



## **The Relationship Between Leg Muscle Explosive Power And Limb Length On The Results Of Flop Style High Jump In Jakarta State Athletic KOP Students**

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### **ABSTRACT**

*This study aims to determine whether there is a relationship between leg muscle explosive power and leg length on high jump results in KOP athletics students of Jakarta State University. The design of this study is a quantitative study that uses a series of tests, namely the measurement of leg length, vertical jump test and flop style high jump test. There were a total of 20 subjects studied and only 18 met the instrument test. Data processing using SPSS version 20 with Correlation found a correlation result of leg muscle explosive power of 0.673 and a significance value of 0.000 where the significance value was smaller than 0.05 indicating a strong relationship between leg muscle explosive power and high jump results. Then based on the results of the correlation test the correlation result of the length of the limb of 0.818 and the significance value of 0.000 where the significance value was smaller than 0.05 The variable correlation value shows a positive value and shows a very strong relationship between leg length and high jump results. Then based on the results of the f test, it is known that the significance value in this f test has a value of 0.000 less than 0.05 so it can be concluded that there is a relationship between the explosive power of the leg muscles and the length of the tukai together with the high jump results of KOP athletics students of Jakarta State University.*

**Keywords:** Leg muscle explosive power; Leg length; High jump.

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### **INTRODUCTION**

Development The development of sports in Indonesia can be said to be experiencing very rapid development (Pardianto & Saputra, 2020). This can be seen from the high level of public interest in changing their lifestyle to a healthier one (Barutu, 2021), apart from that, several influencers from several communities have made sport a lifestyle, thus increasing people's attraction to continue exercising (Wardani & Mahendra, 2017). Sports are also experiencing development in terms of achievements achieved, both on the national

and international levels (Erwizal & Yunitaningrum, 2015). Many sports have made achievements on the national and international stage, one of the sports that has experienced increased performance is athletics (Ali & Lumintuarso, 2017).

Athletics is a fairly old sport that has existed in the world and has been practised since ancient kingdoms until now (Basri et al., 2020). It can be said that since the existence of humans on this earth, athletics has been carried out and carried out by humans (M. Taufik SY, 2017). This is because every human movement includes movements in athletics such as running (Sahabuddin et al., 2020), walking, jumping and throwing which are applications of basic human movements in everyday life (Riyanto et al., 2018). The movements performed in most sports are basic movements originating from athletic movements (Suharto, 2021). Therefore, athletics is said to be the mother of all sports (Zainuri, 2020).

In athletics, there are several numbers one of the competitions is the flop-style high jump. In general, the flop-style high jump sequence is divided into four stages, namely: starting, pushing off, flying and landing. The start is done by running at optimal speed, followed by a strong and high push, flying in the air for a short time and landing perfectly.

At this stage, there is a pushing phase, where in this phase the athlete must push as hard as possible to get the desired height so that the bar from the flop-style high jump can be crossed. To get this high push, athletes must have good leg muscle explosive power. Because when pushing the main muscles that work are the leg muscles. Explosive power is a person's ability to release a large amount of energy in a short time. Explosive power is a combination of two physical components, namely speed and strength. So that the explosive power is carried out strongly and quickly. This is needed by athletes to be able to reach the desired height.

To increase the explosive power of your leg muscles, you can use various training methods such as plyometrics, squats, box jumps and others. In this method, athletes are required to perform a jump quickly and strongly. It is hoped that by carrying out training using this method, athletes will increase the explosive power of their leg muscles.

However, there is a problem in the field where athletes in the flop-style high jump still have poor leg muscle explosive power based on parameter test results. So the results of the jump did not match expectations. This can be used as evaluation material by the coaching team. This also happened to KOP Athletics Student athletes at Jakarta State University. So this is of special concern. The relationship between the explosive power of leg muscles and the results of the flop-style high jump in KOP Athletics Students at Jakarta State University has not yet been researched as a reference for this research.

Apart from explosive leg muscle power, athletes who jump high in the flop style must also have long legs. This is something athletes get from birth, which is a hereditary factor from their parents, so leg length is a gift from God. Having long legs is the initial capital for a flop-style high jumper in making a jump. Athletes who have a height of 190cm will find it easier to pass a height of 160cm compared to athletes who only have a height of 170cm. This is because long legs will produce high jumps because the longer the legs, the higher the distance between the waist and the ground.

Thus, when searching for athletes, the anthropometric factor, namely leg length, can be used as a reference for assessing the search for superior athletes in the flop style high jump because leg length is one of the initial capital. However, many flop-style high jump athletes, including KOP Athletics students at Jakarta State University, do not take advantage of their long legs, so their jump results are less than optimal. This becomes an evaluation material for the coaching team to correct the athlete's shortcomings because the athlete already has the initial capital to become a flop-style high jump athlete. Apart from that, the relationship between leg length and the results of the flop-style high jump has not been studied, which is the reason this research was carried out.

