	1.54	50.62	21.2	92.09	-0.1358	0.07520
Overweight	8	1.56	67.87	26.77	69.38	-0.03636	0.09635
Obese	8	1.56	76	31.7	64.7	-0.03976	0.09635

\* Correlation

Table 1: Represents the mean values of Physical fitness index of the subjects in the various BMI groups and various BMI parameters along with correlation between BMI and Physical fitness index (PFI).

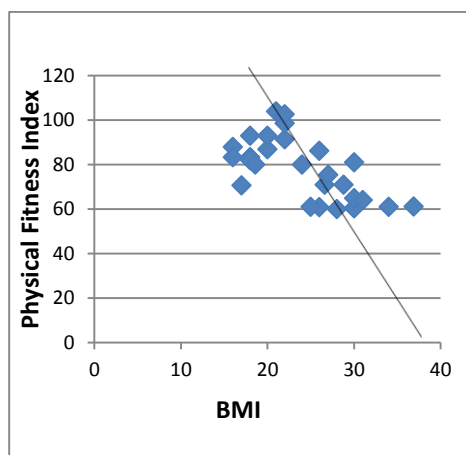


Fig 1: Relationship between the mean values of BMI and Physical fitness index (PFI)

## DISCUSSION

The results from table no.1 showed that the physical fitness index of the subjects differed significantly from one another in the various BMI categories, with the subjects of normal weight possessing a higher fitness than the underweight, overweight or obese subjects. Fitness capacity therefore decreased progressively as the BMI increased. These results correlate with other studies that researched the same variables (Graf C, et al. 2004, Chen LJ, et al. 2006, Tokmakidis SP, et al. 2006)<sup>7,8</sup>. The overweight and obesity are associated with lowered muscle strength (Wearing et al and Tokmakidis et al). There was a negative significant correlation between health-related anthropometric measures and physical

fitness factors as per Leila Jaafari et al (2012).

Sameer Shrivastav et al (2013) conducted a similar study on 22 young subjects in the age group of 18 -25 years which concluded that there was a negative significant correlation between BMI and aerobic fitness ( $r = -0.55$ ).

Physical Fitness Index depends on recovery of the heart rate after exercise and therefore is seen to be less in the overweight group as the overweight group has a higher resting heart rate due to altered sympathetic activity and also the return to resting is prevented by the altered function of the sympathetic nervous system.

## CONCLUSION

There is a negative correlation between Physical Fitness Index and Body Mass Index. These findings

Confirmed previous observations on general population about the negative effect of overweight on physical fitness. This indicated a deteriorated cardiovascular efficiency in the overweight subjects as compared to normal. This study shows that young overweight adults have a poorer cardiovascular response to exercise as compared to normal individuals. The results of this study emphasizes the need for early identification of the risk factors leading to excessive weight gain and initiation of preventive measures in order to prevent the deterioration of

cardiovascular performance in susceptible young adults.

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Conflict of Interest None Declared