“STUDY OF PHYSIOLOGICAL, BODY COMPOSITION AND PSYCHOMOTOR VARIABLES OF BASKETBALL PLAYERS AT DIFFERENT LEVELS OF COMPETITION”

Abstract
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Supervised By: Dr. N. S. Deol, Head & Prof.
Dept. of Physical Education, Punjabi University, Patiala.

Submitted By: Amarpreet Singh

PUNJABI UNIVERSITY, PATIALA
INTRODUCTION

Physical activity is an inherent trait of a human living. It develops its own in a natural way. It becomes all the way imperative to identify the nature and the degree of this natural talent and to nurture, modifies and refines it to get the cherished outcomes. The children perform a lot of activities such as running, jumping, throwing, catching, kicking and striking etc. The activities are known as natural or universal skills.

The twenty first century is the most rapidly of changing century of all time. Rapidity of changes created unusual demands on individuals and on system of education. Today education must not only include the body and knowledge, but also to develop inquiring minds that will enable them to comprehend and accept what is to come tomorrow.

As Jacks, the british philosopher, put it, living becomes an art only, “When work and play, labour and leisure, mind and body, education and recreation are governed by single vision of excellence and a continuous passion for achieving it.

The developing tendencies in international sports, especially in team games are identified as the increase in game tempo, tougher body game and greater variability in technique and tactics. An increased performance level can only be achieved by working and training of all major components i.e. technique, coordination, tactics, physical fitness, physiological qualities and psychological qualities.

The theory of motor coordination is the basis for understanding the motor of coordination abilities. Motor coordination is part and parcel of actions regulation. Coordination abilities have also important and strong links with the motor skills as the motor coordination focus the basis of both. These abilities enable the sportsperson to do a group or set of movement with better quality and effect. Psychomotor abilities enable the sports man to do a group of movements with better quality and effect. The speed of learning of
skill and its stability is directly dependent on the level of various coordinative abilities. They are needed for maximal utilization of conditional abilities, technical skills and tactical skills (Hardayal Singh, 1991).

The accurate appearance of body composition is an important component in a comprehensive program of total physical fitness. The evaluation of body composition permits quantification of the major structural components of the body - muscle, bone and fat. With respect to health fitness, it refers to the percentage of body weight that is composed of fat as compared of fat as compared with fat-free or lean tissue. Having a high percentage of body fat is a serious detriment to fitness and health. Height and weight tables have been used traditionally used to determine desirable body weight. Individuals whose body weight exceeds set standards for their sex, age, and physical strature by 10% to 20% are considered over weight. persons over weight by 20% of their optimum weight are obese, and those who are overweight by more than 50% of their optimum weight are considered morbidly obese or super obese."

It should be noted that being over weight can be attributed to having an excess of either fatty tissue or lean tissue. For example, certain athletes such as football players could be classified as over weight however, when their body composition is examined, the excess weight is attributable to muscular development and their overall percentage of body fat is quite low (e.g., a professional football player can weight 250 pounds or more, yet have only 12 percent body fat or less).The important consideration with respect to health fitness is not the weight of the individual but how much fat the individual has.

It is highly important that professional and the public realize that a certain amount of adipose tissue or fat is essential for the body to function. Body fat also serves to protect internal organs. The goal of fitness programs is not the elimination of body fat but
helping individuals attain desirable levels of body fat. The average percentage of body fat is 18% for men and 23% for women. With respect to health fitness, the desirable level of the body fat for men is 12% or less and for women 18% or less. The percentage of body fat should not be less than 3% in men and 12% in women (the height percentage for women is necessary for the protection of the reproductive organs). Extremely low percentages of body fat are hazardous to one’s health.

A high percentage of body fat is associated with numerous health problems. Obesity contributes to an increased with other cardiovascular risk factors including hypertension. An increase incidence of diabetes, elevated serum blood cholesterol levels, respiratory problems, low back pain, and certain psychological problems are found among individuals with a high percentage of body fat. Mortality is higher at younger age, and life expectancy is decreased for chronically obese individuals.

