

Relationship between Body Composition and Motor Fitness of High School Boys

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Abstract—To achieve the purpose of finding out the relationship between body composition and motor fitness of male high school boys, Seventy (N=70), male students ranging in age between 13-16 years who are studying High School boys.

The sample of subjects selected for the present study were tested and measured for motor fitness. Body mass index (BMI) was measured and calculated for each subject. The motor fitness test battery that consisted of three items, viz., Vertical jump (to measure power of the leg), Chin-ups (to measure muscular and endurance and arms) and Shuttle run (to measure speed and agility) was administered to the selected subjects. Body composition scores as measured by BMI for each subjects and performance scores of each subject in 3 different items of the test battery (y1, y2 and y3,) were in numerical form, which represented the data for the present study. The data in respect of the independent variable and dependent variables were statistically analyzed through computation of correlation coefficient. The statistical analysis of data has revealed that;

1. Body composition was not significantly related to any of the two motor fitness variables, Vertical jump (to measure power of the leg), Chin-ups (to measure muscular and endurance and arms) and Shuttle run (to measure speed and agility).
2. Body composition was not significantly related to power of the leg, and muscular endurance.
3. Body composition was significantly related to speed and agility.

Index Terms— Body Composition, Motor fitness, Vertical jump, Chin-ups, Shuttle run.

I. INTRODUCTION

Body composition is the study of three components in the body, i.e., bone mass, muscle mass and fat mass. Body composition makes an important contribution to an individual's level of physical fitness, performance, particularly in such activities that require one to carry one's body weight over distance. The body composition studies have been conducted very extensively on the athletes. The examination of the body fat and kin folds at selected sites is most important in them. It has been found that the athletes who were lean or less fatty but heavy because of well-developed musculature were superior in performance in certain competitive sports activities. On the other hand the athletes who had substantial amount of adipose tissues have permanently increased energy demands owing to the inert weight of fat (Sodhi, 1991) ¹. So fat plays an important role in order to enhance or hinder performance.

There is a relationship between structure and function of the different parts of the human body. Body fat is

less metabolically active than the lean body mass. That is why exercise increases lean body mass (LBM) by increasing muscle mass, while reducing body fat. The body composition and energy turnover are highly inter related and closely linked with the functional capacity of the organism. Therefore, evaluation of one's body composition is considerably useful for understanding of the functional aspects of an individual. By measuring body composition, a person's health status can be more accurately assessed and the effects of both dietary and physical activity programs better directed.

The fifth basic component of physical fitness, body composition refers to the makeup of the body in terms of lean tissue mass (Inc. muscle, bone, tendons and ligaments) and fat tissue mass. In simple terms, body composition is all about our muscle / fat ratio, or our body fat percentage. A healthy muscle to fat ratio is a common (but not exclusive) indicator of fitness. Body composition is the body's relative amount of fat or fat free mass, those with optimal body composition are typically healthier, move more easily and efficiently, and in general, feel better than those with less than ideal body composition. Achieving a more optimal body composition goes a long way toward improving your quality of life and overall wellness.

It is important to understand influences on excess adiposity to address obesity among children. There are both biological and behavioral determinants to being overweight and obese, and, at present, the behavioral determinants offer the most fruitful possibilities for successful intervention' (Baranowski ² et al., 2000). Fundamental movement skills (FMS) are critical to participation in most physical activities, because they represent the requisite behavioral competencies for participation. It could be argued, then, that the effects of FMS proficiency on being overweight or obese is mediated through cardio respiratory endurance and physical activity participation and that little can be gained by examining the relationship between FMS proficiency and adiposity. However, it is not uncommon for determinants to have both direct and mediated relationships with health outcomes, and a more comprehensive understanding of the factors influencing overweight can only improve our capacity to intervene effectively. A plausible first step is to explore the hypothesis that proficiency of FMS is related to being overweight/obese among children and adolescents.

