

Research Article

# Study on Physical Fitness Index BMI and VO<sub>2</sub> Max of Physical Education Students

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## Abstract

Physical activity is human body movement of any type, while physical education programs use physical activity to teach children how to improve and sustain an active lifestyle. One of the most crucial factors to think about when evaluating a subject's cardiorespiratory efficiency is their Physical Fitness Index (PFI). The risks involved in implementing BMI for adults also affect kids and teenagers. The term "maximal oxygen consumption capacity" (VO<sub>2</sub>max) refers to the body's capacity to consume oxygen in the skeletal muscle mitochondria at a maximum rate during vigorous full-body exercise. To investigate correlation body mass index, physical fitness index and maximal oxygen capacity (VO<sub>2</sub>max) among physical education students. The investigator was selected 36 BPED students (Male: 20 & Female: 16) from University of Kalyani, Kalyani, Nadia. The age range of subject from 19 to 25 years. To conduct this study measured body mass index through Quetelet index, physical fitness index through Harvard step test and maximal oxygen capacity (VO<sub>2</sub>max) through Queens College Step test were considered. Conclusion of this present study were no significant relationship between physical fitness index and body mass index of male, female students and students as a whole. Significantly relationship between VO<sub>2</sub> max and body mass index for female students but in case of male and student as a whole found no relationship. Positive relationship between physical fitness index and VO<sub>2</sub> max for male students and student as a whole but in case of female found no relationship.

## Keywords

Body Mass Index, Physical Fitness Index, Maximal Oxygen Capacity, Physical Education

## 1. Introduction

Physical education curriculum at the primary level to higher education level includes a variety of team and individual sports, as well as leisure activities. Some examples of individual activities include track and field, walking, running, cycling, swimming, gymnastics and wrestling etc. and then game activities includes basketball, cricket, football, netball, hockey, volleyball, badminton, tennis etc. All activities offer additional opportunities for students to improve the different areas of physical fitness including strength, flexibility, aerobic

endurance, balance, coordination and reaction time etc. Physical education students also learned anatomy physiology, nutrition, healthy habits, and individuality of needs.

Physical activity is human body movement of any type, while physical education programs use physical activity to teach children how to improve and sustain an active lifestyle. Both are important for obesity prevention and a student's healthy development. Physical education plays a critical role in promoting physical health, mental well-being, and aca-

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ademic success for students. It's important for schools and communities to work together to ensure that all students have access to quality physical education programs that are inclusive and accessible to all. By prioritizing physical education, we can help promote a healthy lifestyle and a brighter future for our students. Physical students are physically active, their results average values, as a result of engaging physical activity and teaching activity, but also in recreational activities outside the university [2].

One of the most crucial factors to think about when evaluating a subject's cardiorespiratory efficiency is their Physical Fitness Index (PFI). The Harvard step test is used to calculate the Physical Fitness Index (PFI). The ability to recover from a difficult workout and one's level of fitness can both be determined by observing this process. Step tests are frequently used to evaluate cardiovascular and respiratory fitness. Increasing BMI lowers cardiovascular fitness by decreasing VO<sub>2</sub> max. Changes in lifestyle should be made to maintain a healthy BMI and increase cardiovascular fitness [8]. Students with a high BMI might be inspired to adopt a healthier lifestyle due to the inverse relationship between BMI and cardiopulmonary function [12].

The risks involved in implementing BMI for adults also affect kids and teenagers. Being overweight was not found to be related to an increased risk of death for older populations; on the other hand, people at the lower end of the recommended adult BMI range showed an elevated risk. Obese people have poor cardiac function during progressive work rate exercise [15]. Higher BMI has been linked with lower physical fitness [11].

The term "maximal oxygen consumption capacity" (VO<sub>2</sub>max) refers to the body's capacity to consume oxygen in the skeletal muscle mitochondria at a maximum rate during vigorous full-body exercise. Queen's College step test provides accurate estimates of maximum oxygen uptake in the examined population [1]. The gold standard for assessing cardiopulmonary function is VO<sub>2</sub>max. In fact, VO<sub>2</sub>max has been linked to both performance and health in groups of people with varying levels of training. BMI shows an obvious negative connection with VO<sub>2</sub>max and estimated cardiorespiratory fitness [14]. Female triathlon competitors had lower VO<sub>2</sub>max values compared to males in a high-altitude city [7].

#### Purpose of the Study

Objective of the present study -

- 1) To find out correlation between body mass index and physical fitness index in male, female and as a whole physical education students.
- 2) To investigate correlation between body mass index and VO<sub>2</sub> max in male, female and as a whole physical education students.
- 3) To investigate correlation between physical fitness index and maximal oxygen capacity (VO<sub>2</sub>max) among physical education students.

## 2. Method and Materials

Study site: University of Kalyani, Kalyani, Nadia

Sample: 36 BPED students (Male: 20 & Female: 16).

Inclusion Criteria: University level physical education students their age range from 19 to 25 years. Subjects were involved regular activity.

