International Journal of Physical Education, Exercise and Sports
www.physicaleducationjournal.com
Online ISSN: 2664-9896
Received: 28-11-2025, Accepted: 26-01-2025, Published: 10-02-2026
Volume 8, Issue 1, 2026, Page No. 13-18

Correlation between physiological and psychological characteristics and performance in the university level Basketball players

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Abstract
The selection of subjects, selection of variables, Selection of test/ questionnaire, administration of tests/ questionnaire and statistical technique used for analysis of data have been described. The data gathered were analyzed by appropriate statistical techniques. The results of the analysis of the gathered data revealed that most of the variables selected for the purpose of the study were significant in relation to their basketball performance. Though, some of the variables did not show significant relationship to their Basketball performance
The results of the study indicate an insignificant relationship in speed with the basketball performance of basketball players. The results of the study indicate an insignificant relationship in speed with the basketball performance of basketball players. The results of the study indicate an insignificant relationship in speed with the basketball performance of basketball players.
A significant relationship was also found in case of the psychological characteristics selected for the purpose of the study. These psychological characteristics were anxiety and locus of control. As it is evident from previous researches that higher achievers have better locus of control than the lower achiever. A significant relationship was also found in case of the psychological characteristics selected for the purpose of the study. These psychological characteristics were anxiety and locus of control. As it is evident from previous researches that higher achievers have better locus of control than the lower achiever.
In Physiological characteristics all the four selected variables were found to be significant i.e. aerobic power, anaerobic power, vital capacity and resting pulse rate. In Physiological characteristics all the four selected variables were found to be significant i.e. aerobic power, anaerobic power, vital capacity and resting pulse rate.

Keywords: Aerobic power, anaerobic power, vital capacity and resting pulse rate, anxiety, locus of control

Introduction

Selection of Subjects

For the purpose of this study one hundred and fifty university level male basketball players were randomly selected from the west zone interuniversity basketball tournament. The ages of the subjects were between 18 and 27 years.

Selection of the Variables

On the basis of literary evidences and scholars own understanding, the following physiological and psychological variables were selected for the purpose of the study: -

Physiological characteristics

a. Vital capacity
b. Resting pulse rate
c. Aerobic power
d. Anaerobic power

Psychological characteristics:

a. Anxiety
b. Locus of Control
c. Aggression
d. Self - Concept

Criterion Measures Physiological Characteristics

1. To determine the aerobic capacity, Astrand Nomogram was employed, and recorded in liters per minute.
2. To determine the anaerobic capacity, Sargent Jump-Lewis Nomogram was employed, and recorded in Kg-m./sec.
3. Resting pulse rate was measured by manual method at radial artery, over a period of one minute and recorded in numbers.
4. Vital Capacity was measured by dry Spirometer and recorded in liter.

Psychological Characteristics

1. Anxiety was measured by using Sports Competition Anxiety Test (SCAT), questionnaire developed by Renier Martin.
2. Aggression was measured by using Sports Aggression Inventory, questionnaire developed by Anand Kumar and Prem Shankar Shukla.
3. Self-concept was measured by using Self Concept Questionnaire, developed by Mrs. Pratibha Dev.
4. Locus of Control was measured by Locus of Control Questionnaire (LCQ), developed by Rotter.

The Basketball performance was measured by panel of a three experts and recorded in points.

Selection of Tests / Questionnaire

The tests used in this Study for the collection of data were selected because they were found to be most reliable and have been used very often in the profession of physical education and sports throughout the world. The reliability quotients as given in the manuals of respective tests are as under.

Administration of tests

Aerobic Power

Objective: To measure Aerobic Power with the help of Astrand Nomogram.

Equipments: Weighing machine, stop watch, stepping bench, and metronome.

Description: The score of pulse rate was obtained in numbers. Metronome was set at the pace of 90 counts per minute. At the signal 'go', the subject started stepping up and down (four count per step exercise) for one minute. After stepping up for one minute, pulse rate was counted for one minute.

The body weight was obtained in kilograms.
Scoring: To obtain a score of aerobic power, the two points of body weight and pulse counts per minute are joined together from the VO 2 scale where the line crosses the scale. Aerobic Power (Appendix VI) was measured in liters per minute.

Anaerobic Power
Objective: To measure the Anaerobic Power with the help of Sargent jump test.

Equipments: Measuring tape and chalk power.

Description: Anaerobic power of each subject was recorded by conducting Sargent Jump Test. Subjects were asked to stand beside the wall (of at least 12 feet high) with heel together and a piece of chalk in hand. In this position the subject had to stretch their arm upward as high as possible and made another mark on the wall at the maximum height of his jump. Two trials were given to each subject and the best was recorded. The score of the vertical jump was obtained in centimeter by calculating the perpendicular distance between the subjects's standing reach and the height to which he touched with jump. Then a straight line was laid between the score of vertical jump and the weight of the subject in kilogram across the Lewis Nomogram (Appendix III) and the point at which the line intersected the nomogram was the anaerobic power of the subject.
Scoring: Anaerobic power was measured in Kg.m/sec.

