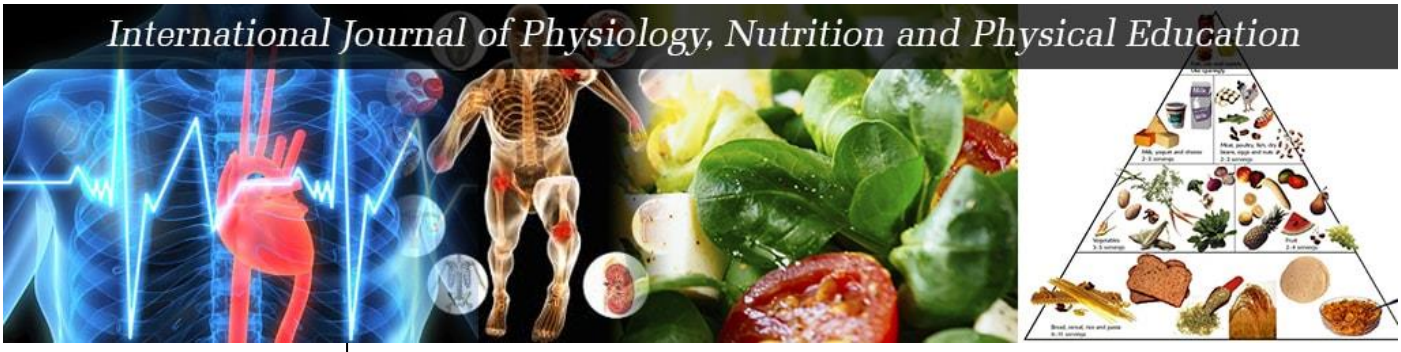

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A study of body mass index in relation to physical fitness components of primary school going children

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Abstract
Introduction: Measures of abdominal obesity are better than BMI as predictors of CVD risk, although combining BMI with these measures may improve their discriminatory capability.
Aim & Objective: The aim of the study was to evaluate and compare the fitness in relation to Body Mass Index of school going children.
Method: 100 primary school going children aged 8 – 10 years of Burdwan and Birbhum districts of West Bengal, India has been tested on physical fitness parameters namely speed (50 mt. dash) and muscular strength endurance (bent knee sit ups) and Body Mass Index (Weight in Kg./Height in Mt.2).
Result and Discussion: Findings of descriptive data of primary school going children of BMI (low, middle and high) on speed and abdominal strength and endurance components of physical fitness indicated that very lesser difference exists among different BMI children of school on various components of physical fitness and performance of the subjects on various components shows more improvement with middle BMI and less with Low and high BMI. There was no significant difference found among three BMI categories.

Keywords: Body mass index, physical fitness

Introduction
The importance of an optimal level of physical fitness as a reflection of certain aspects of health was demonstrated by the work of Kraus and Raab (1961) [14] on hypo- kinetic diseases, or diseases directly related to a lack of exercise. These physicians identified low back pain, foot problems, abdominal posies, obesity, hypertension, and degenerative cardiovascular diseases as conditions produced by sedentary life-styles in our affluent, tension- producing society. Thus the concept of physical fitness does convey a meaning of healthful living. Because heart disease, stroke and circulatory disorders are still primary causes of poor fitness is highly relevant for all people. Sedentary people suffer a higher incidence of coronary heart diseases than active persons (Morris *et. al.* 1973., Paffenbarger & Hale 1991) [16]. Thus attaining a desirable level of physical fitness is an important aspect of preventive medicine because physical inactivity appears to be related to the coronary heart disease. Recent longitudinal data shows that Harvard alumni who expend 2000 calories a week in vigorous exercise during their life span will increase the quality of life as well as live one or more years longer than sedentary persons. For most young participants however a physical fitness test is one that attempts to measure the efficiency of both the muscular and cardiovascular systems.
Physical fitness and physical activity of children are issues of current interest among public health and sport sciences professionals. Studies show that an early sign of chronic disease and risk factors for chronic disease like elevated cholesterol and hypertension which may be considered normal at the middle-age population can also be found in young children (National Institutes of Health, 1996; US Department of Health and Human Services, 1996, World Health Organisation, 2002) [3]
An alarming situation is that current generation of children and youth are often characterized as either physically unfit or physically inactive, or both (Malina, 1997) [6]. Accumulation of excess fat in the body is termed as obesity (Tucker *et al*. 1997). Childhood obesity is associated with several risk factors for the development of heart diseases and other chronic problems including hyperlipidemia, hyperinsulinemia, hypertension and early atherosclerosis.