**Table 1.** Measuring Protocol.

Parameter	Measuring tools
Height	Measuring tape
Weight	Realme Smart Weighing Scale
BMI	Quetlet's index
Physical Fitness Index	Harvard step test
VO <sub>2</sub> Max	Queens College Step test

#### Statistical Treatment

The data was calculated as mean, standard deviation (SD) and coefficient Correlation. Data analyses were followed by the Microsoft Excel 2013 Software (Windows: 11 version). 0.05 level was considered statistically significant. Correlation coefficient was used to calculate PFI and BMI of physical education students. On the other correlation was calculated between VO<sub>2</sub>max and BMI of physical education students.

## 3. Results

**Table 2.** Represented Physical Characteristics, BMI, Physical Fitness Index and VO<sub>2</sub>Max of physical education students.

Variables	Male (Mean±SD)	Female (Mean±SD)	As a Whole (Mean±SD)
Age (Years)	23.3±1.03	22.88±0.81	23.11±0.95
Height (cm)	171.93±6.88	154.56±6.20	164.21±10.90
Weight (kg)	62.77±9.11	53.57±5.72	58.68±8.98
BMI (kg/M <sup>2</sup> )	21.33±2.48	22.38±2.01	21.79±2.31
PFI (Score)	85.65±10.58	80.69±10.65	83.45±10.75
VO <sub>2</sub> Max (ml/kg/min)	57.21±8.36	38.98±3.59	49.11±11.31

The present study was found that among 36 physical education students of which 20 students were of male gender and 16 students were of female above table 2. The mean and SD of age were 23.3 ± 1.03 in male students, 22.88 ± 0.81 in female students and 23.11 ± 0.95 in students as a whole. The mean and

SD of height were  $171.93 \pm 6.88$  in male students,  $154.56 \pm 6.20$  in female students and  $164.21 \pm 10.90$  as a whole. The mean and SD of weight were  $62.77 \pm 9.11$  in male students,  $53.57 \pm 5.72$  in female students and  $58.68 \pm 8.98$  as a whole. The mean and SD of BMI in male students were  $21.33 \pm 2.48$   $\text{kg/m}^2$ , in female students were  $22.38 \pm 2.01$   $\text{kg/m}^2$  and  $21.79 \pm 2.31$   $\text{kg/m}^2$  in both gender. The mean and SD of physical fitness index (PFI) were  $85.65 \pm 10.58$  in male students,  $80.5 \pm 10.64$  in female students and  $83.45 \pm 10.75$  as a whole. The mean value and SD of VO<sub>2</sub> max in male students were  $57.21 \pm 8.36$  ml/kg/min, in female students were  $38.98 \pm 3.59$  ml/kg/min and  $49.11 \pm 11.31$  ml/kg/min as a whole. VO<sub>2</sub> max values in male students were more as compared to values in female students. The results are shown difference between VO<sub>2</sub> max values of male and female students was statistically significant students as a whole.

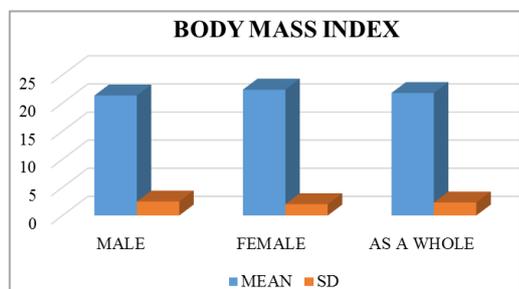


Figure 1. Graphical presentation of Body Mass Index.

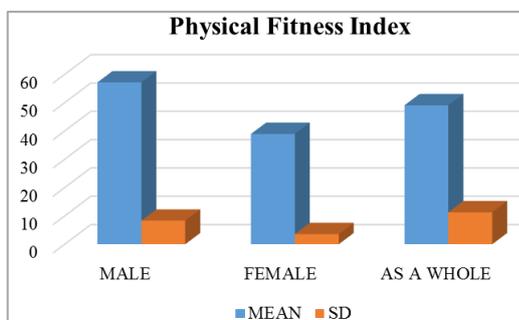


Figure 2. Graphical presentation of Physical Fitness Index.

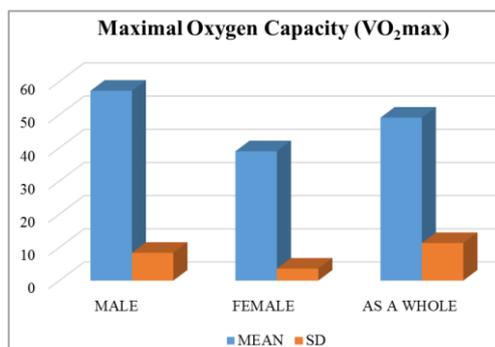


Figure 3. Graphical presentation of Maximal Oxygen Capacity (VO<sub>2</sub>max).

Table 3. Represented Co-efficient of Correlation between physical Fitness Index and BMI of male physical education students.