Vital Capacity
Equipments
Dry Spirometer

Description
The Spirometer was brought to zero position. The subjects performed maximum inspiration and after clipping the nose, the air was blown out as intensely as possible in the mouth piece.

Scoring: The amount of expired air was read directly from the calibrated scale and that was the score of vital capacity and was recorded in liters. [1]

Resting Pulse Rate
Equipment
Stopwatch, Stethoscope and comfortable place or bed.

Descriptions
The resting Pulse rate of each subject was recorded between 6:00 am to 7:00 am. Before recording the resting pulse rate, the subjects was instructed to remain take rest on their bed. By using the pulpatory method (pulse rate count) or stethoscope on the chest per minute heart rate was counted.

Scoring
Score was recorded in numbers of pulse per minute.

Anxiety
The Sport Competition Anxiety Test is latest and most popular sport specific anxiety test whose purpose, as 'claimed' by the authors is to assess individual differences in competitive anxiety or the tendency to purpose competition situations on threatening and/or to respond to these situations with elevated state anxiety.
The sports competitions anxiety test (SCAT) contains fifteen items. Subjects are asked to indicate how generally when they compete in sports and games feel, and respond to each item using a three point ordinal scale (Hardly ever, Sometimes, or Often). Ten of the items assess individual differences in competitive trait anxiety prove ness; five spurious items are also included to reduce possible responses bias. Total scores of the SCAT range from 10 (low competitive trait anxiety) to 30 (high competitive trait anxiety).
The ten items are 2, 3, 5, 6, 8, 9, 11, 13, 14 and 15. The spurious items are 1, 4, 7, 10, and 13are not scored. Items 2, 3, 5, 8, 9, 12, 14 and 15 are worded so that they are scored according to following key:

1. Hardly ever	=	1
2. Some times	=	2
3. Often	=	3

Items 6 and 11 are scored according to following key:
1. Often = 1
2. Sometimes = 2
3. Hardly ever = 3

If a person one of the 10 test items, prorated full scale score can be obtained by computing the mean score for the nine items answered multiply this value by ten and rounding the product to the next whole numbers. When two or more numbers are omitted, the respondent's questionnaire should be invalidated. For each, in hand scoring template was made.

Aggression
The aggression was measured by the Sport Aggression Inventory developed by Mr. Anand Kumar and Mr. Prem Shankar Shukla. The questionnaire was distributed to all the players before/after the matches during the competition. The directions were read by the researcher at a dictation speed to make the subjects understand about what they are exactly required to do.
This inventory consists of 25 questions, in which 13 items are keyed "Yes" are 1, 4, 5, 6, 9, 12, 14, 16, 18, 21, 22, 24 and 25 and the statements which are keyed "No" are 2, 3, 7, 8, 10, 11, 13, 15, 17, 19, 20 and 23.

Scoring
For each item score was "1"- the maximum score may be 25 and minimum score may be "0".
Self-concept
Administration
The SCL can be used for the assessment of the individual for self-reporting approach or for the approach of observation by others. The main purpose of SCL is to help players in finding out and assessing what the individual

thinks of himself and through the assessment, motivation, learning and adjustment. The result can be used to assist the individual for better adjustment, better achievement and better success in life. The SCL consist 90 words by eliminating the opposite words and also some other words. This rating scale is on 5- point scale; the five points being, very much like this, much like this, uncertain, not much like this and not at all like this.

Scoring

Scoring of SCL is quick through the use of stencil hand scoring keys. There are separate transparent keys for positive and negative scores as well as for neutral words. A positive word marked carries a weight of +1, and a negative word marked a weight of -1. each aspect is scored separately.

Locus of Control

Administration

Rotter's Locus of Control scale is a self-administering test and can be administered individually or in groups. The instruction given on the test form is sufficient to take care of the statements that are given. The Rotter's Locus of Control Scale generally takes from 20 to 30 minutes. However no time limit should be given for the test.

The Locus of Control scale consist of 29 pairs of statement, 23 statements which are scored i.e. 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16, 27, 18, 20, 21, 22, 23, 25, 26, 28 and 29 and there are 6 filler statements (item no. 1, 8, 14, 19, 24 and 27) which are not scored.

Scoring

For each item score was "1"- the maximum score may be 23 and minimum score may be "0"

Reliability of Data

The reliability of data was ensured by establishing the instrument reliability, tester's competency reliability, reliability of the tests and subject's reliability.

