

Cardio-Respiratory Fitness and Body Mass Index in Young Male Adults of Hilly and Backward Area

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Abstract: *Being obese is major hazard for variety of chronic ailments such as type-2 diabetes, cardiovascular diseases (CVD) and certain cancers. The study aimed at determining the relationship between BMI and cardiovascular fitness levels of school going students of hilly and backward area. For the purpose of study total 30 male students of Govt. higher secondary school, Rabta, Jammu and Kashmir were selected, the age group ranged between 17 to 21 years. All the subjects were physically active. The BMI (body mass index) and YMCA 3-Minute Step Test was used to collect data for this study. Pearson's correlation analyses were used to test the hypotheses at 0.05 alpha level of significance.*

Keywords: cardiovascular, Body Mass Index, type-2 diabetes

1. Introduction

BMI stands for Body Mass Index. This formula and index was formulated by Belgian Quetelet. This fitness testing is used to measure body composition on the basis of weight and height. BMI helps a person to know whether he is underweight, normal weight or over weight. Whereas, cardiovascular endurance involves contraction of large muscle groups for prolong periods of time during which maximum acclimatization of circulatory and respiratory systems are necessary as in brisk walking, swimming, running, hiking, aerobics, bicycling etc (Clarke and Clarke, 1987 Fox et al.,1993). Rajan Balakrishnan, Sabitha Eunice Regima, Komathi a/p Thanabalan, 2016[3] the subject with underweight BMI shows increased VO₂ max when compare to the normal and overweight individuals. The result reveals the possible effect of body fat on cardio respiratory functions. Susan E. Brien, Cora L. Craig, Peter T. Katzmarzyk, Lise Gauvin, 2007 [4] Cardio-respiratory fitness and BMI were important predictors of weight gain and obesity. Higher levels of cardio-respiratory fitness were associated with a lower hazard of future obesity in women. LaxmiCC,Udaya IB, Vinutha Shankar S, 2014 [5]. There was a significant negative relationship between BMI and VO₂max (ml/kg/min) which reveals possible effect body fat on cardio-respiratory functions. It also demonstrates the importance of low cardio-respiratory fitness in young adults with increased body fat which could be a factor for developing cardio problems later in middle age. ACSM (2005) [6], stated that cardio-respiratory endurance (CRE) is suppose, health related because low levels of that have been consistently linked with markedly increased hazard of deadly health related problems from all causes, especially heart disease. High levels of CRE indicate ability to perform physical activities for prolong period of time, which also shows the ability to release relatively high amounts of energy over prolong period of time. Hence the key importance many physical fitness leaders attach to CRE. One of the indicators of cardio-respiratory fitness is the amount of oxygen the utilized by human body per minute of physical activity, which indicate the oxygen carrying capacity of the cells (Otinwa, 2005) [1]. Perry (2012) [2] explained that improved cardio-respiratory endurance increases lung efficiency so the heart does not have to work

as hard to pump blood to the muscles and also very vital for overall cardiac health and prevention of lifestyle diseases. Therefore cardio-respiratory endurance is the best measure for an individual's physical fitness and overall health. (Srikanthan, Seeman and Karlamangla, 2009) [8] Concluded that the WHR was a superior health-hazard categorization indicator. Davison, Bircher, Hill, Coates and Buckley (2010) [7] investigated the correlation between CRF, body fatness and markers of arterial function using BMI and DEXA to assess body composition, while the bicycle ergometer, treadmill test and submaximal exercise test was used to estimate cardio-respiratory fitness in VO₂max. The study used twenty seven obese and twenty six male and female volunteers, age ranged 40-65 years in Adelaide, Australia. The studies concluded that reduced CRF with associated decrease in arterial compliance may lead to intensify offload and in turn, led to ventricular hypertrophy, minimize coronary perfusion and increased cardiovascular mortality hazard. Kanavi Roopa Shekharappa , Smilee Johncy S , Mallikarjuna P T , Vedavathi K J , Mary Prem Jayarajan, 2011 [9] Body Mass Index provides the most useful, valuable, population-level measurement of obesity. It can be used to calculate the prevalence of obesity within a subjects and the threat associated with it. Kausar,Syed Mudassirand,Anjali N Shete [10] There was a significant negative correlation between BMI and VO₂max (ml/kg/min). This reveals the possibility of effect of body fat on cardio-respiratory functions. Excessive amount of body fat exerts an adverse burden as well as negative action towards cardiac function during exercise.

2. Materials and Methods

30 male subjects were selected from Government Higher Secondary School, Rabta, Jammu And Kashmir randomly, the age group ranged between 17 to 21 years. All the subjects gave an informed consent after detailed protocol of the non-invasive technique was explained to them. Physical examination of all subjects consists of measuring of height in meters, weight in kilograms and Body mass index was derived by Quetelet's index - weight (kg)/ height (m²). YMCA 3-Minute Step Test was used to assess cardiovascular fitness.