The problem of obesity is widespread. It is estimated that more than 50% of the adult population and about 40% of the school-age population in the united states is overweight. Moreover, overweight children typically grow up to be overweight adult. Determination of the cause of obesity is important. In most cases obese can be attributed to overeating and a lack of physical activity. In a few cases however obesity can be the result of disease. When dealing with obesity particularly individuals who are super obese it is important that a physician be consulted. A physical examination and careful monitoring of eating and exercise habit are helpful in determining the cause of the problem. A qualified physician can offer guidance in designing and implementing a sound fitness program of obesity.
Body composition is primarily influenced by nutrition and physical activity. Although body composition is genetically related to body type the nature and amount of food consumed and the extent of participation in physical activity exert a profound influence on body composition. Overeating and low levels of physical contribute to poor body composition. Individuals who are fat tend to eat more and are more sedentary.

Body fat exists in two storage sites, or depots. The first depot, termed essential fat, is the fat stored in the marrow of bones and in heart, lungs, liver, spleen, kidneys, intestines, muscles, and lipid-rich tissues of the nervous system. This fat is required for normal physiological functioning. In the heart, for example, the quantity of dissectable fat determined from cadaver studies represents about 18.4g, or 5.3%, for an average heart weight of 349g in males, and 22.7g, or 8.6%, for an average heart weight of 256g in females (Womack, H.C, 1983). Standard body weight scales provide a measure of total weight, but don’t determine the lean-to-fat ratio of that weight. Standing on most scales can tell you only if you weigh more than the average person, but not if that weight is fat or muscle. Based only on scale weight, a 250-pound athlete with 8% body fat may be considered "overweight" by a typical weight chart. Such charts are not a good indication of ideal body weight for general health or for athletic performance. The ideal weight and fat-lean ratio varies considerably for men and women and by age, but the minimum percent of body fat considered safe for good health is 5 percent for males and 12% for females. The average adult body fat is closer to 15 to 18% for men and 22 to 25% for women. Athletes tend to be at low end of this scale due to their increased lean weight (muscle mass). While low levels of body fat seem to be related to improved performance, body composition alone is not a great predictor of sports success. A linebacker needs to have enough body
mass (lean and fat weight) to generate high forces and avoid injury. Body fat among elite athletes varies largely by sport. There is little evidence of any benefit when men drop under 8% and women drop under 14 percent body fat.

Different types of physique have specific advantages in specific sports. For instance, throwers at different levels of competitions are heavier and taller with long muscular arm and wider shoulders. In shot-put, discus and hammer throwing, greater body weight is beneficial because during throwing the object forward and upward, an equal and opposite reactive force is exerted on the throws, pushing him/her backward and downward. In different events of athletics and different games, specific physique is determined, for eg. In basketball and volleyball the average height of players are more as compared to hockey and soccer players.

Interest in body composition has developed in players with the increased application in parallel with the increased application of scientific methods and in sports medicine and exercise studies. The relationship between work capacity and body fat is of most concern to those involved in sports and physical education. Body composition helps to determine the biological age of the athletes, predicting the possibility of the success of them in specific sports. The evaluation of body composition permits quantification of the major structural components of the body-muscle, bone and fat. To study this section hydrometry, densitometry, somatometry or anthropometry is the main methods.

Bale (1991) studies the anthropometric measurements and performance of 18 junior female national basketball players of England. They were studies according to their playing positions and found that the central position players had taller physique and body compositions, followed by the forwards and guards. It was concluded
that the central positioned players were taller, had longer limbs, wider hips and had more lean body mass.

The Olympic basketball players are the tallest followed by the national team, the state level and district level players (Sodhi and Sidhu 1984). The controls were shortest among all. In general, there was a gradient of decreasing body size from the national team players to state level players through the district level players and the controls. The first mentioned were found to have proportionality longer upper and lower extremities, shorter trunk, broader hips and more slender chest. The somatotype indicated that the rating of ectomorphic components was greater in the case of the state level players than in the case of the other groups. However, it is interesting to note that the rating of mesomorphic component was not greater in these players. The Indian basketballers were, therefore, less muscular than their Olympic competitors. The lack of ectomesomorphic physique among Indians may be a limiting factor for their better performance in the International competitions.

In body composition, the basketballers had less of body fat than the controls. The state level players seemed to be less fatter, with more strongly developed knees and a better developed musculature in the limbs.

The basketballers are tall with longer upper and lower extremities which make them suitable to catch the ball with jumps, provide them with a wider reach during the passes and make it easier for them while throwing the ball into the basket. This also helps them to rebound and also to guard the ball to impede the action of an opponent.

**STATEMENT OF THE PROBLEM**
The purpose of this research work is:
“Study of Physiological, Body Composition and Psychomotor variables of Basketball Players at different levels of Competitions”.

