



# A Study of VO<sub>2</sub> max in Relation with Body Mass Index (BMI) of Physical Education Students

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## Abstract

The main purpose of the study is to find out the relationship between VO<sub>2</sub> max (ml/kg/min) and Body mass index (BMI) of Physical Education students. Thirty (N=30) male physical education (B.P.Ed) student from P.G.G.I.P.E- Banipur, North 24 Pargana, West Bengal, India were selected as the subjects for the study. The age group of the subjects was ranged from 21-25 years. To measure the VO<sub>2</sub>max (ml/kg/min) of the physical education students, 'Cooper 12 Minute Run/Walk test' (1968) was used, recorded the total distance in kilometers they had traveled in 12 minutes and put it in the Formulas: VO<sub>2</sub>max = (22.351 x kilometers) - 11.288. And to measure the BMI of the students, the height and weight were respectively taken from the subjects and put it in the Formula for Body Mass Index: Body Mass Index = Weight (kg) / Height (m)<sup>2</sup>. The collected data were calculated by using descriptive statistic and Coefficient of Correlation "r" and level of significance was set at 0.05 levels. There were a very low positive co-relation was exist on VO<sub>2</sub> max with Body Mass Index (BMI) of Physical Education students. The result was also shows that the mean, standard deviation of VO<sub>2</sub> max (ml/kg/min) and Body Mass Index (BMI) has been found 48.96±6.62 and 21.04±1.48. It was also observed from the same result that the calculated "r"<sub>0.05</sub> values of VO<sub>2</sub> max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students respectively were lower than the tabulated "r"<sub>0.05</sub> value (0.361) at 0.05 level of significance, so it can be said that no significant exist on VO<sub>2</sub> max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students.

**Keywords:** VO<sub>2</sub> max (ml/kg/min), Body Mass Index (BMI), of physical education students.

## Introduction

To determining fatness the most common method is calculating body mass index (BMI). Scientific researchers showed that risk of premature illness and death is most common for those who are overweight but also increased in person who are underweight. Maximum oxygen consumption determined by VO<sub>2</sub> max, it is maximal amount of oxygen that human body can utilize per minute of activity or physical workout. VO<sub>2</sub> max shows cardio respiratory endurance of an individual as aerobic fitness parameter. Higher oxygen consumption of an individual shows her/him more efficient cardio respiratory system. VO<sub>2</sub> max is basically affected by genetics factors, physical training, gender, age, and body composition<sup>1</sup>.

Since all types of prolonged physical actives depend upon cardio respiratory endurance of the performers, therefore, a large number of cardio vascular fitness tests have been based on varying duration of run-walk tests. Majority of these tests have been based on the pulse rate response after a fixed distance running or more frequently on measuring the time taken to run-walk a fixed distance or by measuring distance covered in a given time. While the tests based upon pulse rate response or calculation of VO<sub>2</sub> max from the run-walk tests<sup>2</sup>.

Body mass index (BMI) is a measure of body fat based on height and weight that applies to adult men and women. BMI is

a measure that most people can use to see if they are a healthy weight for their height. Formula of BMI is: BMI = Weight (kg) / Height (m)<sup>2</sup>. However, some very muscular people can have high Body Mass Indexes and in adolescents, BMIs frequently result in overestimation of fatness<sup>3</sup>.

The researcher thought that, the persons generally have a positive relation between VO<sub>2</sub> max and BMI. That was the question and interest to find out the true and that was why the researcher took up this study. It was understood that the results of the research work would be useful for future research in the field of physical education and sports.

## Methodology

In order to find out the relationship between the VO<sub>2</sub> max (ml/kg/min) and Body Mass Index (BMI) of physical education students, thirty (N=30) male physical education (B.P.Ed) students, were from P.G.G.I.P.E- Banipur, North 24 Pargana, West Bengal, India, selected as the subjects for this study. The age group of the subjects was ranged from (21-25) years. To measure the VO<sub>2</sub> max (ml/kg/min) of the physical education students, 'Cooper 12 Minute Run/Walk test' was used, recorded the total distance in kilometers they had traveled in 12 minutes and put it in the formulas: VO<sub>2</sub> max = (22.351 x kilometers) - 11.288. And to measure the BMI of the students, the height and weight were respectively taken from the subjects for present

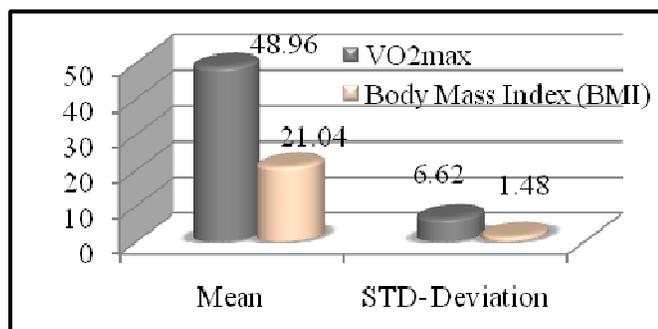
study and put it in the Formula for Body Mass Index:  $\text{Body Mass Index} = \text{Weight}(\text{kg}) / \text{Height}(\text{m})^2$ . All collecting data were calculated by using descriptive statistic (Mean and Standard deviation) and Coefficient of Correlation “r” and level of significance was set at 0.05 levels, after that the conclusion drawn in the basis of the findings.