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3. Assessment of Vo2max

YMCA 3-Minute Step Test

- **Purpose:** To assess aerobic fitness.
- **Objective:** To step up and down to a set cadence for 3 min and take the resulting heart rate.
- **Equipment:** 12 in. (30.5 cm) high bench, Metronome set at 96beats/min, Stethoscope.
- **Instructions:** The subject listens to the metronome to become familiar with the cadence and begins when ready and the time starts. The subject steps up, up, down, down to the 96 beats/min cadence, which allows 24steps/min. This continues for 3 min. After the final step down, the subject sits down and the heart rate is counted for 1 min.
- **Scoring:** The 1 min. recovery heart rate is the score for the test.
- Following formula was used for determining VO2max.
- **For males:** $VO2max = 111.33 - (0.42 \times PR)$

4. Results

Table 1: Baseline characteristics of the Study Group

N=30	Weight (kilograms)	Height (meters)	Body Mass Index(kg/m ²)	Recovery Heart Rate (per minute)	VO2max (ml/kg/min)
Mean	52.76	1.69	18.34	104.6	67.40
S.D	7.37	0.05847	2.80	12.90	5.42

The mean values for body weight, height, body mass index and recovery heart rate were 52.76 kg, 1.69 m, 18.34 kg/m² and 104.6 per minute respectively. Mean predicted VO2 max was 67.40 ml/kg/min. (Table 1)

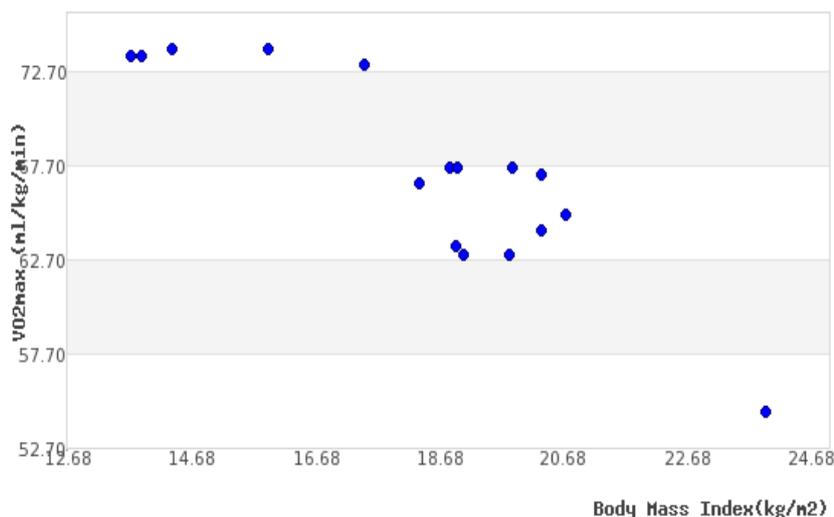
Table 2: Correlation between VO2max and BMI in subjects by Pearson's Correlation

Variable	r
BMI	-0.8997
Vo2 max	

Correlation is significant at the 0.05 level

When VO2max was correlated with BMI using Pearson's correlation coefficient maximal oxygen uptake (VO2max) showed strong negative correlation with, body mass index (r value is -0.8997) (p value <0.05) statistically significant. (Table 2)

Scatter Plot



Graph 1: Scatter diagram showing the relationship between BMI and VO2max

5. Discussions

Present study shows strong negative correlation between VO2max and BMI. BMI is a quick and easy method for providing a general guide in determining if one's weight is appropriate for one's height. It has been used to quantify an individual's obesity level. It is a useful, indirect measure of body composition because it correlates highly with body fat in most people. The U.S. National Institute of Health recommends that a healthy adult male's body should have between 13 to 17 percent fat. A healthy female's body should be composed of between 20 and 25 percent fat. Body fat contributes no power and limits endurance, speed and

movement through space. Most of researches regard VO2 max as the best indicator of cardio-respiratory endurance capacity. Cardio-respiratory endurance consider as the most important component of physical fitness. It is major defense against fatigue, even in the more sedentary sports or activities. Our study has been supported by studies of Afshan Kausar, Syed Mudassir and Anjali N Shete (2015) [10], Laxmi CC, Udaya IB, Vinutha Shankar S (2014) [5], Susan E. Brien (2007) [4]. The data of present study clearly indicates, that a strong negative correlation existed between body fat and aerobic fitness. Excessive amount of body fat put an unfavorable burden and hinder the action of cardiac function particularly during intensive and prolong exercise.

Loss of body weight during weight reduction program
increase aerobic capacity of an individual.

6. Conclusions

In present study, there was a significant negative correlation between BMI and VO₂max (ml/kg/min). This reveals the possibility of effect of body fat on cardio-respiratory functions. Unnecessary body fat put unfavorable pressure on cardiac functions during physical activities. Body fat reduced cardiac performance during prolong exercise results in decreased oxygen uptake. These findings reveal the importance of low cardio-respiratory fitness in young adults with increasing BMI. Moreover, excessive fat leads to many cardiac problems.

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