

## Comparative Study of Selected Physical and Physiological Variables of Male Basketball Players at Different Levels of Competition

Lalit Mohan Tiwari<sup>1</sup>, Manoj Singh<sup>1</sup> and Bhagwat Singh<sup>2</sup>

<sup>1</sup>Department of Physical Education, Punjabi University, Punjab - 147 002, India

<sup>2</sup>Post Graduate Govt. College, Chandigarh - 160 011, India  
E-mail : drlalhitiwary@gmail.com

(Received on 05 December 2011 and accepted on 03 February 2012)

**Abstract** - The purpose of the study was to compare the physical & physiological variables among the Inter District & Inter State Levels of Basketball players. Sixty (60) Male basketball players (30 inter district and 30 interstate) were randomly selected from Uttar Pradesh as a subject. The age of the subjects were ranged from 17-28 years. It was hypothesized that there would be a significant difference in the physical fitness variables and physiological variables among the Indian basketball players of different levels of competitions. The physical variables chosen were speed, endurance and power which were measured by 50m dash(sec), 2.4km. run(min.) and sergeant jump. The physiological variables were resting heart rate measured by manual methos and vital capacity which is measured by dry spirometre. The data collected on the different level of basketball player were analyzed by independent "t" test. The level of significance for testing the hypothesis was set at 0.05 level of confidence. It is found that the inter state level players were better than inter district players with respect to speed, power and endurance. In terms of physiological variables namely RHR and vital capacity both the group were not differ significantly.

**Keywords:** Vital Capacity, Power, Resting Heart Rate, Spirometre

### 1. INTRODUCTION

In today's age of scientific knowledge man is making rapid progress in all walks of life including the area of games and sports. The progress of games and sports may be attributed to the scientific invention for the performance of sportsmen and women, improved scientific and specific training methods and also to the better understanding of the human organism. The performance in most of the sports is determined by such factors as physical fitness, techniques and tactics, though their relative contribution varies from sport to sport. In addition of these, other factors like physique, body composition and psychological traits also have an overall effect on the performance. These factors also influence the physical fitness status and technical and tactical capabilities of the sportsman. Of all these factors the most important one that of the physical fitness, as a high level of efficiency in techniques and tactics are also dependent upon physical fitness. Therefore, it is necessary that during the selection of sportsmen for competition a relatively high weightage should be given to

physical fitness. It has been recognized by experts and sports scientists that performance in basketball team game does not directly depend upon the mastery of skills but also on the optimum development of physical, psychological, and physiological capacities of the athletes. High level performance in basketball not only requires certain physical qualities like speed, endurance, explosive power, agility, flexibility, strength etc., but also physical structure. In addition to the techniques and tactics of a player or a team, physical and physiological characteristics help him for his better performance. The physical & physiological fitness of sportsmen differ at different levels of competitions. Therefore in the present study the investigator intends to find out the differences in physical & physiological fitness of Indian male basketball players at different levels of competitions.

Gilbert (1969) investigated a study of selected variables in predicting basketball players. It was demonstrated that a battery of four independent variables selected from a total of 10, best reflect composite basketball ability and performance at the college level. These four variables are ability criterion, arm strength, penny-cup test, and speed pass test. However, since the derived multiple 'r' of 95 was not reached. This limits the utilization of this battery as a predictive measure of basketball ability.

Gallagher (1970) conducted a study on the relationship of agility to performance in Women's inter collegiate basketball. The hypotheses were that high positive relationships would exist between items of the test (Mc Canliff Agilit Components Test) and performances were not supported. The lack of evidences to support the hypotheses was attributed to some unexpected peculiarities of the sample and several recommendations were made for continued investigation.

Harbin, (August 2000) conducted a study on differences in the physical fitness levels between home school students and public school students were investigated. The presidents challenge physical fitness and sports test battery was used to measure the physical fitness levels. The statistical analysis indicated that the home school students were significantly more physically fit than the public school students in the areas

of upper body strength and endurance, flexibility and cardiovascular endurance. There was no significance difference in abdominal strength and endurance between home school and public school students comparisons made with the state scores revealed that students from south Alabama scores higher than the Public school students across the state of Alabama, with the exception of upper body strength and endurance and cardiovascular endurance for formal public school students. When the data from this research were compared to the national norms, 56% of the female home school students, 48% of the male home school students 39% of the male public school students, and 35% of the female public school students scored above the 50<sup>th</sup> percentiles. Since physical fitness assessment of home school students is a new field of research, there is a paucity of empirical evidence to support or reject these findings.

