RELATIONSHIP OF CARDIOVASCULAR FITNESS WITH PHYSIOLOGICAL FITNESS COMPONENTS

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Abstract: *The aim of the present study was to investigate the relationship of cardiovascular fitness with different physiological fitness components. Total eighty (80) obese boys, within the age group of 13 to 16 years from four (04) different schools of different municipalities of Purba-Medinipur district; they are Panskura, Haldia, Contai and Egra. Age specific BMI cutoff criteria as per the Indian Academy of Pediatrics (IAP), were considered to identify obese subject. Pearson Product moment correlation was applied on the data. Before that all scores were converted into standard score to make a composite score of each physiological fitness components. Result of the study shows that Morphologic fitness (-0.43) and metabolic fitness (-0.24) were negatively correlated with cardiovascular fitness but in the case of Bone integrity no significant relationship was observed.*

Key Words: *Cardiovascular fitness, Physiological fitness, Metabolic fitness, Morphological fitness.*

1. INTRODUCTION:

Over the year the term physical fitness has been defined from different perspective. At the beginning strength was the only component to describe one's fitness. After 1st world war cardiovascular fitness started to get significant responsiveness and the multi-factorial physical fitness concept was started to develop but that was in a budding stage. Only few components like blood pressure, resting and exercise heart rates were used in addition to strength. True multidimensional fitness batteries were developed after the 2nd world war such as Kraus-Weber test, AAHPERD fitness test, Oregon Motor Fitness Test and the California Physical Performance Test etc. According to Corbin's multidimensional hierarchical model, success of physical development is dependent on the development of skill and physical fitness and these two sub-dimensions are dependent on the development of various sub-domains. Health-related fitness and physiological fitness both are principal sub-dimensions of physical fitness. Skill-related fitness is a parallel dimension related to health-related fitness and physiological fitness but in his model, it is classified as a sub-domain of skill development(Corbin, 1991).

Physiological fitness includes non-performance components of physical fitness that relate to biological systems that are influenced by one's level of habitual physical activity. Metabolic fitness, morphological fitness and bone integrity are sub-components of physiological fitness. The state of metabolic systems and variables predictive of the risk for diabetes and cardiovascular disease which can be favorably altered by increased physical activity or regular endurance exercise without the requirement of a training related increase in VO_2 max. Morphological fitness components are non-performance component of fitness linked to body composition factors such as body circumferences; body fat content and regional body fat distribution. All this are non-performance measures which differentiated it from health-related fitness(Charles B. Corbin et al., 2000). Cardiovascular fitness is defined as the ability of the heart, blood cells and lungs to supply oxygen-rich blood to the working muscle tissues and the ability of the muscles to use oxygen to produce energy for movement. This is a health-related fitness component of physical fitness that is brought about by sustained physical activity(Tupniak, 2009). VO_2 max has a good relationship with morphological parameters (viz. body height, mass, body surface area), age, gender, exercise habits and to a lesser extent to heredity(Bouchard et al., 1988). Reduction in the bioavailability of endothelium derived nitric oxide serves as a key link between metabolic disorders and cardiovascular risk (Huang, 2009). As a result the present study was conducted to investigate the relationship of cardiovascular fitness with different physiological fitness components.

2. Objectives:

To established the relationship between the cardiovascular fitness and physiological fitness components of obese school children.

3. Methods:

Selection of the subjects:

In this study total eighty (80) obese boys were included and they belong to the age group of 13 to 16 years. All the subjects were collected from four (04) different schools of different municipalities of Purba-Medinipur

district, which are Panskura, Haldia, Contai and Egra. Indian Academy of Pediatrics (IAP) published an age specific BMI cutoff criteria which was considered to identify obese subject.

Selection of Variables:

Cardiovascular endurance and selected physiological fitness components were selected as variables for this study. In physiological fitness morphologic parameters, metabolic parameters and bone integrity were selected. In morphologic parameters height, weight (BW), body mass index (BMI) and waist circumference were measured. Random blood glucose, systolic and diastolic blood pressure were measured in metabolic fitness. Bone integrity was measured by skeletal mass.

Criterion Measures:

Table 1: Measurement of the Cardiovascular Fitness and Physiological Fitness Components

Parameters	Variables	Test/Measurement
Cardiovascular fitness	Cardiovascular Endurance	9min. run and walk (m)
Physiological Fitness	Morphologic Fitness	Height(cm) Weight (kg) BMI(kg/m^2) Waist Circumference(cm)
	Metabolic Fitness	Blood glucose(mg/dl) Systolic blood pressure (mm/hg) Diastolic blood pressure(mm/hg)
	Bone Integrity	Skeletal Mass (kg)

Collection of Data

For the present study, all data were collected from the govt. aided schools, during the school hours. Data were collected by technical and experienced personnel. All the data were collected in two phases. In first phase personal data (i.e age, height, weight, BMI) were collected, then selected the obese subjects according to the BMI chart (IAP) and all necessary tests and measurements for the study were taken in the next phase from previously selected subjects. In such manner, all the data were collected from four different schools, which are situated in different municipality area of Purba Medinipur district i.e – Panskura, Haldia, Contai and Egra Municipality.

