Correlation of Leg Length and Leg Muscle Strength on Leg Muscle Explosive Power of Men's Volleyball Student Activity Unit (UKM) Participants, PGRI Mahadewa University Indonesia

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Abstract

This study is a correlational study, because there is no relationship (correlation) between free variables and bound variables. The study population was the participants of the Student Activity Unit (SAU) of Putra Volleyball Universitas PGRI Mahadewa Indonesia, the total number of 39 people, while the technique used to take samples was by inclusion and exclusion techniques, namely: of the same sex, age ranges from 18-22 years, with good physical fitness, height 170-190 cm, body weight between 65-85 kg, and willing to participate in research. From the results of the data analysis, the value of the multiple correlation coefficient (R) =0.946 was obtained. This shows that there is a very strong correlation between limb length and limb muscle strength and limb muscle explosiveness of the participants of Student Activity Unit (SAU) of Putra Volleyball Universitas PGRI Mahadewa indonesia. From the calculation of the coefficient of determination or coefficient of determination (CD) is obtained KP= 89.49%. This means that the length of the limb and the strength of the limb muscles determine or determine by 89.49% the explosive power of the limb muscles of the participants of Student Activity Unit (SAU) Putra Volleyball Universitas PGRI Mahadewa indonesia, while the remaining 10.51% was determined by other factors not studied in this study. The F test calculation obtained an F-count value of 153.29 greater than the F-table of 3.26; so Ho was rejected and Ha was accepted (significant). Thus, it can be concluded that, there is a correlation of limb length and limb muscle strength to limb muscle explosiveness of participants of Student Activity Unit (SAU) of Putra Volleyball Universitas PGRI Mahadewa Indonesia.

***Keywords**: Correlation, Limb Length, Limb Muscle Strength, Leg Muscle Explosivity.*

INTRODUCTION

Physical condition is a very important element in almost all sports. Therefore, physical conditioning training needs serious attention, planned carefully and systematically so that the level of physical fitness and functional ability of the body's organs is better. The main goal is to increase the athlete's functional potential by developing the biomotor component to the highest degree. The elements in the game of volleyball require several biomotor components, namely strength, flexibility, speed, agility, explosive power, endurance, balance and coordination.

Correlation is research that involves the act of collecting data to determine whether there is a relationship and the level of relationship between two or more variables.

Leg length is the part of the body that covers from the groin or bottom of the knee to the heel. Leg length in this research is used for students in the jumping phase, namely the jumping ability of students or athletes with different leg lengths to get a high jump in a short time.

Leg muscle strength is a person's ability to use muscle strength to jump as high as possible in the shortest time. To gain leg muscle strength requires several supporting components as follows: strength, speed, leg muscle strength, balance and coordination.

Muscle explosive power is the ability of muscles to overcome resistance and carry out high contractions so that they are able to perform work suddenly and powerfully. In the research, what is meant by explosive power in the leg muscles is the ability of the leg muscles when they push hard so that they can produce high jumps.

Volleyball is a sport played by two teams whose aim is to drop the volleyball into the opponent's area. The number of players in one team is six people (Anonymous, 2012; 1).

Meanwhile, in this study, the researcher focused his research on the jump (explosive power) in the smash. So a smash is an action of hitting the ball hard using a certain technique so that the ball can enter the opponent's court in the hope that it cannot be blocked by the other team

as the opponent in the game, thereby gaining points (Anonymous, 2014; 1).

Mastery of leg muscle strength and leg muscle explosive power in volleyball determines victory in a match. Therefore, it was chosen to prove the relationship between leg length and leg muscle strength on leg muscle explosive power. This is driven by the desire to improve the sporting achievements achieved by PGRI Mahadewa Indonesia University because it has not shown maximum results from year to year. From observations made by researchers at PGRI Mahadewa University, Indonesia, since the inception of this university, it has never achieved good performance at the inter-university championship level. Therefore, researchers want to examine what makes the above happen.

The training was carried out at PGRI Mahadewa University Indonesia with various considerations, including an adequate sample size, the researcher worked as a lecturer at the university. Another consideration is that students are required to be serious in carrying out training considering that researchers are the teachers. Therefore, in order to get results of leg muscle explosive power, a correlation between leg length and leg muscle strength was chosen.

WhereIn this study, what was measured was the leg length, leg muscle strength, and explosive power of the participants' leg musclesStudent Activity Unit (UKM) for Men's Volleyball at PGRI Mahadewa University Indonesia.

The problem formulation that can be formulated from the description above is:Is there a correlation between leg length and leg muscle strength on participants' leg muscle explosive power?Student Activity Unit (UKM) for Men's Volleyball at PGRI Mahadewa University Indonesia.

RESEARCH METHOD

Research design

Withproblem characteristics in the form of a correlational relationship between two or more variables (Sangadji and Sopiah, 2010: 22). Where all samples are given an initial test and a final test, then observed.

Place and time of research

Held in the Hall of PGRI Mahadewa Indonesia University. This research was carried out for 2 days (Saturday and Sunday) from 16.00 WITA until completion.