Pease (1981) conducted a study on the relationship of selected hand and wrist measurements to ability to shoot in basketball. In this study 64 college age males were selected as the subjects and he concluded that speed of hand was only significant predictor of the ability to shoot in Basketball.

Gordan (1965) predicted basketball playing ability from cardio-vascular capacity, leg power, upper body strength, endurance, body composition and body weight. Twenty women varsity basketball player were selected as subject for this study. Field test were selected and administer for each of the variables. Separate prediction equations were development for five criterion measures an ability rating consisting of four offensive – defensive descriptive items, the Tuko-Richards General Personality Ratings. A composite score of two measures of null comparative rating scale, which utilized game statistics and ranking of the players. The data were analyzed by the step-wise multiple regression programme. The best prediction equation was found to be: Basketball Ability = 9.053 + 1.364 (12 min. run) – 0.113 height.

Raymond (1970) investigated the characteristics of potential college basketball players. Basketball coaches from four classes of institutions were surveyed in an attempt to identify those characteristics which coaches demanded in recruiting school athletes. The four classes of institutions were state colleges, and private colleges, state universities and private universities. Thirty-six characteristics and private universities. Thirty-six characteristics were analyzed under five categories, attitude and personality, playing experience, physical qualities, mental ability, and financial need. Mean ratings were determined for each characteristic and each

category. No significant difference was found between the types of institutions and the qualities looked for in the recruiting practices.

Gardan (1978) predicted Basketball playing ability of college women by selected tests. The purpose of this study was to determine the value of cardio-vascular capacity measure (Cooper's 12 Minutes Run) leg power measure (Modified Sergeant Jump-Reach) or upper body muscular strength and endurance (flexed arm hang), a percentage of body fat measure (skin fold thickness), and measure of body height as predictors of basketball playing ability and to develop a statistical equation for predicting success in playing college basketball. The Basketball playing ability or criterion measures were ability rating, personality ability rating, composite ability/personality rating, null comparative rating scale, and ranking of the players by the coaches. The sample was twenty female basketball players from the 1976-77 university of Arkansas and North Eastern Okalahoma State University teams. Ten players from each school participated in the study.

Toner (1982) investigated the relationship of selected physical fitness and mood variables success in female high school basketball candidates. The study examined the relationship of physical fitness, skills, and mood variables to success in female high school basketball players being chosen to become varsity players. Mc Nair's profile of mood states, Cooper's 12 minutes run test, Aahprer jump and reach test, Aahper shuttle run test, 30 yard dash, Aahper under basket test and speed dribble test were administered to eighty one female high school basketball candidates. Each of the three teams was treated on three separate occasions during the regular afternoon practice time of the teams. At the end of the testing and evaluation period, few coaches on the basis of their observations during drills and scrimmage competition independently related each candidate as either a successful or an unsuccessful performer. Discriminant analysis procedures supported the following hypothesis (a) The fitness factor, skill testing and personal factors (known together as pre-season variables) were successful indicators of group membership while the POMS variables were to a lesser extent (b) the battery of tests pre-season and POMS did correlate with coach's ratings.

## II. METHODS

Sixty male basketball players (30 inter district and 30 interstate) were randomly selected from from Uttar Pradesh as a subject. The age of the subjects were ranged from 17-28 years.

**A. Selection of Variables**

TABLE I PHYSICAL FITNESS VARIABLES

Variables	Tests
Power	Sargent Jump (cm.)
Endurance	2.4(k.m) Run/Walk (min.)
Speed	50 Yard Dash Run (sec)

TABLE II PHYSIOLOGICAL VARIABLES

Variables	Tests
Resting Pulse Rate	Palpation of radial artery (beats/min)
Vital Capacity	Dry Spirometer (liters)

**III. HYPOTHESES**

1. It was hypothesized that there may be significant differences in the physical fitness variables among the Indian basketball players of different levels of competitions.
2. It was hypothesized that there may be significant differences in the physiological variables among the Indian male basketball players of different levels at competitions.