OBJECTIVES

I. To find out the difference in psychomotor variables of school, college and university male basketball players.

II. To compare the physiological variables of school, college and university male basketball players.

III. To find out the difference of body composition variables of school, college and university male basketball players.

DELIMITATIONS

1. The research will be delimited to male basketball players.

2. The study will be delimited to male basketball players who have represented their schools, colleges and universities.

3. The study will be delimited to male basketball players ranging between 14 to 25 years of age.

4. The study will be delimited to one hundred fifty male basketball players (50 under-19 school players, 50 inter college players and 50 All India interuniversity players).

5. The study will be delimited to psychomotor, physiological and body compositions variables. These variables are:

I. PSYCHOMOTOR VARIABLES

   a) Speed
   b) Agility
   c) Orientation Ability
   d) Differentiation Ability
   e) Balance ability
   f) Rhythm Ability
   g) Reaction Ability
II. PHYSIOLOGICAL VARIABLES
   a) Vital Capacity
      i. FVC (Forced Expiratory Vital Capacity)
      ii. PEF (Peak Expiratory Force)
      iii. PIF (Peak Inspiratory Force)
   b) VO$_2$ max (Maximum Oxygen Consumption)

III. BODY COMPOSITION VARIABLES
   a) Body Fat
   b) BMI
   c) Visceral Fat
   d) Basal Metabolic Rate

HYPOTHESES
   I. It is hypothesized that there will be significant difference between psychomotor variables of male basketball players at their different levels of participations.
   II. It is hypothesized that there will be significant difference between physiological variables of school, college and university male basketball players.
   III. It is hypothesized that there will be significant difference between the body composition variables of school, college and university male basketball players.

SIGNIFICANCE OF THE STUDY:
Results of the study may be helpful in the following ways:
1. The results of the study will add new dimensions of knowledge in the field of physical education and sports with special reference to basketball players.
2. The study will help to quantify the psychomotor, physiological and body composition status of basketball players.
3. The study also reveal the role played by crucial psychomotor, physiological and body composition variables contributing to basketball performance.

4. The result of study may be helpful for scanning of future potential basketball players on the basis of psychomotor, physiological and body composition variables.

**DEFINITION/EXPLANATION OF THE TERMS**

**SPEED**

Theiss and Schnabel (1987) give the following definition of speed “It is the performance prerequisite to do motor actions under given conditions in minimum of time”.

**AGILITY**

According to Singh “Agility is defined as the ability of the body parts to change direction rapidly and accurately”.

**ORIENTATION ABILITY**

According to Hertz “It is the ability to determine the body position and its parts in time and space in relation to gravity, playing field, other players, ball, equipment etc”.

**DIFFERENTIATION ABILITY**

According to Singh “It is the ability to achieve a high degree of accuracy and economy (time adjustment) of separate body movements and mechanical phases of total movements. It is based upon conscious, precise distinction between force, space and space parameters of the motor process and those existing in the athletes mind”.
According to Singh, “it is the ability to achieve a high degree of accuracy and economy of separate body movements and movement phases in a motor action. It depends upon a person’s capacity to precisely differentiate between the minute differences in temporal, spatial and dynamic parameters of a movement compared to the movement concept.

**BALANCE ABILITY**

According to Singer, “The balance ability is the ability to maintain body positions which is necessary for the successful performance of the sports skills”.

**RHYTHM ABILITY**

Singh defines rhythm as, “The ability to perceive the externally and to reproduce it in motor action. It also denotes the ability to reproduce a rhythm existing in motor memory in motor action”.

**REACTION ABILITY**

Reaction ability is the ability to initiate quickly and perform rapid and well-directed actions following a signal.

According to Singh, “Reaction ability is the ability to react quickly and effectively to a signal”.

**VITAL CAPACITY**

Dill has defined “Vital capacity is the maximal volume of air that can be forcefully exhaled from the lungs following a maximal inspiration. Maximal volume of air forcefully expired after maximal inspiration.”

**VO₂ MAX**
Bye, had written the volume of oxygen we can consume while exercising at our maximum capacity can measure fitness. VO$_2$ max is the maximum amount of oxygen in millimeters, one can use one minute per kilogram of body weight.

VO$_2$ max is defined as, “The height rate of oxygen consumption attainable during maximal or exhaustive exercise.