At the Faculty of Sports Science, Jakarta State University, there is an Achievement Sports Club for the Athletics branch. This club develops students and students who want to become athletic athletes. One of the goals of this coaching is to increase student achievement as high as possible. The flop-style high jump is one of the numbers built into the Athletics KOP. As a result of this KOP Athletics coaching, several athletes entered the PPLM DKI Jakarta training camp. The KOP and PPLM concentration aims to improve performance to the next level, namely PELATDA. Apart from this background, the researcher intends to examine the explosive power of leg muscles and leg length to find out how much they relate to the results of the flop-style high jump for KOP athletics students at Jakarta State University.

## **METHOD**

### **Place and time of research**

This research was conducted on Friday, July 14 2023 at the Rawamangun Athletic Stadium.

### **Research methods**

This research was carried out using quantitative methods with correlation study techniques which is a research to collect data obtained by measuring and recording the

results of the measurements (Sugiyono, 2013).

### **Research Population**

Population is the subject of research. In this study, the population was 113 members of the Jakarta State University Athletics KOP.

### **Sample**

The sample is a part or representative of the population studied. In this study, researchers took samples from the population using accidental sampling techniques. The accidental sampling technique was carried out based on spontaneity or chance factors. This means that anyone present during the research can be used as a sample (Sugiyono, 2016; 124). In this study, the total population present and then used as a sample was 20 people consisting of 17 men and 3 women.

### **Research Instrument**

Instruments are an important point in research, instruments function to obtain the desired data from research as stated by Arikunto (2010) are "Tools or facilities used by researchers in collecting data so that their work is easier and the results are better. "good, in the sense of being more careful, complete and systematic so that it is easier to process."

The research instrument used in this research is Accutrend Lactacid with market brand Roche type 3012522, which is a tool that functions to determine the level of lactic acid in a person's blood after carrying out a treatment test. Accutrend Lactacid does not have validity and reliability figures. However, this tool is standard and meets validity standards for use in checking lactic acid levels. Data collection was obtained from:

1. Tools and equipment
  - a. *Accutrend Lactacid*(lactate meter), to measure lactic acid levels.
  - b. BM Lactic acid strip, a tool for storing blood after the fingertip of the sample is pricked using a blood lancet, then the lactate strip is inserted and checked using a lactate occurred (lactate meter).
  - c. Research format
  - d. Stationery supplies
  - e. Cotton
  - f. Swap alcohol
  - g. *Stopwatch*
  - h. *Lancets blood*, to prick the tip of the finger test
2. Test Implementation Procedure

a. General Procedures

Before carrying out the test, respondents were gathered to be given directions and explanations regarding the regulations for carrying out the test.

b. Test Implementation

1. Respondents were divided into 2 groups according to their respective treatments
2. The blood/lactate sample is taken from the tip of the finger using blood lancets, then the blood is dripped onto a lactate strip.

**Finding Regression Equations**

This step is carried out to ensure the form of the relationship between variable X and variable Y in the form of the following equation:

$$Y = a + bX \text{ Where:}$$

Y = Dependent variable obtained from the regression equation

a = Regression constant for X = 0

b = Regression direction coefficient which determines how the regression direction lies

The direction coefficients a and b for the regression equation above can be calculated using the following formula (Arikunto, 2010):

$$(\sum F)(\sum X^2) - (\sum X)(\sum XF) \tag{1}$$

$$a = \frac{(\sum F)(\sum X^2) - (\sum X)(\sum XF)}{n(\sum X^2) - (\sum X)^2} \tag{2}$$

$$b = \frac{n(\sum XF) - (\sum X)(\sum F)}{n(\sum X^2) - (\sum X)^2} \tag{3}$$

$$\tag{4}$$

**Finding the Correlation Coefficient**

The correlation coefficient between variables X and Y can be found using the following formula:

$$r = \frac{n(\sum XF) - (\sum X)(\sum F)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum F^2) - (\sum F)^2]}} \tag{5}$$

$$\tag{6}$$

**Correlation Coefficient Significance Test**

The correlation coefficient obtained from the equation above is first tested for significance before concluding.