**IV. COLLECTION OF DATA**

**A. 50 Yard Dash**

**Objective:** The purpose of the test was to measure the speed of the subjects in running.

**Equipment:** Clappers and stopwatches.

**Description:** On a 400-meter track, a 50-yard distance was marked with starting and finishing lines. After a short warm up, the subjects took their position behind the starting line. On the sound of the clapper, the subjects started their race in pairs and ran as fast as possible up to the finishing line.

**Scoring:** The time was recorded to the nearest 1/100<sup>th</sup> of a second.

**B. Power (Sargent Jump)**

**Objective:** To measure the explosive strength of the leg.

**Equipment:** Marked black board, chalk powder.

**Description:** The subjects were assembled in batches and apprised of the objectives of the test and the test was fully described. A black board was fixed on the wall and was marked in segments of measuring from the ground upward. In this jump, the individual swings his arm downward and backward taking a crouch position with knees bent

approximately to a right angle. The subject pauses in this position to eliminate the possibility of a double jump and leaps upward as high as possible, swinging the arms forcefully forward and upward. As the subject reaches the highest point of the jump he swings the arm forward and downward, motion being timed to coincide with the height of the jump. The specified movements in executing the jump are extremely important. Each subject was given three chances. The subjects were asked to stand close to the wall with heels on ground and touch the board with fully stretched hand and reading of height was recorded. He then put chalk powder on fingers. As he jumped and touched the blackboard, the powder left, a mark on the board and this reading was recorded.

**Scoring:** The difference between the initial reading (standing) and final reading (jump) was calculated and this was considered the score of vertical jump.

**C. Endurance (2.4 km)**

This test measures the basic endurance of the subject, which is dependent on the maximum aerobic capacity of the individual. The test was administered on a 400-meter track in groups of 8 to 10 persons at a time. The subjects started running on hearing the start signal and were required to run six rounds. Keeping close to the inner edge of the track, the subjects were instructed to pace the run evenly. If any subject was tired, he was allowed to slow down or even walk for some distance, to recover and resume running there after. One timekeeper for two subjects recorded the time to complete the six rounds of the track.

**Scoring:** To complete six rounds of the track, time was recorded in minutes and seconds.

**D. Resting Pulse Rate**

The pulse rate was counted by palpating at the wrist (radial artery) for one minute. The score was expressed in terms of number of pulse beats per minute.

The test was conducted in the morning 07:00 hrs when the subjects were at rest.

**Scoring:** Total number of pulse beats per minute for each subject was recorded as the score.

**E. Vital Capacity**

**Equipment:** Dry spirometre

**Procedure:** Vital capacity was measured in liters by using dry spirometre. The spirometre was brought in zero position. The subject performs maximum inspiration and after closing the nose the air was breathed out as intensely as possible into the

mouthpiece. The amount of air expired was read directly from the calibrated scale. Best of the three trials were recorded in liter per minute. The Mouthpiece was sterilized with rectified spirit after every three trials.

**Scoring:** The reading shown by the calibrated scale is seen and the vital capacity is recorded in liters.

**V. STATISTICAL PROCEDURE**

To determine the differences in selected physical and physiological variables of basketball players at different level of participation (viz. Inter district & Inter state), an Independent 't' test was used. The level of Significance was set at 0.05 levels ( $p < 0.05$ ).

**IV. RESULTS**

Findings pertaining to each of the selected physical & physiological variables of different groups which were subjected to the 't' ratio & mean difference method has been given in Table.

Table III reveals that there were significant differences in speed, endurance & power variables as the obtained 't' value is higher than the required 't' value.

Table III shows that Inter State Level players were significantly superior in speed, endurance and power variables as compared to the Inter District Players.

TABLE III SIGNIFICANCE OF DIFFERENCE OF MEANS IN PHYSICAL FITNESS VARIABLE AT DIFFERENT LEVEL OF COMPETITION

Variable	Mean of Inter District	Mean of Inter State	D.M.	$\sigma$ DM	't' ratio
Speed	6.96	6.34	0.62	0.36	1.68*
Endurance	14.01	9.91	4.1	0.66	6.21*
Power	40	59.1	19.1	1.89	10.10*

Significant at 0.05 level  
 $t_{(0.05)}(58) = 1.671$

TABLE IV SIGNIFICANCE OF DIFFERENCE OF MEANS IN PHYSIOLOGICAL VARIABLES AT DIFFERENT LEVEL OF COMPETITIONS

Variables	Mean of Inter District	Mean of Inter State	DM	$\sigma$ DM	't' ratio
Resting Heart Rate	69.53	67.76	1.77 7716	3.47	0.51
Vital Capacity	3.38	3.54	0.16	2	0.08

\*Significant at 0.05 level  
 $t_{(0.05)}(58) = 1.671$

From Table IV it is revealed that the 't' ratio obtained was not significant in the case of all physiological variables i.e., resting heart rate, vital capacity as the observed 't' value is lesser than the required 't' value at 0.05 level of significance.