Variables	'r' Value
PFI and BMI	0.216
VO <sub>2</sub> Max and BMI	0.224
PFI and VO <sub>2</sub> Max	0.456*

Table Value -.444, \*significant  $\leq 0.05$

The result was shown above table 3 significant negative correlation between PFI and BMI ( $r = 0.216$ ) of physical education male students. The results was shown significant negative correlation between VO<sub>2</sub> Max and BMI ( $r = 0.224$ ) of physical education male students. Further shown significant positive correlation between PFI and VO<sub>2</sub> Max ( $r = 0.456^*$ ) of physical education male students. Pearson's correlation factor for the founded between PFI & BMI was negative correlation and other correlation between VO<sub>2</sub> Max & BMI was negative correlation in male gender. Then correlation between PFI and VO<sub>2</sub> Max was positive correlation in male gender, which was statistically significant 0.05 level.

Table 4. Represented Co-efficient of Correlation between VO<sub>2</sub> Max and BMI of female physical education students.

Variables	'r' Value
PFI and BMI	-0.297
VO <sub>2</sub> Max and BMI	-0.615*
PFI and VO <sub>2</sub> Max	0.081

Table Value -.468, \*significant  $\leq 0.05$

The result was shown above table 4 significant negative correlation between PFI and BMI ( $r = -0.292$ ) of physical education female students. The result was shown significant negative correlation between VO<sub>2</sub> Max and BMI ( $-0.615^*$ ) of physical education female students. Further shown significant negative correlation between PFI and VO<sub>2</sub> Max ( $r = 0.081$ ) of physical education female students. Pearson's correlation factor for the founded between PFI & BMI was negative correlation but other correlation between VO<sub>2</sub> Max & BMI was positive in female genders. Then correlation between PFI and VO<sub>2</sub> Max was negative correlation in female gender, which was statistically significant 0.05 level.

**Table 5.** Represented Co-efficient of Correlation between VO<sub>2</sub> Max and BMI of students as a whole of physical education students.

Variables	'r' Value
PFI and BMI	-0.039
VO <sub>2</sub> Max and BMI	-0.162
PFI and VO <sub>2</sub> Max	0.380*

Table Value -.329, \*significant  $\leq 0.05$

The result was shown above table 5 significant negative correlation between PFI and BMI ( $r = -0.039$ ) of physical education students as a whole. The result was shown significant negative correlation between VO<sub>2</sub> Max and BMI ( $-0.162$ ) of physical education female students both gender. Further shown significant positive correlation between PFI and VO<sub>2</sub> Max ( $r = 0.380^*$ ) of physical education students as a whole. Pearson's correlation factor for the founded between PFI & BMI was negative correlation but other correlation between VO<sub>2</sub> Max & BMI was positive in female genders. Then correlation between PFI and VO<sub>2</sub> Max was positive correlation in male gender, which was statistically significant 0.05 level.

## 4. Discussion

In the present study, physical fitness index and body mass index found no significant relationship of male, female students and both of them. In the previous study- Farooque & Hussain found negative correlation between physical fitness parameters and BMI of young healthy sedentary adults [5]. Mirza at al, illustrated a negative moderate relationship between body mass index and physical fitness among the students of this tribal district teaching hospital [10]. So the present researcher agree with the previous study.

In this study the researcher observed relationship between VO<sub>2</sub> max and body mass index for female students but in case of male and student as a whole found no relationship. In the previous study - Ghosh & Jahan, was found a negative relationship between BMI and VO<sub>2</sub>max [6]. Dhara & Chatterjee, found a very low positive co-relation between VO<sub>2</sub> max and Body Mass Index (BMI) of Physical Education students [3]. Singh at al observed negative relationship between BMI and VO<sub>2</sub>Max indicate necessity of regular aerobic activities to improve health status among University students [9]. University students must engage in daily aerobic activities to improve their health due to high rates of obesity, poor cardio respiratory fitness, and a negative link between BMI and VO<sub>2</sub>max [13]. In the present study is also agreed with previous study in case of male and female students.

Further, in this study showed that positive relationship between physical fitness index and VO<sub>2</sub> max for male students and student as a whole but in case of female found no relationship. In the previous research –Dana at al, results

showed that insignificant between physical fitness index and VO<sub>2</sub> max of male and female students [2]. Females have less wealthy physical fitness compared to males, but have a better aerobic capacity [4]. So the present study is no agree with previous study. Because previous study was so long sample size, but present study is small sample size.

## 5. Conclusion

In this study concluded that-

- 1) No significant relationship between physical fitness index and body mass index of male, female students and students as a whole.
- 2) Significantly relationship between VO<sub>2</sub> max and body mass index for female students but in case of male and student as a whole found no relationship.
- 3) Positive relationship between physical fitness index and VO<sub>2</sub> max for male students and student as a whole but in case of female found no relationship.

## Abbreviations

BMI	Body Mass Index
PFI	Physical Fitness Index
VO <sub>2</sub> max	Maximal Oxygen Capacity

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## Author Contributions

Ujjal Bag is the sole author. The author read and approved the final manuscript.

## Conflicts of Interest

The author declares no conflicts of interest.

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