Population and Sample

Where all participants are usedPGRI University Men's Volleyball Student Activity Unit (UKM). Mahadeva Indonesia as a population. And select samples from the population using inclusion and exclusion criteria that meet the following criteria; male gender, age 18-22 years, height 170-190 cm, weight 65-85 kg, volleyball UKM participant, moderate physical fitness and sincerely signed a letter of agreement to be a sample from the start of the study until completion.

Research variable

This research is correlational research, namely examining the relationship between two or more variables, so the variables used are the independent variable (independent variable) and the dependent variable (dependent variable). The independent variables in this study are leg length, symbolized by X_1 and leg muscle strength, symbolized by X_2. Meanwhile, the dependent variable in this research is the explosive power of the leg muscles of the men's volleyball UKM participants, which is symbolized by Y.

Method of collecting data

There are various data collection methods, such as: questionnaires, tests, interviews, measurements and observations (Anonymous, 2013; 1). The method that will be used in this research is the measurement method. Measurement is a way to obtain data by determining the amount of something (Nasrum, 1992: 120). In this study, what was measured was the leg length, leg muscle strength, and explosive power of the participants' leg musclesStudent Activity Unit (UKM) for Men's Volleyball at PGR Mahadewa Indonesia University.(Measurements are made using*Anthrometer*in centimeters (cm) to measure leg length, leg dynamometer in Kg/BB units to measure leg muscle strength, and jump MD in centimeters (cm) to measure leg muscle explosive power).

Data analysis

Before calculating the multiple correlation coefficient, each product moment

correlation coefficient X_1 with Y, X_2 with Y, and X_1 with X_2 will be calculated in stages as follows:

1. $rX_1Y = \frac{n(\sum X_1Y)-(\sum X_1)(\sum Y)}{\sqrt{\{n.\sum {X_1}^2-(\sum X_1)^2\}\{n.\sum Y^2-(\sum Y)^2\}}}$
   (Riduwan, 2003: 241)

2. $rX_2Y = \frac{n(\sum X_2Y)-(\sum X_2)(\sum Y)}{\sqrt{\{n.\sum {X_2}^2-(\sum X_2)^2\}\{n.\sum Y^2-(\sum Y)^2\}}}$
   (Riduwan, 2003: 242)

3. $rX_1X_2 = \frac{n(\sum X_1X_2)-(\sum X_1)(\sum X_2)}{\sqrt{\{n.\sum {X_1}^2-(\sum X_1)^2\}\{n.\sum {X_2}^2-(\sum X_2)^2\}}}$
   (Riduwan, 2003: 242)

4. The multiple correlation test coefficient is formulated as follows:
   $Rx_1x_2y = \sqrt{\frac{r^2x_1y + r^2x_2y - 2(rx_1y)(rx_2y)(rx_1x_2)}{1 - r^2x_1x_2}}$
   (Riduwan, 2003: 238)

The level of relationship based on the correlation coefficient (R) value obtained is shown in table 2 below:

Table 1. Interpretation of the Correlation Coefficient R value

Coefficient Interval	Relationship Level
0.000 – 0.199	Very low
0.200 – 0.399	Low
0.400 – 0.599	Enough
0.600 – 0.799	Strong
0.800 – 1,000	Very strong

Source: Riduwan, 2003: 223

To find out the amount of contribution X_1 and X_2 to Y is calculated using the formula:
$KP = R^2 \times 100\%$
(Riduwan, 2003: 234)
To test whether the results of the multiple correlation coefficient (R) obtained are significant or not, an F test is carried out with the following formula:

$Fcount = \frac{\frac{R^2}{k}}{\frac{(1-R^2)}{(n-k-1)}}$

(Riduwan, 2003: 238)

RESULTS

From the helper table, the following values are obtained:
$\sum X_1 = 3500$
$\sum X_2 = 3068$
$\sum Y = 1972$
$\sum X_1^2 = 315140$
$\sum X_2^2 = 242339.5$
$\sum Y^2 = 99892$
$\sum X_1Y = 177310$
$\sum X_2Y = 155420.5$
$\sum X_1X_2 = 275541$
The next step is to plug the statistical numbers into the formula:

1. Product Moment Correlation Coefficient X_1 with Y

$$rX_1Y = \frac{n(\sum X_1Y)-(\sum X_1)(\sum Y)}{\sqrt{\{n.\sum {X_1}^2-(\sum X_1)^2\}\{n.\sum Y^2-(\sum Y)^2\}}}$$
$$= \frac{39(177310)-(3500)(1972)}{\sqrt{\{39.315140-(3500)^2\}\{39.99892-(1972)^2\}}}$$
$$= \frac{6915090-6902000}{\sqrt{\{12290460-12250000\}\{3895788-3888784\}}}$$
$$= \frac{13090}{\sqrt{\{40460\}\{7004\}}}$$
$$= \frac{13090}{\sqrt{283381840}}$$
$$= \frac{13090}{16833,94903164436}$$
$$= 0.777595321$$
$$= 0.777$$