**VII. DISCUSSION OF FINDINGS**

**A. Physical Fitness Variables**

This may be attributed to the fact that these factors are contributing factors to the performance in Basketball game; therefore much weightage is given to these components in training of Basketball players.

Secondly at higher stages/levels of competition the volume/intensity of the training increases which might

directly improves the different physical fitness components of the Basketball players. Moreover the total duration of training, i.e., training age is higher for state level players to that of Inter district players, which might also be a factor for the improved physical variables among Inter State Level Players.

As Basketball is one of the fastest games of the world, the game requires a high speed to play the game. Explosive leg strength (power) is required for better rebounding, shooting & other related skills. As the game has to be played for a long duration at a high speed a high level of endurance is required.

**B. Physiological Variables**

In general Resting Heart Rate & vital capacity of an individual reflect, general Cardio Vascular Endurance for e.g.:



a marathon runner or a swimmers in general will have lower Resting heart rate & at the same time very high vital capacity if we closely look into the physiological foundation of basketball we might say that speed explosive strength, endurance are directly linked with performance. However, resting heart rate & vital capacity will not have much waightage to cardiovascular endurance specific to basketball. Player & as such these two components are not having much / directly contribution to playing ability of basketball players therefore for above stated reason significant differences between physiological parameters was not found between Inter State & Inter District Level Basketball players.

### VIII. TESTING OF HYPOTHESIS

It was hypothesized that there may be significant difference between Inter district & Inter state level players in relation to selected physical & physiological variables. The study exhibited the insignificant difference between Inter state & inter district level players in relation to all physiological variables, hence the hypothesis is not accepted at this level, but present study shows the significant difference between inter state & inter district level players in relation to speed, power & endurance hence the hypothesis is accepted at this level.

### IX. CONCLUSIONS

Based on the findings and with in the limitations of the present study the following conclusions are drawn:

1. The Inter State level players are better than Inter District play with respect to speed, power and endurance.
2. In terms of physiological variables namely resting heart rate and vital capacity both the groups do not differ significantly.

### REFERENCES

- [1] Gallagher Donna, "The Relationship of Agility to Performance in Women's Inter-Collegiate Basketball", *Completed Research in Health, Physical Education and Recreation*, Vol. 12, pp. 221, 1970.
- [2] Garden Patricia, "Prediction of Basketball Playing Ability of College Women by Selected Tests," *Dissertation Abstracts Internationa*, Vol.38, pp. 3449, 1978.
- [3] Gilbert R.Raymond, "A Study of Selected Variables in Predicting Basketball Players," *Completed Research in Health, Physical Education and Recreation*, Vol. 11, pp. 204, 1969.
- [4] P.A. Gordon, "Prediction of Basketball Playing Ability of College Women by Selected Test", *Completed Research in Health, Physical Education and Recreation*, Vol. 21, pp.225,1979.
- [5] Harbin Huff Nancy, "A Comparison of Physical Fitness Levels of Home School and Public School Students in Alabama", *Dissertation Abstracts International*, Vol. 61, pp. 544, 2000.
- [6] Pease G. Dale, "Relationship of Selected Hand Wrist Measurements to Ability to Shoot in Basketball," *Perceptual and Motor Skills*, Vol. 52, pp. 793, 1981.
- [7] Raymond E Lloyd., "Identification of the Important Characteristics of Potential College Basketball Players," *Completed Research in Health, Physical Education and Recreation*, Vol. 12, pp. 136,1970.
- [8] Smith S. Harald, "The Relationship of Volleyball Playing Ability to Score Achieved in the Sargent Jump," *Completed Research in Health, Physical Education and Recreation*, Vol. 11, pp.229, 1969.
- [9] Toner Mark Keven, "The Relationship of Selected Physical Fitness Skills and Mood Variables to Success in Female High School Basketball Candidates", *Dissertation Abstracts International*, Vol. 42, pp. 390, 1982.