The correlation of childhood obesity to adulthood diseases is of major concern (Chatterjee *et al*. 2006) as it because harder to treat obesity in adults than in children (Park *et al*. 2005). So effective prevention of adult diseases due to obesity will require the prevention and management of childhood obesity (WHO, 2000) [10].

Based on an extensive review, Huxley *et al*. (2010) concluded that there was convincing evidence that measures of general obesity (e.g. BMI) and measures of abdominal adiposity (e.g. waist circumference, waist–hip ratio and waist–height ratio) are associated with CVD (Cardiovascular disease) risk factors and incident CVD events. The authors also concluded that there was probable evidence that:-

Measures of abdominal obesity are better than BMI as predictors of CVD risk, although combining BMI with these measures may improve their discriminatory capability;

Research shows that nearly 60% of overweight children age 5 to 17 had at least one risk factor for cardiovascular disease and 25% had two or more and obese have 80% chance of staying obese their entire lives. Obesity has been more precisely defined by the National Institutes of Health as a BMI of 30 and above. (A BMI of 30 is about 30 pounds overweight.)

The causes for being overweight are numerous and some of them related to the environmental influences and heritability of body mass index (BMI). Both family environment and the genetic predisposition effected the development of body fat (Bouchard *et al*, 1997). The rapid economic changes and political stability, which happened in the Asian region, have left a great impact in the lifestyle of people, behavioral mentality and healthy eating habit. This may result in more frequent eating out and higher intakes of energy dense and high fat poor nutrients (Foong *et al*, 2004; Tee *et al*, 2002). Consequently, weight-related problems are replacing the more traditional public health concerns.

Aim & Objective: The aim of the study was to evaluate and compare the fitness in relation to Body Mass Index of school going children.

Materials & Methodology

Considering the feasibility the researcher have selected a total of 100 class III-IV students (Girls and boys) aged 08 – 10 years from Burdwan and Birbhum District primary school children, West Bengal, India.

The researcher has selected the following components and test battery.

Table 1: Variables & test

Components	Variables	Test Battery
Fitness	Speed Muscular Strength & Endurance	50 mt. dash Bent Knee One Minute Sit Ups
Body Mass Index	Height	Anthropometry Rod
(Weight in Kg. /Height in Mt.2)	Weight	Weight Machine

- Anthropometric Rod / Stadiometer
- Stopwatch
- Weighing machine
- Measuring tape
- Clapper

To evaluate and compare the physical fitness in relation to Body Mass Index of school going children at first the entire 100 sample have been divided into three groups on basis of calculated quartile deviations (Q1 and Q3). To find out variations of Physical Fitness in relation to Body Mass Index of school going children Analysis of Variance was predominantly used. The level of significance for testing of hypothesis was kept at.05.

Graphical presentations of each parameter were made for proper interpretations of statistical values (Verma, 2000) [2].

Results

To evaluate and compare the physical fitness in relation to Body Mass Index of school going children at first the entire 100 sample have been divided into three groups on basis of calculated quartile deviations (Q1 and Q3. Subjects having BMI values between Q1 and Q3 were put in the middle BMI group (N=50). Subjects possessing BMI values > Q3 were put in High BMI group (N=25) while those having BMI values < Q1 were assigned to the low BMI group (N=25). Q1 score of BMI is 13.41, it means subject were having >13.41 or 13.41 and <16.49 or 16.49 for high BMI group and the subject whose BMI calculated between Q1 and Q3 were in middle BMI group.