HEMOGLOBIN CONTENT

Hemoglobin is a red colored protein located in erythrocytes, which transports most of the oxygen in the blood. Anologeneric protein composed of four polypeptide chains each of which contains a hemo group having a single atom of iron with which oxygen reversible combines.

BODY MASS INDEX

According to Katch and Katch ,“Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m$^2$). For eg. An adult weight 70 kg and height 1.75 m will have BMI=70(kg)/1.75$^2$(m$^2$) = 22.9.”

VISCERAL FAT

According to Goran, Visceral fat usually accumulates around the abdomen or lower part of the body. People with high visceral fat content are to be at high risk of developing lifestyle related illnesses such as diabetes, high blood cholesterol, etc. It is different from other body fat, also called intra-abdominal fat, and refers to the fat that surrounds the internal organs.
BODY FAT PERCENTAGE

According to Goran, Body fat percentage is the amount of fat tissue in your body as a percentage of total body weight. So if you weigh 180 pounds and have 36 pounds of fat, your fat percentage is 20 percent.

BASAL METABOLIC RATE

According to Goran, Basal metabolic rate is the amount of energy which our body needs to maintain normal function while at rest.

METHODOLOGY

PROCEDURE

In this chapter the selection of subjects, selection of variables, reliability of data, tester’s competency, subject’s reliability, administration of test and statistical analysis of data are described.

SELECTION OF SUBJECTS

For the purpose of the study 150 Basketball players were selected as subjects (50 All India interuniversity players, 50 inter college players and 50 under-19 school players). The subjects were thoroughly acquainted with the testing procedure as well as the purpose and significance of the study. A thorough orientation of requirements during the testing procedures and performance test were made for successful completion of study. The selected sample consists of 150 basketball male players under-19 school players, 50 inter college players and 50 all India interuniversity players. They were requested by the scholar to cooperate and to participate with utmost sincerity. Everything regarding the tests were made clear and finally requested to participate whole heartedly in the present study.
**SELECTION OF VARIABLES:**

On the basis of available literature in Physiology, Body Composition and Psychomotor Variables tests, the following variables were selected for this study.

I. **PHYSIOLOGICAL VARIABLES:**
   i. Vital capacity: This variable will be assessed by Spirometer with computer (spiroexcel) and measured the following:
      a. Forced Vital Capacity (FVC)
      b. Peak Expiratory Flow (PEF)
      c. Peak Inspiratory Flow (PIF)
   ii. VO$_{2}$max: Maximum Oxygen Consumption will be assessed with the help of Rockport calculation.

II. **BODYCOMPOSITION VARIABLES:**
   i. Body Fat%: It will be analyzed with the help of Body Composition Monitor with scale HBF-361.
   ii. Visceral fat: It will be calculated with the help of Body Composition Monitor with scale HBF-361.
   iii. Body Mass Index (BMI): It will be calculated with the help of Body Composition Monitor with scale HBF-361.
   iv. Basal Metabolic Rate (BMR): It was calculated with the help of Body Composition Monitor with scale HBF-361.

III. **PSYCHOMOTOR VARIABLES:**
   i. Speed Ability: Speed will be measured by applying a standard test of 50 yards dash (Johnson, Borrey and Nelson, Jack K.1988).
   ii. Agility: Shuttle Run will be to measure Agility of the Basketball Players (Johnson, Borrey and Nelson, Jack K.1988).
   iii. Differentiation Ability: It will be determined by using backward medicine ball throw test and will be recorded in
iv. Orientation Ability: It will be assessed by using medicine ball run test and will be recorded in 1/100th of second.

v. Balance Ability: This variable will be assessed by using ‘Stork Stand Test’ and will record in 1/100th seconds.

vi. Rhythm Ability: It will be measured through ‘Straight and Rhythm Run Test’ and will record in 1/100th second.

vii. Reaction Ability: This variable will be evaluated by using ‘Visual Reaction Timer’ and will record in 1/100th seconds.

STATISTICAL ANALYSIS OF DATA

With regard to purpose of the study Mean, Standard Deviation and ‘t’ test were calculated. Technique of One-Way Analysis of Variance (ANOVA) was also used to study the significance of difference in selected Physiological, Body Composition and Psychomotor Variables between three different competition levels. Scheffe Post-hoc test will be applied to find out Mean Differences among different levels. In order to check the significance, level of significance was set at 0.05.

References:


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