Statistical Procedure

1. To find out the relationship of selected physiological and psychological variables to Basketball performance, product moment method of correlation was used.
2. To find out the combined relationship of set variables of physiological and psychological variables to Basketball performance, multiple correlation method was used.
3. To predict the Basketball performance on the basis of selected physiological and psychological variables, multiple regression analysis was used.
4. The level of significance was set at.05 levels.

Analysis of data and results of the study

In this chapter the analysis of the gathered data is interpreted. The data pertaining to physiological and psychological characteristics of the one hundred fifty university level basketball players were gathered for the purpose of the study.

The data collected were subjected to product moment correlation, multiple correlation and regression equation for analyzing the result. The level of significance was set at.05 level.

Findings

The relationships of physiological variables to Basketball performance was computed using product moment method of correlation which are presented in Table no. 1.

Table 1: Relationship of Physiological Variables to Performance in Basketball

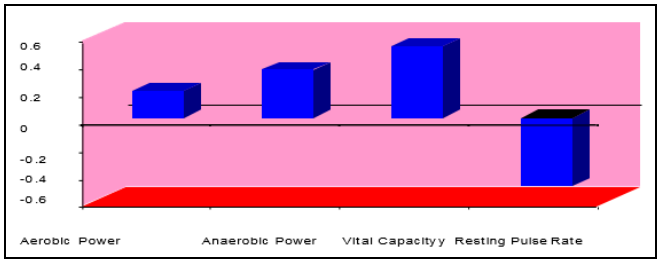
Correlation Coefficient	Variables	Correlation coefficient
	Aerobic Power	0.217*
	Anaerobic Power	0.316*
	Vital Capacity	0.522*
	Resting Pulse Rate	-0.488*

* Significant at.05 level.
r.05 (148) = 0.117

From Table 1 it is quite clear that there is significant relationship between physiological variables (aerobic power, anaerobic power, vital capacity, resting pulse rate) and Basketball performance when the computed value being 0.217, 0.316, 0.522 and -0.488 respectively is greater than the found value of 0.117 at 0.05 level of significance.

Figure 1

Relationship of Physiological Variables to Performance in Basketball



Physiological Variables

Combined contribution of physiological variables to performance in Basketball is presented in Table no. 1A.

Table 1A: Combined Contribution of Physiological Variables to Performance in Basketball

Criterion Variables	Independent variables	Coefficient of multiple correlation
Basketball performance(c)	Aerobic Power	0.544*
	Anaerobic Power	
	Vital Capacity	
	Resting Pulse rate	

* Significant at.05 level.

Table 1A clearly discloses that the Basketball performance is significantly related to the aerobic power, anaerobic power, vital capacity, resting pulse rate.

Multiple Regression Analysis

The multiple regression equation for predicting the performance of the Basketball players on the basis of relative contribution of four physiological variables resulted in the following –

$Y = 43.84 – 0.16 X1 + 0.015 X2 + .002 X3 – 0.29 X4$

Where,

Y = Predicted Basketball performance X1 = Aerobic power
X2 = Anaerobic power X3 = Vital Capacity
X4 = Resting pulse rate

The above-mentioned regression equation shows that the basketball performance depends upon the aerobic power, anaerobic power, vital capacity, resting pulse rate in a diminishing order.

The relationships of psychological variables to Basketball performance was computed using product moment method of correlation which are presented in Table no. 2.

Table 2: Relationship of Psychological Variables to performance in Basketball

Variables	Correlation coefficient
Anxiety	0.607*
Aggression	0.124
Self-Concept	-0.114
Locus of Control	0.876*

* Significant at.05 level.
r.05 (148) = 0.117

Table 2 indicates that there exists a significant relationship between psychological variables and performances as the correlation coefficient value were found greater than the tabulated value.187 at.05 level of significance. Psychological variables such as anxiety and locus of control were found significantly related to the performance with the found value of
.607 and.876 respectively. Though, insignificant relationships were found between aggression, self-concept and performance but overall contribution of psychological variables to performance in basketball found highly significant.

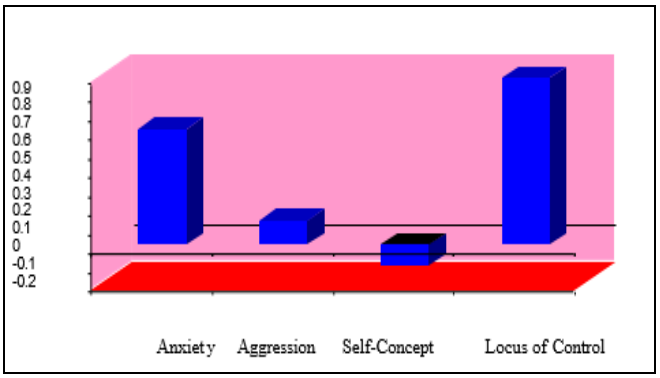


Fig 2: Relationship of Psychological Variables to performance in Basketball

Psychological Variables

Combined contribution of psychological variables to performance in basketball is presented in table no. 2A.