Test criteria:

Reject  $H_0$  if t-count > t-table, in other cases  $H_0$  received on  $\alpha = 0.05$  For this test with the following formula (Sudjana, 1992)

$$T_{count} = r\sqrt{n-2} \tag{7}$$

$$\sqrt{1-r^2} \quad (8)$$

## RESULTS AND DISCUSSION

### Normality test

The normality test uses the non-parametric Kolmogorov-Smirnov (KS) statistical test. Testing uses histogram graphic analysis, normal plot graphs and statistical tests with Kolmogorov-Smirnov Z (1-Sample KS). According to Ghozali (2018), statistical test decision-making using Kolmogorov-Smirnov (1-SampleK-S) is:

**Table 1.**  
Normality Test Results

Information	Sig.	Results
Explosive Power of Leg Muscles	0.917	Normally distributed
Leg Length	0.627	Normally distributed
Flop-style high jump results	0.228	Normally distributed

Based on the results of table 1 which shows the results of the normality test, it shows that the Asymp. Sig (2-tailed) has a value greater than 0.05, so it can be concluded that the regression model is normally distributed so that the normality assumption is met.

### Linearity Test

**Table 2.**  
Linearity Test Results

Information	Sig.	Results
Explosive Power of Leg Muscles	0.455	Linear
Leg Length	0.686	Linear

Based on the table above, it is known that the significant value of Deviation from linearity is greater than 0.05, so it can be concluded that the relationship between the independent and dependent variables is linear.

### Hypothesis Test Results

Hypothesis testing in this research uses multiple linear regression analysis which is used to determine the influence of moderating variables on the influence of the independent and dependent variables.

The hypothesis test consists of being carried out in two ways, namely the Spearman correlation test and the t-test (Y hat) with the following results:

### Correlation Test

To know the level of relationship of the variables studied, you can use the interpretation of the correlation coefficient (Safrit & Wood, 1995). To determine the level of relationship between the variables studied, you can use the interpretation of the



correlation coefficient of the Spearman correlation test hypothesis, namely:

Ho: No significant relationship between the independent variable and the dependent variable.

Ha: There is a significant relationship between the independent variable and the dependent variable.

The t-test decision conditions are:

If the sig value is  $> 0.05$ , then the independent variable does not have a significant relationship with the dependent variable (Ho is accepted).

If  $\text{sig} < 0.05$ , then the independent variable has a significant relationship with the dependent variable (Ho is rejected).

**Table 3.**  
Spearman Correlation Test Results

Information	Correlation	Sig.	Results
Explosive Power of Leg Muscles	0.733	0.016	There is a significant relationship
Leg Length	0.935	0,000	There is a significant relationship

Based on the Spearman correlation test table presented in Table 3, the results of this research will be explained as follows:

### **The Relationship between Leg Muscle Explosive Power and Flop Style High Jump Results in KOP Athletics Students at Jakarta State University**

Based on the Spearman correlation results, it shows that the Limb Muscle Explosive Power variable has a correlation value of 0.733 and a significance value of 0.016 where the significance value is smaller than 0.05 so it can be concluded that H1 is accepted, which means there is a significant relationship between the explosive power of the leg muscles and the results of the flop style high jump in KOP Athletics Students at Jakarta State University. The correlation value of 0.733 which leads in a positive direction indicates that the greater the value of Leg Muscle Explosive Power, the greater the flop style high jump results will be by 0.733 or 73.3%. This value shows that there is a significant relationship between leg muscle explosive power and flop-style high jump results in KOP Athletics Students at Jakarta State University.

### **Relationship between leg length and flop style high jump results in KOP Athletics Students at Jakarta State University**

Based on the Spearman correlation results, it shows that the Length variable has a correlation value of 0.935 and a significance value of 0,000 where the significance value is smaller than 0.05 so it can be concluded that H2 is accepted, which means there is a

significant relationship between limb length and the results of the flop style high jump in KOP Athletics Students at Jakarta State University. The correlation value of 0.935 which leads in a positive direction indicates that the greater the value of the Leg Length, the greater the flop-style high jump results will be by 0.935 or 93.5. This value shows that there is a significant relationship between limb length and the results of the flop-style high jump in KOP Athletics Students at Jakarta State University.

## Discussion

**It is suspected that there is a relationship between the explosive power of the leg muscles and the results of the high jump, flop style, and flop style in CKOP Athletics Students, State University of Jakarta.**

Based on the results of the hypothesis test, it is known that the Limb Muscle Explosive Power variable has a correlation value of 0.733 and a significance value of 0.016 where the significance value is smaller than 0.05. The correlation value of the Limb Muscle Explosive Power variable has a positive value, which means that the higher the Limb Muscle Explosive Power value, the higher the flop style high jump results produced and the correlation value of 0.733 shows that there is a significant relationship between the Limb Muscle Explosive Power and the flop style high jump results. This means that H1 is accepted, which means that there is a significant relationship between leg muscle explosive power and flop-style high jump results in KOP Athletics Students at Jakarta State University.

In general, the flop-style high jump sequence is divided into four stages, namely: starting, pushing off, flying and landing. The start is done by running at optimal speed, followed by a strong and high push, flying in the air and landing. At this stage, there is a pushing phase, where in this phase the athlete must push as hard as possible to get the desired height so that the bar from the flop-style high jump can be crossed.

