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J Akil
Assistant Professor, Department of Physical Education, Health Education and Sports, Scott Christian College (Autonomous), Nagercoil-629003, Tamilnadu, India.

Dr. GP Sudheer
Reader and Head, Department of Physical Education, Christian College, Kattakada, Trivandrum, Kerala-695572.

Correspondence
J Akil
Assistant Professor, Department of Physical Education, Health Education and Sports, Scott Christian College (Autonomous), Nagercoil-629003, Tamilnadu, India.

A study on relationship of anthropometric measurements of pole vault players

J Akil, Dr. GP Sudheer

Abstract
The purpose of the study was to investigate the selected anthropometric measurements i.e. height, weight, arm length, leg length and speed of pole vault players. 20 male pole vault players Manonmaniam Sundaranar University inter collegiate meet were selected. To analyze the collected data, inter correlation matrix was employed. The finding revealed that there was significant difference in anthropometric measurements such as height, arm length and leg length. But there was no significant difference between weight and pole vaulting performance.

Keywords: Height, Weight, Arm length, Leg length and Pole vaulting performance.

Introduction
The relationship between performance and anthropometric characteristics has always been interesting for researchers (Rad and Mohammadi, 2013) [5]. The pole vault was born in Germany as a type of sport in the 18th century. The pole vault rules from 18th century till now have been approximately the same. But, the material of the pole always kept changing from solid wood, to bamboo, to glass fiber and to carbon fiber (Jahromi, *et al*., 2012) [3]. Pole vaulting is a very complex movement that requires the power and strength coupled with fine motor skills and a biomechanical and efficient technique (Scott *et al*., 1997) [6].
Although there are many techniques used by pole vaulters at various skill levels to clear the bar, the generally accepted technical model can be broken down into several phases such as approach run, plant, take-off, swing up, extension, turn and fly-away.
The main aim of the run-up is to arrive at the take-off with the maximum amount of controlled speed. At take-off, the vaulter plants the pole into the take-off box and executes an upwards running jump. The pole begins to bend under the effect of the momentum of the vaulter, and the vaulter and pole system rotates about the take-off box with the initial kinetic energy of the run-up being transformed into potential energy of the vaulter above the ground. As the pole bends and recoils, the vaulter rotates about the shoulders, and then pulls up on the pole so as to pass over the crossbar feetfirst. The peak height achieved by the vaulter is determined mostly by the kinetic energy at the end of the run-up, but there are also considerable energy losses in the pole plant and take-off phases and there is a significant positive contribution from the work done by the vaulter during the pole support phase (Stepp, 1993; Armbrust, 1997; Linthorne, 1994) [7, 1, 4].
Anthropometry as a study is a technique of expressing quantitatively the different forms of the human body. In other words, anthropometry means the measurement of human beings (Barreto and Mathog, 1999) [2].
It is a measurement for assessment of physical status was expected quite naturally to include consideration of body types and relation of physical to one's health, immunity from disease, positives physical performance and personality qualities. Measurements of body include in height, weight, limb length width and circumferences. There specific measurements of the segments reveal the relationship between anthropometry and performance.
These body segments help the top sports persons perform in aid require for the particular performance. Accordingly the body segments have a significant place in the body field of sports activities and incorrect body proportion may lead to bad performance. The physical fitness performers such as speed, agility, flexibility, stamina and endurance help a sports

person to make size and shape of the body to perform high skill the game. The parameters accommodate physical proportion and physical efficiencies. Human performance is a combination of many variables and one of them is the structure of body. All of the above factors that are age related what is perfect from for less tall, well built, motivated and dedicated players may prove inadequate as they, mature into fine players (Tanwar, 2013) [8].

1.1 Statement of the problem
The purpose of the study was to find out the relationship of anthropometric measurements of pole vault players.

1.2 Significance of the study
1. The results of the study might also be able to provide comparisons on the pole vaulting performance and improvement for the selected variables.
2. This study was examining the effect of pole vaulting performance and improvement for the selected variables among the male athletes.
3. This study would develop new concepts in improving their pole vaulting performance.

1.3 Hypothesis
There would be significant relationship between selected anthropometric measurement variables (height, weight, arm length and leg length) with respect to pole vaulting performance.

2. Methodology
2.1 Selection of Subjects
20 male pole vault players of Manonmaniam Sundaranar University inter collegiate meet were selected as subjects. The age of the subjects were ranged between 18 to 22 years.

