

CARDIO-RESPIRATORY FITNESS IN RELATION TO BODY FAT PERCENTAGE**SANJOGDEEP SINGH**Assistant Professor
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ABSTRACT: This study was undertaken to investigate the relationship of cardio – respiratory fitness to body fat percentage of adolescents. To study the relationship forty male students of age group 18-21 years from Dashmesh Khalsa College, Zirakpur were selected using purposive random sampling technique. For measuring cardio-respiratory fitness, the researcher has selected two major physiological variables to be tested, i.e. VO_{2max} and vital capacity. For measuring body fat percentage skin fold measurements was taken from seven body sites with the help of skin fold calipers and the scores were calculated using the equations given by Jackson-Pollock's equation (1978) for bone density and Siri's formula (1961) to get body fat percentage. For testing the statistical significance of cardio- respiratory fitness and body fat percentage variables of subject, product movement correlation (Pearson 1971) was employed. Findings from the study revealed a significant relationship of cardio – respiratory fitness with body fat percentage. The level of significance was set at 0.01 levels.

Key Words:**INTRODUCTION**

These days more and more people are health consciousness and concerned about getting and keeping a fitter and better looking body. In fact more and more people are becoming obsessed with it than ever before. It is even considered important in the overall appeal of a person. And this obsession is not only present among adults, but even amongst teenagers. Teenagers nowadays are craving for fitter and strong bodies. However, this is not actually surprising, because it is, after all, during adolescence that an individual becomes more and more conscious of their appearance. Teenagers want to get to explore the wonders of relating with the opposite sex. That's why they want to get in shape so they look more attractive and appealing.

Govindarajulu (2006) obesity is more than a cosmetic concern. Excess fat puts you at greater risk of developing such serious health risks as high blood pressure, diabetes, cardiovascular disease, stroke and cancer. The human body, with its nearly 40 billion fat cells, can support some extra fat. Fat is required for storing energy and insulating the body. But after a certain point, body fat can begin to interfere with human health. Ultimately, obesity can even be life threatening.

Anrig (2003) obese children and teenagers have a greater chance of becoming overweight adults. The increase in weight among children and teenagers has caused an elevation in the prevalence of chronic disease like type II diabetes, coronary heart disease, insulin resistance, impaired glucose tolerance, menstrual irregularity, and hypertension. Other complications include asthma and obstructive sleep apnea among children. Nieman, (2004) it has been shown that more than 60% of overweight kids have at least one additional risk factor for heart disease and that more than 85% of kids are diagnosed with type II diabetes are obese or overweight. Partridge, (2003) at one point in time, type II diabetes and heart disease were thought to only affect adults. However, these diseases are now appearing in the adolescent population.

Anrig (2003) the causes of childhood obesity are not getting enough exercise. This lack of activity is a result of the lack of emphasis on physical education in schools and at home. More specifically, there has been a decline in the development of grass root sports and a general decrease in the amount of time during and after school that is devoted to physical activity. It has been shown by Tremblay et al. (2003) that organized and unorganized physical activity is negatively associated with obesity.

Causes of obesity can be many like **biological, genetic and cultural factors**. Modern lifestyle also makes weight gain much easier. It affects their eating habits. One of the **main reasons**, why these teenagers tend to put on weight is their diet. They take fast food and **sweetened carbonated drinks** instead of having proper meal. Bodies store the extra calories as fat when they consume more calories than they burn. **Consumption of high fat foods** and lack of exercise or physical activity contributes to obesity. Bad eating habits of **childhood** continues hence causing obesity. There are several health risks if one is **dealing with obesity**. Health problems that affect adults like high cholesterol levels, high blood pressure and **diabetes** are

presently developing to younger people. Obese children and adolescents may suffer from **orthopaedic problems**. It was also investigated by Lee (2009) obesity is a global pandemic and a major health concern.

A final cause of obesity identified by Spence (2004) a practicing physician is that today society is so obsessed with academic achievement that we as a society are producing a fat and drug dependent generation. The are many causes of childhood obesity and only few have been discussed, new and more advanced causes of obesity appearing every day.