**Analysis of Data:** To find out the relationship of VO<sub>2</sub> max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students, Descriptive Statistic and ‘Coefficient of Correlation’ was applied at 0.05 level of Significant and it is presented in the table.

**Table-1**  
**Mean, Standard deviation and ‘Coefficient of Correlation’ of VO<sub>2</sub>max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students**

Variables	Mean	STD-Deviation	Coefficient of Correlation ‘r’
VO <sub>2</sub> max (ml/kg/min)	48.96	6.62	0.0157 NS
Body Mass Index (BMI)	21.04	1.48	

Table value- ‘r’<sub>0.05</sub> (28) = 0.361, NS=Not- Significant



**Figure-1**  
**Mean, Standard deviation and ‘Coefficient of Correlation’ of VO<sub>2</sub>max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students**

**Findings:** From the above table it was observed that the calculated “r” 0.05 values (0.0157) at 0.05 level of significance was not better than the tabulated “r” 0.05 value (0.361) at 0.05 level of significance, it means no significant relationship was exists in between VO<sub>2</sub> max (ml/kg/min) and Body Mass Index (BMI) of Physical Education students. But if consider the correlation value then the researcher can say that a little positive co-relational direction was exist in between the VO<sub>2</sub> max (ml/kg/min) and Body Mass Index (BMI), but it was not so much that significant relationship on be seen.

## Results and Discussion

Within the limitation of the present study the following Conclusions were drawn on the basis of obtaining results. In this

study there were very low positive co-relation was exist on VO<sub>2</sub> max (ml/kg/min) with Body Mass Index (BMI) of Physical Education students, but the value was not so correlated that a significance difference can be posses.

The scholar is greatly satisfied to mention that the findings have accomplished the purpose for which the study was initially conceptualized. The study done by ‘Sports Medicine Program Faculty of Medicine Universities Indonesia’, In the year of 2012 it was held in Gelora Bung Karno (GBK) Jakarta, Fitness Challenge is a serial fitness tests held annually including BMI and cardio respiratory endurance examination. Where the most of population of Jakarta spent their weekend relaxing and/or exercising. In this study the scholar would like to describe the results of body composition examination and cardio respiratory endurance test from that event and analyze the relationship between them<sup>4</sup>.

The study done by Laxmi C.C, Udaya I.B and Vinutha Shankar S, in titled “Effect of BMI on Cardio respiratory Fitness in Young Healthy Males”, showed that, there was a significant negative correlation between body mass index (BMI) and VO<sub>2</sub> max (ml/kg/min) (r = -0.48, p<0.01). The results of the study suggest that the striking effect of human body fat on cardio respiratory functions. Large amount of body fat exerts an unfavorable burden on cardiac respiratory function and oxygen uptake by active working muscles. Low cardio respiratory fitness in young adults with increased body fat could be a factor for developing cardio vascular co morbidities later in middle age<sup>5</sup>.

In the study “Body Mass Index and VO<sub>2</sub> max Relationship of FKUI Fitness Challenge 2012 Participants in Gelora Bung Karno Jakarta” shows that Participants are 23 women and 36 men age 15-48 years old with mean age 32.86 ± 12.85 years old. Mean VO<sub>2</sub> max is 27.94 ± 6.91 and mean BMI is 23.36 ± 3.41. There is a significant negative correlation between VO<sub>2</sub>max and BMI which is -0.408 (p=0.01)<sup>6</sup>.

But on the other hand in the present study the researcher found that a little positive co-relational (0.0157) direction was exist in between the VO<sub>2</sub> max and Body Mass Index (BMI), but it was not so much that significant relationship on be seen, because for the calculated “r” 0.05 values (0.0157) at 0.05 level of significance was not better than the tabulated “r” 0.05 value (0.361) at 0.05 level of significance. On the bases of related reviews and result of the present study which the researcher had discussed above the certain conclusion drawn by the researcher.

## Conclusion

In this study, there was a no significant positive correlation between BMI and VO<sub>2</sub> max (ml/kg/min) of Physical Education students, which suggests possible effect body mass index on cardio respiratory functions. It also demonstrates that the low BMI in physical education students may decries the cardio

respiratory fitness slightly because of slightly positive relation, but from the other researches created on general population we can see a negative relation between BMI and VO<sub>2</sub> max (ml/kg/min) which could be a factor for developing cardiovascular co morbidities later in middle age<sup>7</sup>, but in the case of physical education students due to their different physiological function the 'Negative Relation' transfer in 'Slightly Positive Relation'.

In the field of games and sports we can see that the slightly higher body mass of an individual is helpful for storing more energy in the form of muscles glycogen/glucose and body fat for more effective activity, applying more biomechanical force and power, and it also increase the stability. Because of these reason slightly higher BMI in physical education students increase VO<sub>2</sub> max (ml/kg/min) slightly.

**Recommendations:** On the basis of the findings of the present study, the following recommendations are made: i. Similar study may be conducted with female subjects or different age and level of participation with large populations. ii. Further study can be taken up by using other measuring methods on above mentioning certain physical and physiological variables. iii. Similar study may be conducted on psychological, anatomical and sociological parameters. iv. Similar study may be conducted on larger subjects with same or other variables. v. The present study will helpful for farther research in the field of physical education and sports physiology.

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