Body composition is used to describe the percentage of muscle, fat and bone in the human body. But what does body composition mean. To find out, read on body composition is a technical term used to describe various components that make up the body weight. Two people of same height and same body weight appear completely different from each other due to different body composition. So, what is body composition? Body composition is defined as the ratio of lean body mass to body fat mass. Lean body mass includes structural and functional elements in cells, body water, bones, muscles, If body composition is of (higher fat compared to muscle mass) there are many health related disease and illness you have a higher chance of contracting. It is important to combine healthy eating habits with your exercise program.

II. MOTOR FITNESS

Motor fitness is the organic soundness and proper nutrition undergirds the entire physical structure. A motor unit is made up of a single motor neuron as well as all of the muscle fibers that neuron activity. When they receive signals from the brain to contract the muscle.

Motor fitness is an individual quality that differs from person to person. It is influenced by age, sex, heredity, personal habits and eating habits, attitude towards life, anxiety, tension and stress values of physical fitness. It is limited in its scope, it becomes a less elusive quality and can be defined more easily than total fitness or physical fitness. Motor fitness may be defined as a readiness or preparedness for performance with special regard for big muscle activity without undue fatigue. Furthermore, it is highly related to total fitness in the same manner. This interpretation is in keeping with the principle that the individual is an integer and cannot be divided into divisible units for education and training. Is gauged by performance and this performance is based on a composite of many factors. The most commonly mentioned fitness factors are strength, endurance, power, speed, agility, balance, flexibility, and stamina. Some of these factors evidently are more dominant than others and thus have a higher relationship with motor fitness. It is interesting to note how closely these factors resemble the list experts have used to analyze motor fitness. Furthermore, although experts have assigned to motor fitness and motor fitness definitions which seem to distinguish one from the other, the same factors have been used to describe them and, in many cases, By the same-token, fitness is lost unless it becomes a product of day-to-day living.

III. COMPONENTS OF MOTOR FITNESS

Definitions of the various components designated in the motor fitness concept presented above are as follows.

Muscular Strength: - Maximum strength applied in a single muscular contraction.

Muscular Endurance:-Ability to continue muscular exertions of sub- Maximal Magnitude.

Muscular Power:-Ability to release maximum muscular force in the shortest period of time.

Agility: - Speed in changing body positions or in changing direction.

Speed:-Rapidity with which successive movements of the same kind can be performed.

Flexibility:-Range of movements in a joint or sequence of joints.

Statement of the Problem

The purpose of the present study was to find out the relationship between body composition and motor fitness of high school boys.

Limitations

- 1) The selected test items could not be administered to all the subjects under highly identical and controlled conditions, as the tests were administered on three different days.
- 2) The health status and motivation levels of the selected subjects at the time of test performance were beyond the control of the investigator.
- 3) Lifestyle of the subjects affecting their nutritional status and fitness levels and the data collected was beyond the control of the investigator.

Delimitation

1. The study was delimited to male subjects only
2. The study was delimited to the students studying in IX and X standards of high School. The subjects were in the age group of 14-15 years.
3. The study was delimited to only one hundred students (n=100), who volunteered to serve as subjects in the study.
4. The study was delimited to the measurement of BMI (height – weight ratio) and administration of J.C.R. test for measuring motor fitness.
5. The stud was delimited to only correlational study

Hypothesis

For the purpose of the present study it was hypothesized that the body composition and motor fitness are independent of each other.

IV. SIGNIFICANCE OF THE STUDY

The study was be justified as worthwhile on the following grounds.

- 1) The study undertaken by the investigator is significant in the present social context and will be of use of keeping track, body mass and fitness of students. The results may provide baseline from which goals can be set and measured.
- 2) As the school students grow into adulthood at a later stage, knowledge and the results of the study if fed back to the students, may help them in modifying goals for developing the derived level of fitness and body mass.
- 3) Body mass with excess for invariably leads to impaired athletic performance because of reduced power to weight ratio. It is found to affect motor fitness too, which is fundamental to movement, skills and efficiency.