Table 2A: Combined Contribution of Psychological Variables to Performance in Basketball

Criterion Variables	Independent variables	Coefficient of multiple correlation
Basketball Performance(c)	Anxiety	0.894*
	Locus of control	

* Significant at.05 level.

Table 2A indicate that significant relationship between criterion variables (Basketball performance) and independent variables (anxiety and locus of control) was found.894which is higher than the tabulated value.188 as r being.05 (105).

Multiple Regression Analysis

The multiple regression equation for predicting the performance of the Basketball players on the basis of relative contribution of two psychological variables resulted in the following –

$Y = 26.27 + 0.27 X1 + 0.97 X2$

Where,

Y = Predicted Basketball performance X1 = Anxiety
X2 = Locus of Control

Discussion of findings

The data gathered were analyzed by appropriate statistical techniques. The results of the analysis of the gathered data revealed that most of the variables selected for the purpose of the study were significant in relation to their basketball performance. Though, some of the variables did not show significant relationship to their Basketball performance.

In Physiological characteristics all the four selected variables were found to be significant i.e. aerobic power, anaerobic power, vital capacity and resting pulse rate. The result has clearly indicated that all the physiological characteristics are some how connected with each other and closely effecting the working ability of each other. The vital capacity has the direct bearing on pulse rate, aerobic power and anaerobic power and vice versa. That is why the fact may be attributed to the lung capacity and its working conditions as it is directly associated with these physiological characteristics.

A significant relationship was also found in case of the psychological characteristics selected for the purpose of the study. These psychological characteristics were anxiety and locus of control. As it is evident from previous researches that higher achievers have better locus of control than the lower achiever. Therefore this result may be attributed to the fact that basketball players were national level players and may be considered as high achievers when compared to other grades of players. The previous studies have also proved that the optimum level of anxiety is always good for the performance. The result of present study proved to be in accordance with previous study as the analysis of data has also revealed that there exists a significant relationship of psychological characteristics with the basketball performance. The present result of the study is also supported by Hassain and Jones.

The results of the study indicate an insignificant relationship in speed with the basketball performance of basketball players. This may be attributed to the fact that, other significant physical variables might have affected speed component of the players.

In case of other two selected psychological variables i.e. aggression and self-concept the result indicated an insignificant relationship. As self-concept is a very complex psychological characteristic of an individual which is related to knowledge, past experiences of the individual right from the childhood. Therefore the basketball players might not have been able to exhibit this character. The result of the study also revealed an insignificant relationship aggression with the basketball performance in the players. Though the game of basketball is considered as most aggressive game but the result of the present study did not reveal a significant relationship in aggression with the basketball performance this may be attributed to the fact. That these players were of national level that have already been playing the game for a long time in various competition and tournaments and also

had undergone a systematic and scientific schedule for past several years and hence these players did not exhibit the aggressive character in them.

All the three regression equations may be used to predict the performance of basketball players since standard error of estimate was found less.

Conclusions

1. The relationship between Basketball performance and physiological variables i.e., aerobic power, anaerobic power, vital capacity and resting pulse rate were found to be statistically significant since, the obtained coefficient of correlation 0.217, 0.316, 0.522 and 0.488 were significant at.05 level of significance.
2. The result further reveled that set variables of aerobic power, anaerobic power, vital capacity and resting pulse rate were significantly related to performance in Basketball as the obtain multiple correlation was found to be.635 at.05 level of significance.
3. The multiple regression equation for predicting Basketball performance on the basis of relative contribution of four physiological variables resulted in the following-
   Y = 43.84 – 0.16 X1 + 0.015 X2 +.002 X3 – 0.29 X4
4. The relationship between Basketball performance and psychological variables i.e., anxiety and locus of control were found to be statistically significant since the obtained coefficient correlation.607 and.876 respectively were significant at.05 level of significance.
5. No significant relationship was found between Basketball performance and psychological variable i.e., aggression and self concept, as the obtained coefficient correlation of.124 and -.114 respectively were statistically not significant at.05 level of significance.
6. The Study further reveled that set variable of anxiety and locus of control were statistically significant to performance in Basketball as the obtained multiple correlation.894 was found to be significant at.05 level of significance.
7. The multiple regression equation for predicting Basketball performance on the basis of relative contribution of two psychological variables resulted in the following-
   Y = 26.27 + 0.27 X1 + 0.97 X2

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