Statistical Analysis:

To determine the relationship between cardiovascular fitness and physiological fitness components Pearson's Product Moment Correlation was employed with the help of IBM-SPSS statistical software package (version 25.0; IBM Corp., Armork, NY). The level of significance or the p-value was set at 0.05. But before find out the relationship a composite score had been drawn from all the sub domains of different physiological fitness components and for that "z" score had been used to convert all the raw scores into standard score.

4. Analysis:

Table – 2 Relationship of Cardiovascular Endurance with Physiological Fitness Components

	Cardiovascular Endurance	Morphologic Fitness	Metabolic Fitness	Bone Integrity
Cardiovascular Endurance	1			
Morphologic Fitness	-0.43*	1		
Metabolic Fitness	-0.24*	0.41*	1	
Bone Integrity	-0.141	0.69*	0.36*	1

Table -2 revealed that cardiovascular endurance had a significant inverse relationship with Morphologic fitness (-0.43) and metabolic fitness (-0.24) but in the case of Bone integrity no significant relationship was observed.

5. Findings:

Result of the study reviled that cardiovascular endurance had a negative significant relationship with Morphologic fitness. The fat deposition is more in obese people than their normal counterpart. In general, male bodies will amass fat at the belly area but fat starts to accumulate in the liver, pancreas, and muscle when accumulation of fat in the belly region is full(Geggel, 2017). Cardiovascular training had a beneficial effect on health which are reduce body fat, improvement of blood flow to the muscle, the involuntary cardiac muscle facilitates the pumping of the blood through the body and this occurs due to the enhanced metabolism of free fatty acid as an effect of cardiovascular training. Regular exercise aid to increase Vo_2 max and due to that in the working muscles blood flow increase and it helps in the oxidation process and as a result muscle can work for a longer period (Sorosky & Sorosky, 2006). According to (Siddhartha, 2014) cardiovascular endurance training enhances the metabolism of free fatty acid which further reduced body fat. Probably these are the reasons to get inverse relationship between cardiovascular endurance and morphological fitness.

This study also found a negative significant relationship between cardiovascular endurance and metabolic fitness components. Low level of cardiovascular fitness is associated with obesity and obesity is a major cause of hyperglycemia. With the increment of body fat % and weight the body surface area also increases for that heart need to exert blood more forcefully than normal, so that it can reach to the peripheral part of the body also. Due to that blood also exert more pressure in the wall of the blood vessels which is the cause of high blood pressure. This might be the reasons for getting inverse relationship between cardiovascular fitness and metabolic fitness. However, the result of this study shows cardiovascular fitness is one of the important factors for predicting physiological condition of an individual.

6. Conclusions:

On the basis of the findings, it may reasonably be concluded that the selected physiological fitness components i.e. morphologic and metabolic fitness has significant inverse relationship with the cardiovascular endurance of obese school children and cardiovascular fitness is an indicator of individual's physiological condition.

REFERENCES:

1. Bouchard, C., Boulay, M. R., Simoneau, J.-A., Lortie, G., & Pérusse, L. (1988). Heredity and Trainability of Aerobic and Anaerobic Performances: An Update. *Sports Medicine*, *5*(2), 69–73. https://doi.org/10.2165/00007256-198805020-00001
2. Charles B. Corbin, Pangrazi, Robert, P., & Franks, B. D. (2000). Definitions: Health, Fitness, and Physical Activity. *President's Council on Physical Fitness and Sports Research Digest*, *3*(9). file:///C:/Users/User/Downloads/2000PCPFSDefinitions.pdf
3. Corbin, C. B. (1991). A Multidimensional Hierarchical Model of Physical Fitness: A Basis for Integration and Collaboration. *Quest*, *43*(3), 296–306. https://doi.org/10.1080/00336297.1991.10484032
4. Geggel, L. (2017). *Why Do Men Gain Weight in Their Bellies?* Livescience.Com. https://www.livescience.com/57610-why-do-men-have-potbellies.html
5. Huang, P. L. (2009). ENOS, metabolic syndrome and cardiovascular disease. *Trends in Endocrinology & Metabolism*, *20*(6), 295–302. https://doi.org/10.1016/j.tem.2009.03.005
6. Siddhartha, S. (2014). Effects of Core Strengthening on Cardiovascular Fitness, Flexibility and Strength on Patients with Low Back Pain. *Journal of Novel Physiotherapies*, *04*(02). https://doi.org/10.4172/2165-7025.1000202
7. Sorosky, S. C., & Sorosky, B. S. (2006). *The Management of Low Back Pain: A Comprehensive Rehabilitation Program*. Tupniak, D. (2009).
8. Tupniak, D. (2009). *Cardiovascular Fitness—Cardio Workouts*. DISABLED WORLD. https://www.disabled-world.com/fitness/cardiovascular-fitness.php