V. REVIEW OF RELATED LITERATURE

Oklay 4 and others examined association of fundamental movement skills (FMS) with measures of body composition. Among children and t-adolescents. Secondary analyses of cross-sectional data collected from 4,363 children and adolescents in Grades 4,6,8, and 10 as part of the 1997 New South Wales Schools Fitness and Physical Activity Survey were conducted. Six FMS (run, vertical jump, throw, catch, kick, and strike) were assessed by observation. Height and weight (used to calculate body mass index; 8MI) and waist circumference were directly measured. Results indicated that the children's and adolescents' ability to perform FMS was significantly related to 8MI and waist circumference. Specifically, 8MI and waist

circumference were significant predictors for FMS in six of the eight demographic groups. Adjusted odds ratios revealed that overweight boys and girls in all grades were less likely to possess high levels of FMS and more likely to possess low levels of FMS than those who weren't overweight. When FMS were partitioned into locomotors and object-control skills, non over weight boys and girls in each grade were two to three times more likely to possess more advanced locomotors skills than overweight boys and girls. However, for object-control skills, the only demographic groups in which non over weight students possessed a greater number of advanced skills than overweight students were boys in Grades 6 and 10. There appear to be significant and important association between performance of locomotors skills and weight status among children and adolescents. This would suggest that intervention strategies to prevent unhealthy weight gain among children and youth might usefully include increasing proficiency of locomotors skills as a key component.

VI. METHODOLOGY

The purpose of the present study was to find out the relationship between body composition and motor fitness of high school boys. In this chapter the selection of subject sample for the present study, variable selected procedure of measurement of body mass index and procedure of test administration, collection of data, design of the study and statistical technique employed have been present.

Sample

The sample for the present study was compared of 70 male high school students ranging in age between 13-16 years.

Variables Selected for the Study

- Body mass index was considered the independent variables (X)
- Motor fitness was considered as the dependent variable (Y)

Body Mass Measurement

Body Mass Index (BMI)

BMI stands for Body Mass Index. It is a measure of body composition. BMI is calculated by taking a person's weight and dividing by their height squared. For instance, if your height is 1.82 meters, the divisor of the calculation will be $(1.82 * 1.82) = 3.3124$. If your weight is 70.5 kilograms, then your BMI is $21.3 (70.5 / 3.3124)$ (see calculator links below).

The higher the figure the more overweight you are. Like any of these types of measures it is only an indication and other issues such as body type and shape have a bearing as well. Remember, BMI is just a guide - it does not accurately apply to elderly populations, pregnant women or very muscular athletes such as weightlifters.

Calculate BMI

For the rest of the world, there is a [metric version](#) for entering height in meters and weight in kilograms.

Test Details

Equipment required: Scales and stadiometer as for weight and height.

Procedure: BMI is calculated from body mass (M) and height (H). $BMI = M / (H \times H)$,

Where M = body mass in kilograms and H = height in meters. The higher the score usually indicating higher levels of body fat.

Test and Administration Procedure

JCR Motor Fitness Test

Jump Vertical Jump Test

Aim of the Test

To Measure the power of the Legs.

Chin Up

Aim of the Test

To measure the muscular endurance of the arms and shoulder girdle in pulling the body upward.

Shuttle Run

Aim of the Test: To measure the speed and agility

Equipment and Materials: Bank boards, stop watch

Collection of Data

The body mass index that is a measurement of height and weight was measured as per the instructions given in the literature. The scores were in numerical form. That represented the data in impact of the independent variables (X). The JCR motor fitness test which is a battery of three items. Viz. : Vertical Jump, (Power of the leg) Chin-ups (to measure the muscular endurance of the arms and shoulder girdle in pulling the body upward.) And Shuttle Run (measure for Speed & agility), was administered to the subject in the present study the measurement was taken as per instruction in the literature. The scores of each subject in each of the three test items that were in numerical form, represented the data in respect of the dependent variables (Y).

Design of the Study and Statistical Procedure

The present study was designed to be a correlational study involving the investigating the investigation of the possible relationship of Body Mass Index (X) to motor fitness of high school boys co-efficient of correlation 'r' was computed to find out the relationship of independent variable to dependent variable.