To get this high push, athletes must have good leg muscle explosive power. Because when pushing the main muscles that work are the leg muscles. Explosive power is a person's ability to release a large amount of energy in a short time. Explosive power is a combination of two physical components, namely speed and strength. So that the explosive power is carried out strongly and quickly. This is needed by athletes in the flop-style high jump to be able to reach the desired height.

**It is suspected that there is a relationship between limb length and the results of the high jump, flop style, and flop style in KOP Athletics Students at Jakarta State University.**



Based on the results of the hypothesis test, it is known that the Limb Length variable has a correlation value of 0.935 and a significance value of 0,000 where the significance value is smaller than 0.05. The correlation value for the variable Leg Length has a positive value, which means that the higher the value of the Leg Length, the better the flop style high jump results will be and the correlation value of 0.935 indicates that there is a significant relationship between the Leg Length and the flop style high jump results. This means that H2 is accepted, which means that there is a relationship between limb length and the results of the flop-style high jump in KOP Athletics Students at Jakarta State University.

A flop-style high jump athlete must have long legs. This is something athletes get from birth, which is a hereditary factor from their parents, so leg length is a gift from God. Having long legs is the initial capital for a flop-style high jumper in making a jump. Athletes who have a height of 190cm will find it easier to pass a height of 160cm compared to athletes who only have a height of 170cm. This is because long legs will produce high jumps because the longer the legs, the higher the distance between the waist and the ground.

**It is suspected that there is a relationship between the explosive power of the leg muscles and the length of the legs together with the results of the Flop style high jump in KOP Athletics Students at Jakarta State University.**

Based on the results of the hypothesis test, it is known that the significance value in the F test is 0.000, less than 0.05. So it can be concluded that H3 is accepted, which means there is a significant relationship between the explosive power of the leg muscles and the length of the legs together on the results of the high jump style of the flop in KOP Athletics Students at Jakarta State University.

In general, the flop-style high jump sequence is divided into four stages, namely: starting, pushing off, flying and landing. The start is done by running at optimal speed, followed by a strong and high push, flying in the air and landing. At this stage, there is a pushing phase, where in this phase the athlete must push as hard as possible to get the desired height so that the bar from the flop-style high jump can be crossed. To get this high push, athletes must have good leg muscle explosive power. Because when pushing the main muscles that work are the leg muscles. Explosive power is a person's ability to release a large amount of energy in a short time. Explosive power is a combination of two physical components, namely speed and strength. So that the explosive power is carried out strongly and quickly. This is needed by athletes in the flop-style high jump to be able to reach the

desired height.

To increase the explosive power of the leg muscles, you can use various training methods such as plyometrics, depth jumps, box jumps and others. In this method, athletes are required to perform a jump quickly and strongly. It is hoped that by carrying out training using this method, athletes will increase the explosive power of their leg muscles.

Apart from explosive leg muscle power, athletes who jump high in the flop style must also have long legs. This is something athletes get from birth, which is a hereditary factor from their parents, so leg length is a gift from God. Having long legs is the initial capital for a flop-style high jumper in making a jump. Athletes who have a height of 190cm will find it easier to pass a height of 160cm compared to athletes who only have a height of 170cm. This is because long legs will produce high jumps because the longer the legs, the higher the distance between the waist and the ground.

Thus, when searching for athletes, the anthropometric factor, namely leg length, can be used as a reference for assessing the search for superior athletes in the flop style high jump because leg length is one of the initial capital.

## CONCLUSIONS AND SUGGESTIONS

### Conclusions

Based on the results of data analysis, this research resulted in the conclusion that there is a significant relationship between the explosive power of the leg muscles and the results of the flop-style high jump. Apart from that, there is also a significant relationship between limb length and the results of the flop-style high jump. There is a significant relationship between the explosive power of the leg muscles and the length of the legs together with the results of the flop-style high jump in KOP Athletics Students at Jakarta State University.

### Suggestion

Some suggestions can be given so that further research can get better results, including:

- (1) It is recommended for future researchers to use different research locations so that the sample scope is also wider.

- (2) For future researchers who are interested in researching the same topic, it is recommended to consider or look for other variables related to the results of the flop-style high jump.
- (3) It is hoped that coaches will be more selective in recruiting prospective athletes according to their talents and potential so that they can continue to develop.
- (4) Athletes are expected to be able to know and understand their talents and potential.
- (5) For the Jakarta State University athletics KOP, it is hoped that it can better protect and facilitate the path for its members both in pursuing academic achievements and fluency in their studies.
- (6) It is hoped that sports science faculties will pay more attention to the completeness, renewal and maintenance of equipment in athletics.

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