Parents can help their teenagers to **overcome adolescent obesity**. Some gradual changes in lifestyle will surely help to reduce weight. Teaching children the **importance of** healthy eating is important. One way is to cut certain food items from **adolescent's** diet such as fast foods, high calorie and sugared foods. They should be provided with healthier options like **fresh fruits, vegetables, proteins, nuts and leaner meats**. Activities like playing **outdoor games, swimming and cycling** are enjoyable and very helpful to control weight.

Ortega et. al (2007) Physical fitness in childhood and adolescence: a powerful marker of health. Health promotion policies and physical activity programs should be designed to improve cardio respiratory fitness, but also two other physical fitness components such as muscular fitness and speed and agility. Schools may play an important role by identifying children with low physical fitness and by promoting positive health behaviours such as encouraging children to be active, with special emphasis on the intensity of the activity.

Muscular fitness is also inversely related to degree of cardiovascular stress endured when lifting or holding objects. Fitness which includes muscular strength and muscular endurance is important to overall health. It improves or maintains the following the integrity of muscles and tendons, which is related to the risk of injury. Fat free body mass and resting metabolic rate which are related to weight gain and the risk of obesity. An individual ability to perform activity of daily living. It was also investigated by Singh et. al (2006) that cardio respiratory fitness is associated with higher insulin sensitivity in children and adolescents. Cardio respiratory and higher central adiposity are highly predictive of higher levels of insulin resistance in this cohort, and should be considered potential targets for interventions designed to enhance metabolic fitness in children and adolescents.

Zoeller et. al. (2009) these findings suggest that in this population, greater muscular strength is associated with greater aerobic power and endurance. Greater muscular strength could exert a positive influence on exercise performance by enabling higher levels of cardio respiratory stress as the result of reduced or delayed local muscle fatigue.

Cardio respiratory fitness refers to the ability of the circulatory and respiratory systems to supply oxygen to skeletal muscles during sustained physical activity. Regular exercise makes these systems more efficient by enlarging the heart muscle, enabling more blood to be pumped with each stroke, and increasing the number of small arteries in trained skeletal muscles, which supply more blood to working muscles. Exercise improves the respiratory system by increasing the amount of oxygen that is inhaled and distributed to body tissues. Cardio respiratory fitness is also sometimes referred to as Aerobic exercise. There are many benefits of cardio respiratory fitness. Some include improving stamina, longer endurance, increase in energy, better sleep, and can make a person feel happier. It can also reduce the risk of heart disease, lung cancer, type 2 diabetes, stroke, and many other sicknesses. Cardio respiratory fitness helps improve the condition of your lungs and heart, and will make you feel strong. For an average person, cardio respiratory fitness is recommended at least every week for a healthier body and stronger build. It was also investigated by Wei et al (1999) **relationship between low cardio respiratory fitness and mortality in normal-weight, overweight, and obese Men**. Overweight and obese men with baseline Cardiovascular disease or Cardiovascular disease risk factors were at higher risk for all-cause and Cardiovascular disease mortality compared with normal-weight men without these predictors. In this analysis, low cardio respiratory fitness was a strong and independent predictor of Cardiovascular disease and all-cause Cardiovascular disease mortality and of comparable importance with that of diabetes mellitus and other risk factors.

The Knowledge about the functioning of the circulatory and respiratory system is of utmost importance. The cardio respiratory system undergoes several changes as a result of physical activity or movement; be it in the form of exercise for general fitness or vigorous training for high performance. Thus it becomes essential to improve cardio respiratory fitness, either of an athlete, sedentary persons or any patient suffering from cardiac or lung disorders.

Significance of the study

The study will help to understand the relationship between cardio-respiratory endurance and body fat percentage of adolescents. The study will further help in creating awareness regarding the benefits of controlling body fat percentage. At last but not the least this study will motivate the young individuals to adopt physical training to lead a healthy life.

Statement of the problem

The Purpose of the study is to find out the Relationship of Cardio Respiratory fitness with the body fat percentage of Adolescents.

Operational definition of terms

Adolescents - The term adolescence comes from Latin verb *adolescere* meaning to grow into maturity. In this sense, adolescence is process rather than a period, a process of achieving the attitudes and beliefs needed for effective participation in society. The stage between adulthood and childhood is called adolescence.

VO_{2max} - VO_{2max} is the maximal oxygen uptake or the maximum volume of oxygen that can be utilized in one minute during maximal or exhaustive exercise. It is measured as milliliters of oxygen used in one minute per kilogram of body weight.