VII. ANALYSIS AND INTERPRETATION OF DATA

The purpose of the present study was to find out the relationship between body composition and motor fitness of high school boys. To achieve the purpose of the study seventy (n=70) male high school boys. The subjects were in the age group of 13-16 years.

The sample of subjects selected for the present study were tested and measured for body mass and motor fitness. Body mass index was calculated for each subject as explained in methodology. The J.C.R. motor fitness test that comprised of three items was administered to the selected subjects as explained in methodology chapter. The items of the test battery were, Vertical jump (to measure power of the leg), Chin-ups (to measure muscular endurance and arms) and Shuttle run (to measure speed and agility).

Body mass index scores and performance scores of each subject in different items of the test gathered were in numerical form that represented the data for the present study. The data in respect of the independent and dependent variables were statistically analyzed.

The details of the analysis and the results of the study have been presented in table I.

TABLE I. CORRELATION COEFFICIENT VALUES

		Body Mass Index (BMI)	Vertical Jump (in inches)	Chin-up (Max. Nos.)	Shuttle Run (in seconds)	Total
BMI	cor	1	-.159	.194	.338(**)	.101
	Sig.	.	.190	.108	.004	.405
	N	70	70	70	70	70
V.Jump	cor	-.159	1	.449(**)	.113	.834(**)
	Sig.	.190	.	.000	.352	.000
	N	70	70	70	70	70
Chin-Up	cor	.194	.449(**)	1	.120	.562(**)
	Sig.	.108	.000	.	.322	.000
	N	70	70	70	70	70
S.H.	cor	.338(**)	.113	.120	1	.615(**)
	Sig.	.004	.352	.322	.	.000
	N	70	70	70	70	70
Total	cor	.101	.834(**)	.562(**)	.615(**)	1
	Sig.	.405	.000	.000	.000	.
	N	70	70	70	70	70

The figures presented in table 1 reveal the correlation coefficient calculated for finding the relationship of body composition (BMI) to all the three variables selected in the study.

The correlation coefficient calculated for finding the relationship of body mass index (body composition) with vertical jump (measure of power) was -.159 which was found to be non-significant ($p = .190$). The correlation coefficient calculated for finding the relationship of body mass index (body composition) with chin-ups (measure of muscular endurance) was -.194 which was found to be non-significant ($P = .108$).

The correlation coefficient calculated for finding the relationship of body mass index (body composition) with shuttle run (measure of speed and agility) was .338 which was found to be significant ($P = .004$).

It was concluded from the analysis of data and the remarks obtained in the present study that body composition (as measured by BMI) was positively and significantly correlated with the performance of the subjects in shuttle run test (measure of agility and speed). It was further concluded from the analysis of data that the relationship of body composition as measured by BMI was not significantly related to performance of the subjects in Vertical jump (to measure power of the leg) and Chin-ups (to measure muscular endurance and arms).

It may be concluded that body composition and speed and agility were significantly related to each other, where the hypothesis was rejected and that body composition and power of legs and muscular endurance of arms were not significantly related to each other. That is body composition and power of legs and body composition and muscular endurance of arms were independent of each other, and hence, the hypothesis was accepted.

The results of the study seem to agree with the study conducted by Hussey⁶ and others who reported in boys, body composition was increasingly related to fitness and to vigorous activity and was positively related to inactivity. In girls body composition was related to fitness but not the specific components of physical activity.

VIII. CONCLUSION

It was concluded from the analysis of data that body composition was not significantly related two motor fitness variables, Vertical jump (to measure power of the leg) and Chin-ups (to measure muscular endurance and arms).

RECOMMENDATIONS

- Similar studies may be conducted with a larger sample for reliable results.
- A large number of subjects divided into various categories on their body mass index values maybe considered to find out the difference as well as relationship of BMI to qualities of fitness.
- Intervention strategies for development of desirable BMI values should be recommended and suggested to students.
- Similar studies may be undertaken to find out the relationship of body composition with locomotor skills, individual physical fitness or motor fitness variables.

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