2. Product Moment Correlation Coefficient X_2 with Y

$$rX_2Y = \frac{n(\sum X_2Y)-(\sum X_2)(\sum Y)}{\sqrt{\{n.\sum {X_2}^2-(\sum X_2)^2\}\{n.\sum Y^2-(\sum Y)^2\}}}$$

$$=\frac{39(155420,5)-(3068)(1972)}{\sqrt{\{39.242339,5-(3068)^2\}\{39.99892-(1972)^2\}}}$$
$$=\frac{6061400-6050096}{\sqrt{\{9451241-9412624\}\{3895788-3888784\}}}$$
$$=\frac{11304}{\sqrt{\{386167\}\{7004\}}}$$
$$=\frac{11304}{\sqrt{270469966}}$$
$$=\frac{11304}{16445,97111757162}$$
= 0.686777861
= 0.686

3. Product Moment Coefficient X_1 with X_2

$$rX_1X_2 =\frac{n(\sum X_1X_2)-(\sum X_1)(\sum X_2)}{\sqrt{\{n.\sum {X_1}^2-(\sum X_1)^2\}\{n.\sum {X_2}^2-(\sum X_2)^2\}}}$$
$$=\frac{39(275541)-(3500)(3068)}{\sqrt{\{39.315140-(3500)^2\}\{39.242339,5-(3068)^2\}}}$$
$$=\frac{10746099-10738000}{\sqrt{\{12290460-12250000\}\{9451241-9412624\}}}$$
$$=\frac{8099}{\sqrt{\{40460\}\{386167\}}}$$
$$=\frac{8099}{\sqrt{1562423590}}$$
$$=\frac{8099}{39527,50422174413}$$
= 0.204895304
= 0.204

4. Entering the Product Moment Coefficient above in the Multiple Correlation Coefficient (R) formula

$$Rx_1x_2y = \sqrt{\frac{r^2x_1y + r^2x_2y - 2(rx_1y)(rx_2y)(rx_1x_2)}{1 - r^2x_1x_2}}$$
$$=\sqrt{\frac{(0,777595321)^2 + (0,686777861)^2 - 2(0,777595321)(0,686777861)(0,204895304)}{1 - (0,204895304)^2}}$$
$$=\sqrt{\frac{0,604654483 + 0,471663831 - 0,218842631}{1 - 0,041982086}}$$
$$=\sqrt{\frac{0,85475683}{0,958017914}}$$
$$=\sqrt{0,895051826}$$
= 0.9463822642040583
= 0.946

5. Calculating KP

KP = R^2 x 100%
= $(0.946)^2$ x 100%
= 0.894916 x 100%
= 89.49%

6. Testing the significance of the multiple correlation coefficient can be done using the F test

$$Fcount = \frac{\frac{R^2}{k}}{\frac{(1-R^2)}{(n-k-1)}}$$

$$=\frac{\frac{(0,946)^2}{2}}{\frac{(1-(0,946)^2)}{(39-2-1)}}$$
$$=\frac{\frac{0,894916}{2}}{\frac{(1-0,894916)}{36}}$$
$$=\frac{0,447458}{0,002919}$$
= 153.291538198013

Fcount = 153.29
The significance level used to test the hypothesis above is a significance level of 5% with the degree of the numerator (db = k) and the degree of the denominator (db = nk-1). If it turns out that the F-calculated value obtained in this study is greater than or equal to the F-table then the proposed null hypothesis is rejected. Likewise, if it turns out that the F-calculated value obtained in this study is smaller than the F-table value, then the proposed null hypothesis is accepted.
7. Determining the F-table
F-table(0.05) degrees of freedom numerator (db numerator = k = 2); compared with the degrees of freedom in the denominator (db denominator) = (nk-1) = 39-2-1 = 36. The F-table value (0.05) is 3.26.

CONCLUSIONS AND SUGGESTIONS

Based on the correlation coefficient obtained of 0.946, there is a very strong correlation between leg length and leg muscle strength on the explosive power of the participants' leg muscles.Student Activity Unit (UKM) for Men's Volleyball at PGRI Mahadewa University Indonesia.

From the calculation of the determining coefficient, the determining coefficient value is 89.49%. This means that leg length and leg muscle strength together determine 89.49% of the participant's leg muscle explosive power.Student Activity Unit (UKM) for Men's Volleyball at PGRI Mahadewa University Indonesia. Meanwhile, the remaining 10.51% was influenced by other factors that were not researched.

The correlation coefficient obtained in the calculation is significant for all members of the population. This can be seen from the F test, the F-count of 153.29 is greater than the F-table of 3.26; so Ho is rejected and Ha is accepted (significant). Thus, it can be said that it is true that there is a correlation between leg length and leg muscle strength on the explosive power of the participant's leg muscles, Students' Activity Unit (UKM) for Men's Volleyball at PGRI Mahadewa University Indonesia.

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