Vital Capacity - Vital capacity is the maximum amount of air that can be exhale after a maximum inhalation (usually tested by spirometry), used to determined the condition of lung tissue.

Cardio respiratory fitness - Cardio respiratory endurance is the ability of the body's circulatory and respiratory systems to supply fuel and oxygen during sustained physical activity.

Fitness - Physical fitness is not only one of the most important keys to a healthy body, it is the basis of dynamic and creative intellectual activity.

Rockport one mile run test - The Rockport is a common aerobic fitness test for those of low fitness level. There is a very similar 1 mile walk test used for the Fitness Gram program.

Objective

To analyze the relationship of cardio- respiratory fitness with body fat percentage in adolescent.

Delimitations

(i) The study was be delimited to male adolescents of 18 to 21 years of age.

(ii) The study was further delimited to the students of khalsa college ,zirakpur

Hypothesis

Based upon the literature found, it is hypothesized that there will be a significant relationship between cardio respiratory fitness and body fat percentage of male adolescent.

METHOD AND PROCEDURE

After the selection of problem and formulation of hypotheses, there is a need to give a practical shape to the research. For that any researcher needs proper planning and preparation of appropriate research design. Research design is the blue print of what is to be done and how to be done. It is the path which is followed by the researcher to reach the target.

Sampling

As per the requirement of the study forty male adolescent students were selected, these subjects were the students of Dashmesh Khalsa College, Zirakpur. The average age of the students was ranged from 18 to 21 years.

The selection of the subjects was done on the basis of purposive-random sampling technique.

Tools

All the instruments to be used in this investigation were found to be quite precise and reliable.

For measuring cardio- respiratory fitness, the researcher has selected two major physiological variables to be tested, i.e Vo_{2max} and vital capacity. For testing cardio respiratory- fitness the researcher has used stop watch, wet Spiro-meter, nasal clip, mouth piece, marked 1 mile track, body weight scale , cones , score sheets and Pen.

For measuring body fat percentage the researcher has used seven site skin fold measurement, skin fold caliper and norms table.

Procedure for Administering the Test

To measure VO_{2max} all the subjects were assembled on the same day in the evening session at the play ground of Dashmesh Khalsa college, Zirakpur. Then the researcher has explained the test procedure to the subjects and motivated them to perform their best. Further he has administered the Rockport 1 mile test.

The students were instructed to walk as fast as possible for 1 mile that is 1609.344 meters. After the subject had completed the specified distance, immediately the researcher has measured the pulse rate. The researcher manually counted the number of beats for 10 seconds, and then multiplies that by 6 to get the minute heart rate along with the time the subject took to complete the specified distance. Then to calculate the VO_{2max} score of the subject the researcher has used the following equation (Kilne et.al, 1987 and McSwegin et. al. 1998).

For measuring vital capacity the instrument “Wet Spiro meter” has been used to measure Vital Capacity, graduated in litre and placed at such a height that all subjects could perform at erect standing position. The Spiro meter bell was immersed in the water filled in the Spiro meter drum. It was ensured that the pointer of the scale was at the zero mark at the beginning of the test. The subject took three deep breaths before starting the test, and then after fullest inhalation the subject placed the mouth piece attached to the nose connected to the drum of the Spiro meter, in his mouth, taking care of that no air escaped through the edges of the mouth piece. The subject exhaled through slowly and steadily while bending forward slightly until the maximum volume of air could be expelled without taking in a second breath. The subject was instructed to take care that they have to blow out only by the mouth and not by nose even partially. The nose of each subject was clipped by a nose clip to prevent the air escaping through the nose. The score of vital capacity for each subject was recorded in litres. Three trails will be given to each subject and the average was being recorded.