Table 2: Descriptive statistics of body mass index (BMI) on various components of physical fitness of primary school going children

	Low BMI N=25		Middle BMI N=50		High BMI N=25	
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Speed (50 M)	9.34	0.87	9.73	0.79	10.14	0.87
Abdominal Strength & Endurance (Sit Ups)	27.12	3.73	26.3	4.39	28.88	4.68

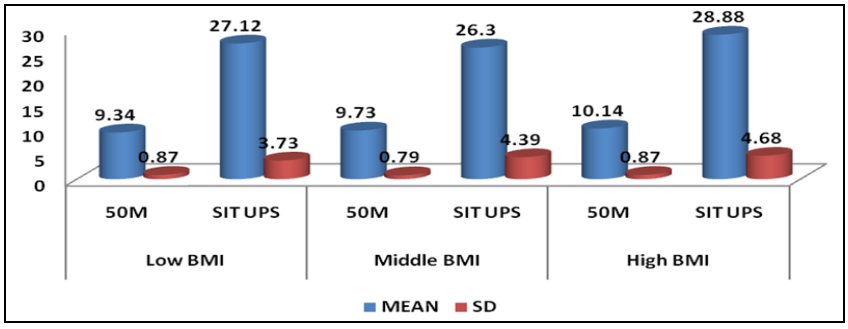

Fig 1: Descriptive statistics of body mass index (BMI) on various components of physical fitness of primary school going children

Table 2 and Fig. 1 is showing the mean and standard deviation of physical fitness components in relation to Body mass Index (BMI). The mean and standard deviation value of speed is 9.34 and 0.87 for low BMI; 9.73 and 0.79 for middle BMI and 10.14 and 0.87 for high BMI. For abdominal strength and endurance the mean and standard deviation value of low BMI is 27.12 and 3.73; 26.30 and 4.39 for middle BMI; and 28.88 and 4.68 for high BMI.

Table 3: One-way analysis of variance of speed (50m Dash) in relation to BMI of school going children N = 100

Source of Variance	df	Sum of Square	Mean of Square	F - ratio
Between Groups	2	639.94	319.97	8.40*
Within Groups	97	3694.90	38.09	

* Not Significant at.05 Level. Tab.
F.05 (df = 2, 97) = 19.49.

Table 3 signifies that there is no significant difference found of speed in relation to body mass index as the calculated F = 8.40 is found to be lesser than the tabulated F = 19.49.

Table 4: One-way analysis of variance of abdominal strength & endurance (Sit Ups) in relation to BMI of school going children N = 100

Source of Variance	df	Sum of Square	Mean of Square	F - ratio
Between Groups	2	5754.08	2877.04	
Within Groups	97	28095.56	289.65	9.93*

* Not Significant at.05 Level. Tab.
F.05 (df = 2, 97) = 19.49.

Table 4 signifies that there is no significant difference found of abdominal strength & endurance in relation to body mass index as the calculated F = 9.93 is found to be lesser than the tabulated F = 19.49.

Discussion of Findings

Findings of descriptive data of primary school going children of BMI (low, middle and high) on speed and abdominal strength and endurance components of physical fitness indicated that very lesser difference exists among different BMI children of school on various components of physical fitness and performance of the subjects on various components shows more improvement with middle BMI and less with Low and high BMI.

There is no significant difference found among three BMI categories. The present researcher would like to attribute some reasons behind this kind of result.

The mean differences among the three categories of BMI (Low, Middle, and High) are very less. More over the low and middle BMI categories mean value i.e. 12.65 and 14.38 respectively comes under the very severely underweight categories of BMI according to WHO BMI norms. The mean value of 18.99 of high BMI category of the present study has just reached the normal BMI category according to WHO BMI norms (Wikipedia.org).

So the subjects selected for the present study are mostly at the under nutrition/underweight category according to WHO norms. This may be the reason they could not perform in physical fitness tests.

Conclusion

Findings of descriptive data of primary school going children of BMI (Low, middle and high) on speed and abdominal strength and endurance components of physical fitness indicated that very lesser difference exists among different BMI children of school on various components of physical fitness and performance of the subjects on various components shows more improvement with middle BMI and less with Low and high BMI.

There was no significant difference found among three BMI categories.

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