2.2 Criterion Measures
The criterion measures of selected anthropometric measurements adopted in this study are as below:
- **a. Height**: To measure height, stadiometer was used and the measurement was taken in centimeter.
- **b. Weight**: Weighing machine was used and the score was recorded.
- **c. Arm length**: Measurement tape was used. It was recorded in centimeter.
- **d. Leg length**: Sliding caliper was used and the measurement was taken in centimeter.

2.3 Collection of Data
The necessary data on the selected anthropometric measurements of pole vault players were collected at inter collegiate meet of Manonmaniam University, Tirunelveli.

2.4 Statistical Analysis and interpretation of Data
The analysis of data collected on selected anthropometric measurement includes height, weight, arm length and leg length of pole vault players. The data pertaining to each of the selected variables were studied by Pearson product-moment correlation.

2.5 Level of significance
To find out the relationship of the selected anthropometric measurements of pole vault players, the level of significance was found at 0.05 level of confidence.

3. Results and Discussions

Table 1: Inter correlation matrix between pole vaulting performance and selected anthropometric measurements

Variables	Pole vaulting performance	Height	Weight	Arm length	Leg length
Pole vaulting performance	1				
Height	0.612	1			
Weight	-0.267	-0.138	1		
Arm length	0.568	0.647	-0.049	1	
Leg length	0.492	0.598	0.126	0.749	1

Table 2: Coefficient of correlation values between pole vaulting performance and selected anthropometric measurements

Variables	Obtained "r" values	Required "r" values
Pole vaulting performance and Height	0.612	0.44
Pole vaulting performance and Weight	-0.267	0.44
Pole vaulting performance and Arm length	0.568	0.44
Pole vaulting performance and Leg length	0.492	0.44

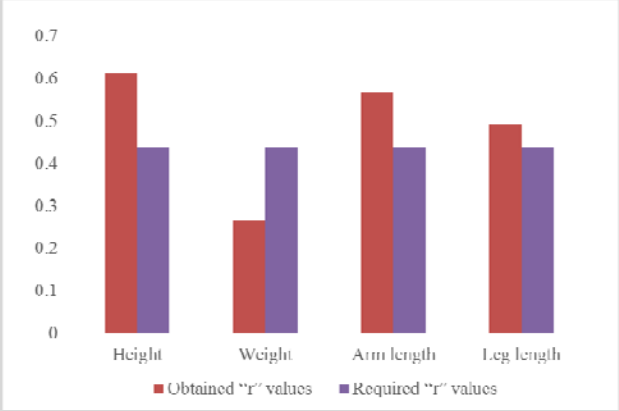

Fig 1: Graphical representation of the coefficient of correlation values between pole vaulting performance and selected anthropometric measurements

Table 1 reveals that the inter correlation matrix between pole vaulting performance and selected anthropometric measurements such as height, weight, arm length and leg length.

Table 2 shows that the coefficient of correlation values between pole vaulting performance and selected anthropometric measurements. The correlation value obtained between pole vaulting performance and height (0.612), pole vaulting performance and arm length (0.568), pole vaulting performance and leg length (0.492) were significant at 0.05 level of confidence. Since, the obtained "r" value were greater than the required "r" value of 0.44 with "df" of 1 and 18 at 0.05 level of confidence.

The result of the study also reveals that the obtained correlation value between pole vaulting performance and weight (-0.267) was insignificant at 0.05 level of confidence. Since, the obtained "r" value was lesser than the required "r" value of 0.44 with "df" of 1 and 18 at 0.05 level of confidence.

3.1 Discussions of Hypothesis

It was hypothesized that there will be a significant difference of the selected anthropometric measurements of pole vault players. The result reveals that there was significant difference between pole vaulting performance and the selected anthropometric measurements such as height, arm length and leg length, so the hypothesis is accepted in three variables. But, in weight, there was no significant difference, so the hypothesis was rejected among anthropometric variables.

4. Conclusion

1. It reveals that there was significant difference in height and pole vaulting performance.
2. No significant difference was found in weight.
3. It shown that there was significant difference between arm length and pole vaulting performance.
4. It also revealed that there was significant difference between leg length and pole vaulting performance.

Finding, it is concluded that the anthropometric measurements include height, arm length and leg length are related to pole vaulting performance except weight.

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