For measuring body fat percentage, all the subjects were assembled on the same day morning in the college ground. They were informed with the requirements of the study and skin fold method testing procedure. Seven anatomical sites were selected for skin fold measurements to get appropriate and reliable result. Therefore the subjects were instructed to stand erect and all the seven skin fold measurements from the right side of the subjects were taken in centimeters. Three measurements had been taken for each anatomical site and the average was noted down for further calculation. The various anatomical sites selected to measure body fat percentage were as follows. Chest - The data was collected by a diagonal pinch half way between the armpit and the nipple. Midaxillary – the subjects were instructed to raise their arms and then a vertical pinch was performed on the midaxillary line which runs directly down from the center of the armpit to get the data. Subprailiac - a diagonal pinch just above the front forward protrusion of the hip bone was performed to get the data. Abdominal - a vertical pinch about one inch from belly button was performed to get appropriate data. Thigh- a vertical pinch halfway between the knee and top of the thigh was performed to get appropriate data. Triceps - a vertical pinch halfway between the shoulder and the elbow was performed to get appropriate data. Sub scapular - a diagonal pinch directly below the shoulder blade was performed to get appropriate data.

Further to calculate the body fat percentage the researcher has used the following equations given by Jackson-Pollock's equation (1978) for bone density and Siri's formula (1961) to get body fat percentage from that.

RESULT

For testing the statistical significance of cardio- respiratory fitness and body fat percentage variables of subject, product movement correlation (Pearson 1971) was employed. For testing hypothesis level of significance was set at 0.01 level.

TABLE: 1
SHOWS THE RELATIONSHIP OF VO_{2MAX} WITH BODY FAT PERCENTAGE

Variable	Mean	Sd	df	r
Body fat percentage	0.6976	0.5242	38	-0.91424*
VO_{2max}	80.8230	9.4696	38	

$P_r(38)(0.01)=.393$

* (significant at 0.01 level)

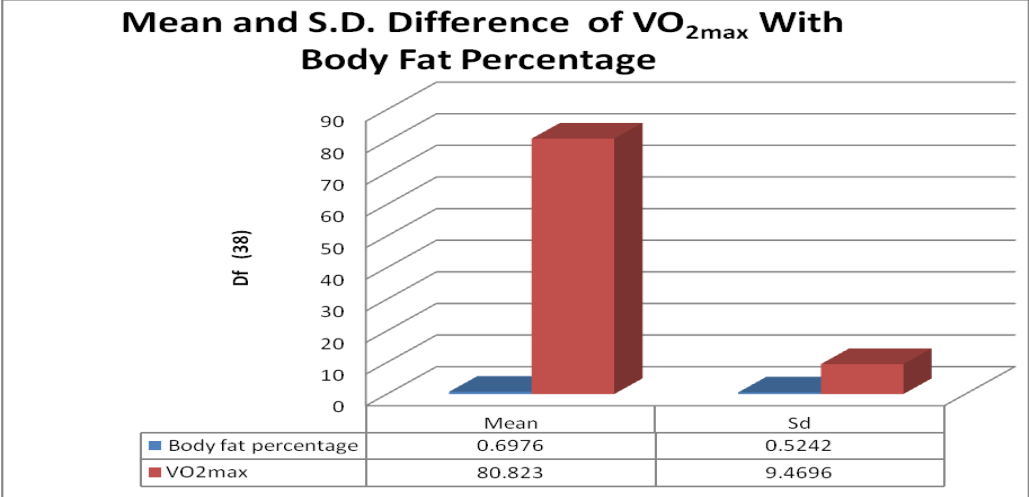


FIGURE: 1

The perusal table no 1 and Fig of 1 indicates the mean scores of vo_{2max} and body fat percentage, which was 80.8230 and 0.6976 respectively and the standard deviation, was 9.4696 and 0.5242 respectively. The value of r is -0.91424 which indicate that there is an existence of negative correlation between the body fat percentage and Vo_{2max}.

As shown in table no: 1 the obtained value of ‘r’ that is -0.91424 was higher than the tabular value of 0.393 for the selected degree of freedom (df=38) and level of significance (0.01). This indicates that the two selected variables i.e. body fat percentage and VO_{2max} are closely related with each other. Which can be further explained that if a person is having low level of vo_{2max} then it can be pretend that he/she may has higher level of body fat percentage.

Therefore hypothesis which states that there will be a significant relationship between cardio-respiratory fitness and body fat percentage of male adolescents was accepted.

TABLE: 2
SHOWS THE RELATIONSHIP OF VITAL CAPACITY WITH BODY FAT PERCENTAGE

Variable	Mean	Sd	df	r
Body fat percentage	0.6976	0.5242	38	0.92234*
Vital Capacity	3.8825	0.4012	38	

Pr (38)(0.01)=.393

*(significant at 0.01 level)

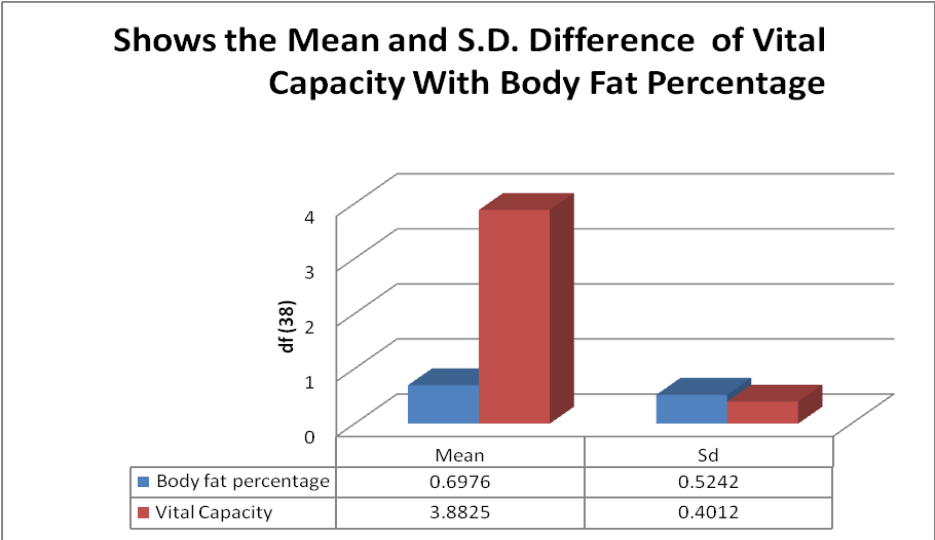


FIGURE:2

The perusal table no 2 and Fig 2 indicates the mean scores of vital capacity and body fat percentage, which was 3.8825 and 0.6976 respectively and the standard deviation, was 0.4012 and 0.5242 respectively. The value of r is 0.92234 which indicates that there is an existence of positive correlation between the body fat percentage and vital capacity.

As shown in table no: 4 the obtained value of ' r ' that is 0.92234 was higher than the tabular value of 0.393 for the selected degree of freedom ($df=38$) and level of significance (0.01). This indicates that the two selected variables i.e. body fat percentage and vital capacity is closely related with each other. Which can be further explained that if a person is having low level of vital capacity then it can be pretend that he/she may has higher level of body fat percentage.

Therefore hypothesis which states that there will be a significant relationship between cardio-respiratory fitness and body fat percentage of male adolescents was accepted in case of vital capacity, which is one of the most important components of lung capacities as well as cardio-respiratory fitness.

Testing Hypothesis

Finally the obtained data from table no 1 and 2, and figure no 1 and 2 combined indicate that body fat percentage is very closely related with various components of cardio-respiratory fitness. Hence Hypothesis, which states that there will be a significant relationship between cardio-respiratory fitness and body fat percentage of male adolescents is fully accepted.

Discussion and Interpretations

The findings pertaining to the study resolved with significant relationship between body fat percentage and cardio respiratory fitness of male adolescents.

Cardio respiratory fitness deals with the fitness of human heart and lungs. Which can be estimated by measuring various cardiac efficiencies like stroke volume, cardiac output, resting heart rate etc along with various lung capacities like vital capacity, tidal volume, residual volume, respiratory rate etc. Therefore any change in the associated factors of Cardio respiratory fitness directly affect the body fat percentage of human beings.

Recommendations

In the light of the findings of this study the following implications can be drawn. The importance of cardio-respiratory fitness has been well recognized by several researchers. The present research has tried to find out the relationship of cardio respiratory fitness with body fat percentage of adolescents. It is suggested and recommended that significant relationship exists between body fat percentage and cardio respiratory fitness of male adolescents. Further it is mandatory to conduct a similar type of research to discover new facts and figures.

1. If a person wants to decrease body fat percentage he has to increase his cardio respiratory fitness.
2. If a person has lower cardio-respiratory fitness ,there may be maximum chances of higher body fat percentage.
3. This study was conducted on the 18 to 21 years of age group of male adolescents. The same study is suggested to be conducted on the different age, sex.

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